Mapping the skills supply and demand of the lighting-related construction sector

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DELIVERABLE CONTROL PAGE	
Deliverable Title	Mapping the skills supply and demand of the lighting-related construction sector
Deliverable Number	R2.1
WP number	2
Short Description	The objective of this deliverable is to identify the skills supply and demand of the lighting-related Construction Industry sector for well-trained and high skilled lighting professionals, in France, Germany, Greece and Italy. To identify the sectorial needs the authors collected information from Construction Industry representative organisation in Europe but not only. This information has been combined with the results of ECOSLIGHT questionnaire and interviews in France, Germany, Greece and Italy used to identify the competences required as well as particular job role profiles related to smart, energy efficient and sustainable lighting environments for infrastructure, cities, buildings and industries (including construction sector). Apart from that, a detailed analysis was conducted for the "skills supply side", i.e. the training programs offered for the professionals of the sector, in the aforementioned project countries. A gap analysis was conducted afterwards.
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1 Introduction

This report presents the key findings of the initial research activities conducted *under the ECOSLIGHT: Environmentally Conscious Smart Lighting* Project conducted the second semester of 2020 in France, Germany, Greece and Italy. The research was funded by the Erasmus + Programme Sector Skills Alliance of the EU.

The ECOSLIGHT consortium aimed to identify the skills and competences required for construction industry professionals operating or would like to operate in the lighting sector. These competences included job specific competences, digital (basic and advanced) competences, green competences, entrepreneurship competences and additional horizontal (life) competences. Based on their expertise and their extensive knowledge related to the professional needs of the sector, the consortium has identified early enough a set of role profiles that appeared as emerging; the Light Pollution Specialist, the Human-Centric Lighting Specialist, and the Road Lighting Safety and Security Specialist. These profiles were studied during the ECOSLIGHT research and lead eventually the proposed ECOSLIGHT Role Profiles that the reader may find in the *R2.2 Emerging Job Profiles for ECOSLIGHT Professionals related to lighting design and lighting technologies*.

The first part of this report (Chapters 1 and 2) is an introduction to the ECOSLIGHT project and the current state of the art in respect to the human capital development needs for lighting related professionals.

The second part (Chapters 3 and 4) orients to the research activities conducted under the project, focusing to the “demand” side, i.e. the need for professionals, skills and competences from the sector. ECOSLIGHT defined its own research methodologies and tools and established a common framework across the four project countries (France, Germany, Greece and Italy) in order to collect comparable results and produce eventually the ECOSLIGHT Job Role Profiles and the respective curricula that will operate as a benchmark for the sector. The research objective necessitated a hybrid research approach including a qualitative and a quantitative component, in order to get rich insights into the emerging job roles, the competences required for them in the volatile landscape, and in parallel taking into account the existing supply of skills and the requirement for quality in Vocational Education and Training.

The third part (Chapter 5) of the report focuses to the “supply” side, the provision of training for lighting professionals. Various training programs and opportunities were studied in the project countries and beyond, in order to identify the current state and the potential “weaknesses”, i.e. the lack of curricula, training programs and separate skills and competences for the sector professionals.

The fourth part (Chapter 6) presents the findings of the qualitative research, i.e. the interviews conducted during the ECOSLIGHT research, in France, Germany, Greece and Italy

The last part of the report (Chapter 7) illustrates the key findings of all the research activities and the gap analysis.

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2 The ECOSLIGHT Landscape

2.1 Construction sector needs highly-skilled collaborators

The construction industry, and its broader ecosystem, erects buildings, infrastructure, and industrial structures that are the foundation of our economies and are essential to our daily lives. Further, the construction industry is one of the fastest-growing industries in the world and the most robust. In fact, construction is the biggest industry in the world with an estimated US$1,3 trillion in construction projects in 2019 alone (National Surety Services Inc. 2020). With a value chain delivering approximately US$11 trillion of global value added it represents 13% of the world Gross Domestic Product (GDP), however, the annual growth is tinny (1% in average per year during the last for the past two decades) and overall earnings before interest and taxes (EBIT) are only around 5% (Mischke 2020).

To overcome this relative stagnation, all of the players in the construction value chain will need to develop their strategies for dealing with or leading disruption. In fact, Players that move fast and manage to radically outperform their competitors could grab the lion's share of the $265 billion in new and shifting profits and see valuations increase more rapidly than traditional construction firms (Mischke 2020).

It's vital for a construction business to plan ahead, as technology is advancing almost faster than we can keep up with, and without **workers who have the proper skills**, it can be easy to get left behind. For this reason, a staggering number of construction firms **looking to hire more skilled workers**, the field is going to get more competitive. Of course, with this level of success comes corresponding challenges, including where to find the best workers. With a shortage of skilled workers, construction companies face a unique challenge: **where to find the best workers with the best job skills** to recruit for now and into the future.

Following NSSI, the numbers regarding recruitment in the construction industry over the next year are stunning. A whopping 79% of construction companies are looking to hire skilled workers in the next year. That way, 95% of contractors have seen it as a challenge to find workers with the right job skills to recruit for their pool (National Surety Services Inc. 2020).

Knowing what construction job skills to target for when moving forward can be tricky and requires predictive hiring[1] practices to understand, analyse and invest in the right technology and approaches for future skills. The technology used in predictive analytics detects patterns among the current workforce and reduces reliance upon traditional intuition-based job interviews and brief resume screenings. The first step in hiring for the future involves knowing what skills are well-represented among existing staff and which job skills are needed to recruit to fill in the gaps. Because construction workers need a broad range of skills to perform their duties, it can be tricky to discover where the gaps lie. In parallel, following NSSI, players have started to implement more robust Human Resources activities aimed at attracting and retaining employees. As example, 75% of engineering and construction players in the United States have made changes to training and development programs in the past two years, to better enable employee retraining and ensure continuous learning of their workforces`;

In addition, the future of the construction industry is technology-based and green. Client demands are also evolving toward higher performance and sustainability: smart buildings, energy and operational efficiency, and flexibility and adaptability of structures will become higher priorities. Expectations are also rising among customers, who want simple, digital interactions as well as more adaptable structures. That way, construction industry must include in the equation the emergence of new technologies. This adds to the

[1] Predictive hiring uses a specific set of analytics based on historical data to make predictions regarding future needs

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persistent scarcity of skilled labour, the need of changing logistics equation resulting from new materials and technologies.

The sector needs workers with job skills that allow them to slot seamlessly into this coming world. Artificial intelligence, software and technology packages, energy efficient solutions of any kind, autonomous construction equipment and more are becoming more commonplace in the industry, and that's only going to grow in the future. If some construction industry players holding off on adopting such emerging technologies because thinking they're a fad, may not survive for long-enough to verify this hypothesis. In reality, the sector needs to continue recent investment more heavily in STEM (science, technology, engineering and mathematics). Many of the most valuable construction workers have an understanding of the science and engineering involved in projects. This empowers them to make more informed decisions about everything, from which building materials are healthiest to how the different materials affect one another.

2.2 The domain of renovation and energy efficiency are driving forces

Buildings are responsible for about 40% of the EU's energy consumption and 36% of greenhouse gas emissions from energy. But only 1% of buildings undergo energy efficient renovation every year, so effective action is crucial to making Europe climate-neutral by 2050. To achieve the at least 55% emissions reduction target for 2030, proposed by the Commission in September 2020, the EU must reduce buildings' greenhouse gas emissions by 60%, their energy consumption by 14%, and the energy consumption of heating and cooling by 18%. This will help nearly 34 million Europeans unable to afford keeping their homes heated, public policies to promote energy efficient renovation are also a response to energy poverty, support the health and wellbeing of people and help reduce their energy bills (European Commission 2020).

The European Commission published in October 2020 its "Renovation Wave Strategy" to improve the energy performance of buildings. The Commission aims to at least double renovation rates in the next ten years and make sure renovations lead to higher energy and resource efficiency. This will enhance the quality of life for people living in and using the buildings, reduce Europe's greenhouse gas emissions, foster digitalisation and improve the reuse and recycling of materials. By 2030, 35 million buildings could be renovated and **up to 160 000 additional green jobs created in the construction sector** in Europe. Europe's strategy lies among other on increasing capacity to prepare and implement renovation projects, from technical assistance to national and local authorities **through to training and skills development for workers in new green jobs**. It is clear that Construction industry will look in the next few years to hire workers with specific skills in the domain of energy efficiency in the buildings.

2.3 The place of lighting in construction industry

Looking closer to building's energy consumption, lighting has an important place. For instance, in educational and administrative buildings lighting consumption can goes up to 35-40% of the global energy use of the building. In an office building the lighting system is in average representing 20 % of the total running costs. For residential buildings lighting share is much lower and it is estimated to be in the order of 4-5% for European countries.

Energy-saving lighting technologies have progressively displaced legacy technology fixtures, moderating an increase in appliance related electricity consumption, but there is still a way to go. Lighting based on LEDs seems likely to drive further improvements as this technology matures sufficiently to be ready for mass market deployment. In fact, even if, LED penetration remains uneven across many markets, and sales are

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typically lower in relative terms for lamp replacements than for newly built buildings, many companies and governments are enacting measures to enlarge the share of LEDs in existing residential, public and commercial buildings.

Furthermore, lighting equipment is normally entering the project site at a late stage. The value of the lighting fittings and their control systems is in average up to 4% of the building investment costs. Despite this relatively small part of the total cost, the investment in lighting is often under strong price pressure, as it enters in the very end of the project, when the budget is restricted or run out (Holoubek 2011).

At a first glance, demand for trained electricians and installers of energy management systems will increase[2]. Further, demand for workers in retrofitting and new green construction is expected to grow over the coming years as part of government efforts to bring emissions of greenhouse gasses under control as green building technologies and techniques mature, and indeed as many governments seek to boost employment in construction. However, as Solid-State Lighting technology matures, maximizing the energy savings from connected lighting systems will become increasingly dependent on successful integration into the built environment. The replacement of legacy lighting infrastructure with LED products offers the potential for future **connected lighting systems (CLS)** that could become a data-collection platform that enables greater energy savings in buildings and cities. Connected lighting is a catch-all term, a marketing buzzword used to describe any kind of lighting equipment that has an element of intelligence or connectivity to it. Each fixture or bulb in a connected lighting system has its own unique hardware address, though most will need a separate “bridge” which connects the bulbs to the internet. There’s a variety of features that would come under the blanket term of connected lighting, so let’s take a look at some of the features you should look out for. At the most basic level, lighting systems combine luminaires and controls and then it will rapidly evolve into a **Smart Lighting** configuration. This imminent mutation will completely change the deal concerning the construction industry needs for workers with lighting skills.

Smart lighting has emerged as one of the most disruptive technologies over the past five years. Advanced LED lights are offering a significant bottom-line saving in terms of energy costs. These units are being offered by companies as a part of IoT systems for enabling highly connected infrastructure. This provides users with extra control to effectively manage smart lighting systems. With cheaper & smarter lights rapidly replacing legacy bulbs, smart and connected digital lighting using IoT is expected to bring an excellent intelligence and functionality into lighting systems.

Indoor lighting accounts today for over 78% share in the smart lighting world market (Amerlux Innovation Center 2018). Asia Pacific region region is leading the market. As example, Figure 1 shows the growth of the market size for smart indoor lighting in Japan.

[2] At domestic level, mostly responsible for helping individual householders to choose energy efficient appliances and lighting technologies

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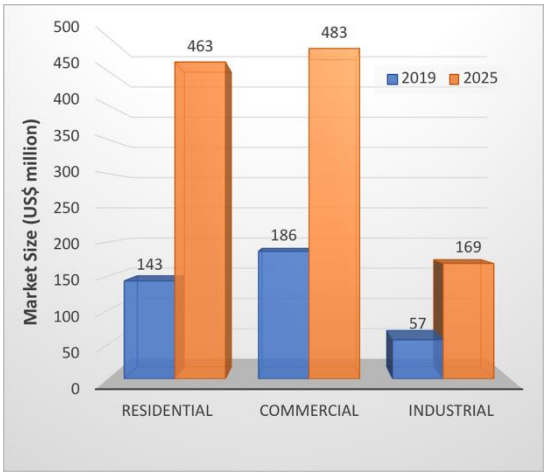

Figure 1: Japanese Smart lighting market size, by major sectors, in 2019 and 2025 forecast. Data from (Global Markets Insights 2019)

Digitalisation of light in the Middle-East region is foreseen by Gulf Cooperation Council as a mega trend that will see a surge in adoption in the short term. For example, connected lighting indoor positioning systems are being used to enhance the shopping experience in supermarkets, and light as a service (LaaS) is being offered to reduce electricity consumption (Frost & Sullivan 2017).

Within smart home lighting we can distinguish the segment Comfort and Lighting that includes devices for the improvement of the living atmosphere. These are devices such as sensors and actuators (e.g. door and window sensors, shutters) as well as connected and remote controllable light sources (smart bulbs) or garage door controls. Today, in almost all countries worldwide individual consumers (especially people in the segment of 25-45-year old) are more and more attracted by smart technologies and invests significative amounts of money to equip their homes with such trendy technologies. Figure 2 shows the 2020 penetration rate of smart bulbs in private houses. USA is leading with 17.1% followed by Scandinavian countries (especially Norway). China is still behind but its market is growing exponentially.

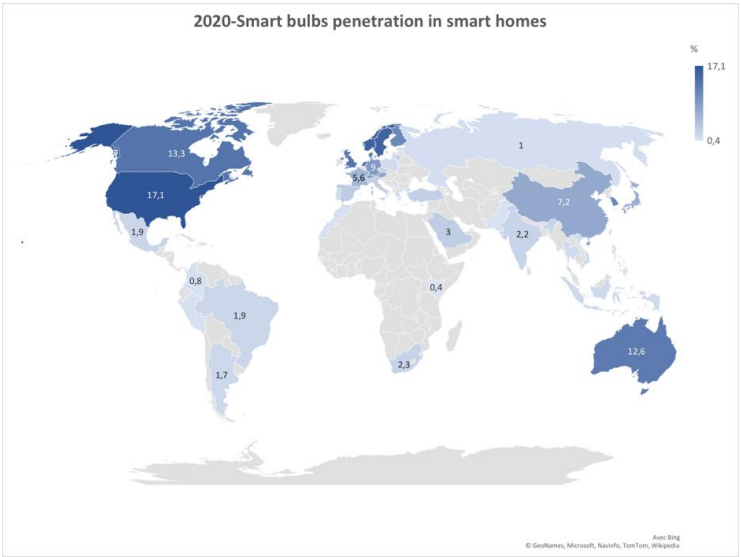

Figure 2: Penetration of smart light bulbs in residential sector across the world in 2020. Data aggregated from (Statista 2019)

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Figure 3 shows the financial efforts consent by private sector to equip smart households with Comfort and Lighting related systems. Switzerland is leafing with an effort of ~US$ 130 per smart house, followed by Saudi Arabia and Norway where smart households invested per year, in average, ~US$ 125 each in this segment.

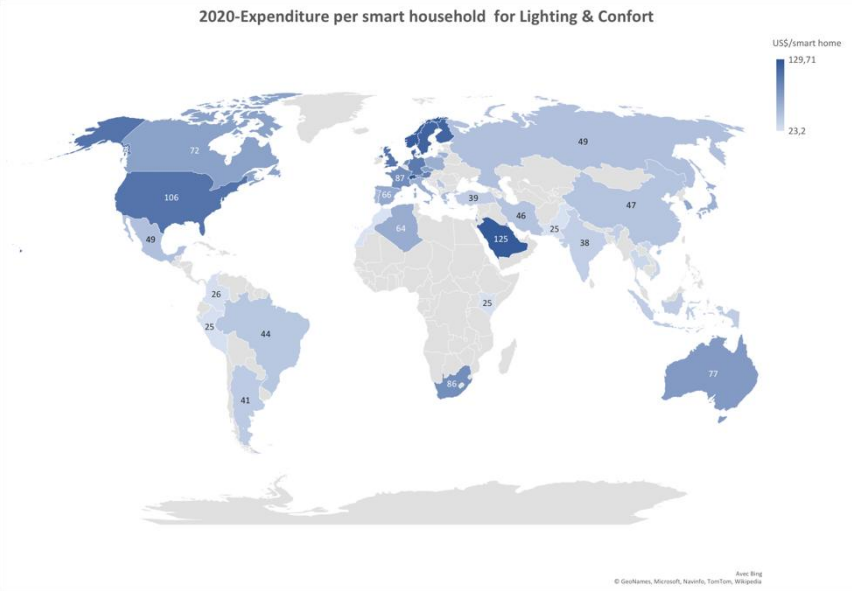

Figure 3: Expenditures per "smart household" in the segment of Comfort and Lighting across the world in 2020. Data aggregated from (Statista 2019)

In this segment, the quality of light is fundamental. This pushed Lighting Industry to develop the Human Centric Lighting (HCL) concept. **Human Centric Lighting** is a lighting solution intended to improve a person's well-being, mood, and health by varying the Correlated Colour Temperature and offering the best light quality according to a task and/or end-user's preference.

This revolution will fundamentally change the necessary skills for lighting trained people that construction industry will look in the next decade. The next paragraph of this document is dedicated to a specific description of Construction Industry needs for lighting-related skills. Another deliverable (R2.2) will detail the emerging job profiles for professionals related to lighting design.

2.4 What are the lighting skills that construction industry is looking for?

Construction industry employs different kinds of jobs, ranging from Architects and civil engineers to quantity surveyors and people working on construction trade or craft. Among them, we can distinguish some role profiles in close relation with lighting-related skills:

- Building services engineers make sure that a building has more than walls and a roof. They ensure that the lighting, power, ventilation, heating, cooling and water systems work. They might work on the designs of a building or ensure that the designs are put into practice correctly. They are sometimes known as mechanical and/or electrical engineers.
- Architectural technologists ensure that the technical aspects of a design work and comply with regulations. They work in a similar role to civil engineers in that way. Architectural technologists may also be hired to oversee a project from start to finish.

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- Technicians help prepare drawings, compile technical information such as surveys, and help put together proposals and contracts.

In fact, the sale and use of technical equipment for building construction is a complex process. There are many layers of stakeholders and many different decision makers involved. The interest in lighting equipment is differing between the stakeholders who also regard the value of the chosen lighting in different ways. Their relationship is differing depending of the character of the project and ownership. The architect looks more at design, the lighting planner at technical function and the installer at availability and easiness of installation. Only the end user seems to benefit from an energy-efficient solution besides the owner of the building and in the public sector the process is also directed by a legislation that put demand on transparency in purchasing. The trends in modern lighting are mainly: many simple standard products available of low prices, fascination of new light sources (LED), integration with control systems and energy efficiency;

Apart from those, there is a series of skills related directly or indirectly with the work of lighting professionals. These include digital skills, basic and advanced, mostly required due to the proliferation of the smart technologies and the need to communicate and collaborate effectively and efficiently with colleagues. There is also a series of entrepreneurship-related and human-qualities skills. Last, due to the strong environmental aspect of lighting, there is a series of green skills demanded.

2.5 The ECOSLIGHT approach

ECOSLIGHT focused from the beginning to "bridge the gap" between the supply and demand of and for skills and professionals in the lighting area of the construction sector, aiming to satisfy the emerging needs in the contemporary landscape. In this regard, a research framework is established enabling the ECOSLIGHT partners to work in parallel in their countries (France, Germany, Greece and Italy) in order to collect comparable results and set the route towards the identification of the emerging lighting related job role profiles and the respective curricula. The research framework is presented in the following figure (Figure 4).

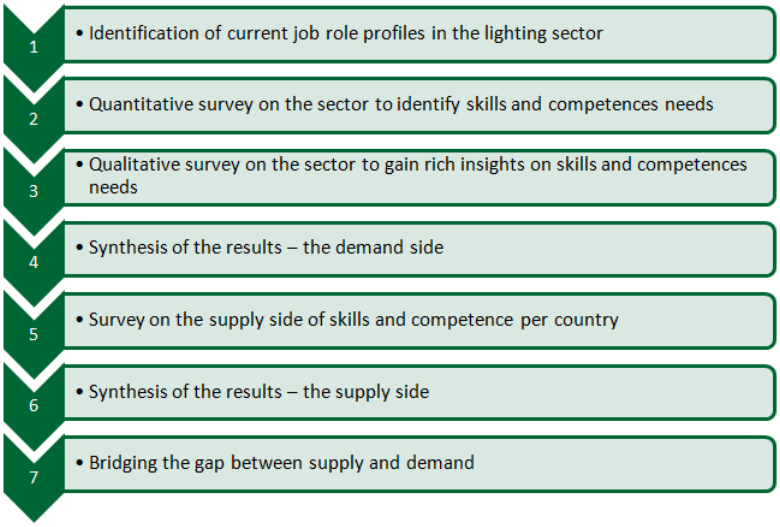

Figure 4: The ECOSLIGHT research framework

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The results of the research are intended to feed the design of the ECOSLIGHT interventions. A set of emerging Job Role profiles are designed that will be delivered to the interested trainees through a variety of training interventions fulfilling the priorities of adult learners; adult learners are in general internally motivated and self-directed, commit life experiences and knowledge to learning experiences, are goal oriented, and practical. Moreover, adult learners, and especially professionals, consist in many cases working adults with professional and personal life, priorities and commitments, limited available free time, and in many cases ambitious. In this regard, the ECOSLIGHT professional development approach has foreseen a step-wise approach, as presented in Figure 5.

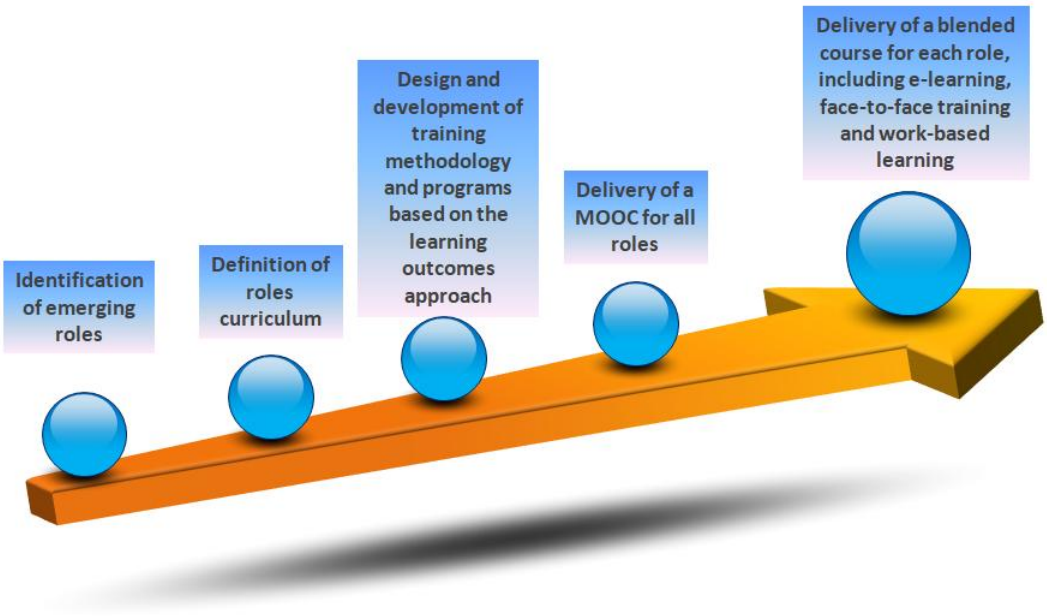

Figure 5: The ECOSLIGHT implementation approach

In the first phase, ECOSLIGHT research explores emerging role profiles identified from EU projects and other sources (like studies, regulations, etc), with special focus on projects on developing role profiles related to the assessment and analysis of lighting setups, human centric and environmentally conscious lighting environments of any scale (i.e. homes and offices, cities and roads, factories, etc), as well as roles enhanced with new directions on the sector, like IoT technologies, energy efficiency, green skills, etc. Apart from that, a short analysis of the (emerging) market profiles was conducted.

Next, ECOSLIGHT identifies and maps professional needs of lighting-related professionals in the construction sector. In this regard, it tries to identify the “lighting professionals of tomorrow”, following a hybrid research approach with interviews with key stakeholders and a quantitative survey aiming to several actors. The results are used to synthesize the curricula for the emerging job role profiles. A cross-checking is done with existing job role profiles in official frameworks (e.g. ESCO) so as to ensure that the profiles identified are emerging and not current / existing. In this regard, ECOSLIGHT identifies five (5) thematic areas for professional development; (a) pure sector-related competences, i.e. lighting- related competences, (b) digital competences, (c) green competences, (d) entrepreneurship competences, and (e) competences related to the personal development of the professionals (Figure 6).

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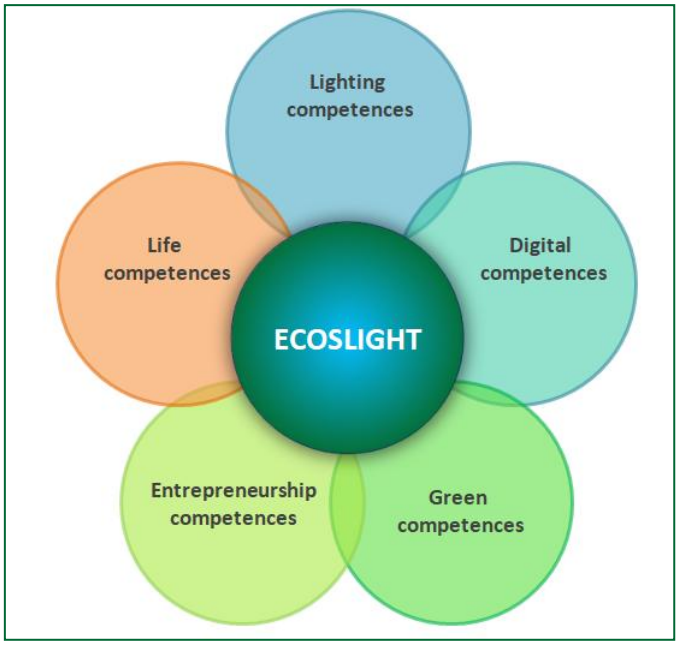

Figure 6: The ECOSLIGHT competences areas

Thereafter, the research tries to identify the current offer for skills for the professionals of interest; therefore a desk research is conducted in the project countries (mainly) to identify the respective training offer, mainly in EQF 5 as this is the level ECOSLIGHT orients to. If not adequate, the research will identify programs also in the neighboring levels. Based on these results, a gap analysis is conducted and will feed in the curricula development.

The results, accompanied with the appropriate training methodology, will be used to design and develop training materials. The competences / modules identified will be categorized accordingly to their level (entry / prerequisite or advanced), and their commonality between the different curricula. The less advanced but common will be delivered to the target group through a MOOC (Massive Online Open Course), accessible from everyone in the world. At least 800 seats will be offered / retained for participants from France, Germany, Greece and Italy. The successful alumni from the four aforementioned project countries will be invited to continue the training through a specialization blended course (including online learning, face-to-face training and work-based learning) in one of identified ECOSLIGHT job role profiles (at least 100 seats in the four project countries). The successful trainees of this second phase will be awarded with a certificate on the ECOSLIGHT job role profile they followed.

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3 The market analysis

The ECOSLIGHT research focused to the identification of (a) the skills and competences required for the professionals operating in the sector, i.e. the "demand" side, and (b) the training programs currently offered for them, mainly possessed in the EQF 5 level, i.e. the "supply" side. In this chapter we shall see the results of the market analysis of the sector, conducted mainly through a quantitative and a qualitative study.

3.1 Research design

One of the objectives of ESCOLIGHT (Environmentally Conscious Smart Lighting) project was to identify the competences required as well as particular job role profiles related to smart, energy efficient and sustainable lighting environments for infrastructure, cities, buildings and industries (including construction sector) in order to respond to the market needs for Environmentally Conscious Smart Lighting Designers.

To achieve this objective, a quantitative survey was conducted orienting to various stakeholders of the sector. In order to elicit better the needs and understand the different viewpoints, four questionnaires were developed and delivered online through Limesurvey. The questionnaires were available in English, French, German, Greek and Italian. The following versions of the questionnaire were delivered orienting different target groups:

1. Individual professionals
2. Companies
3. Municipalities, Local collectivities, City councils, Policy makers, Governmental organizations
4. Social partners, Non-governmental organizations, International organizations, Associations or similar bodies, Private organizations with public interest.

The main differences of the aforementioned questionnaires are identified mainly in the profile of the participant / organization details provided, and in the presentation of a very detailed list for digital skills (in the case of Individual professionals.

The purpose here was the collection of additional data for analysing needs regarding Technical Training in order to create modular VET curricula (EQF 5) based on the learning outcomes approach and the adult learning principles in order to develop lighting design skills that bring together lighting design and smart technologies, as well as skills that take into account ecological and human-centric issues on lighting systems in the connected world.

3.2 The quantitative survey

3.2.1 The participants

The questionnaires were accessible via the web for a period of 6 months (June 2020 to December 2020). Totally 438 answers have been collected. After a data clearance, **342 questionnaires were considered valid** (filled in adequately) and analysed. Among those 342 questionnaires, 246 (71,9%) were submitted by individual professionals, 66 (19.3%) from companies, 11 (3.2%) from Municipalities, Local Collectivities, City Councils, Policy Makers, or Government Organizations, 6 (1.8%) from Social Partners, NGOs, or Internationals Organization, whereas 13 (3.8%) did not declare their professional identity (Figure 7).

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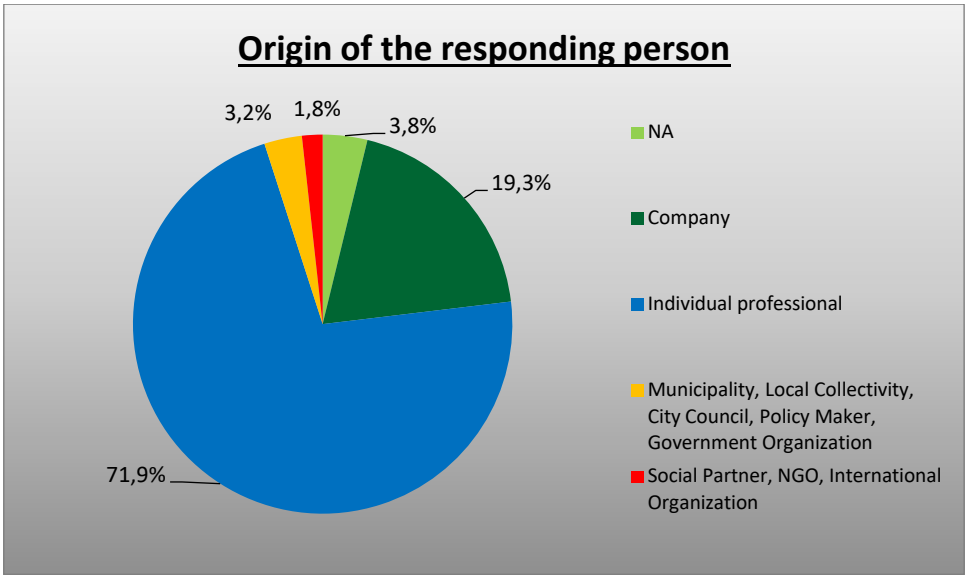

Figure 7: Typology of responding persons to the survey

Concerning the participation per country and per type of respondent, the results are presented in the following table (Table 1). Here we see that the **vast majority of individual professionals participated come from Greece, whereas the companies participated come mainly from Greece and France**. **Most of the governmental organizations participated come from France.**

	NA	Company	Individual professional	Municipality, Local Collectivity, City Council, Policy Maker, Government Organization	Social Partner, NGO, International Organization	**Total**
NA	10	0	0	0	0	**10**
Other	2	7	25	0	1	**35**
Italy	0	4	37	1	2	**44**
Greece	0	35	134	2	0	**171**
Germany	0	0	9	0	2	**11**
France	1	20	41	8	1	**71**
Total	**13**	**66**	**246**	**11**	**6**	**342**

Table 1: Respondents per country per type

Concerning the gender of the participants, this question was not obligatory and the vast majority did not mention it, most probably for personal data protection reasons. Therefore, these results do not reveal interesting information. But as far as it concerns their **educational background**, data are more detailed (Figure 8). We see that **the vast majority of them hold a master's degree (40.6%) followed by the bachelors' holders (28.1%)**. In this figure we see also the results of the separate group of the individual **professionals** participated to the survey, which seem to dispose a masters' degree in a greater percentage than the general population of the participants to the survey.

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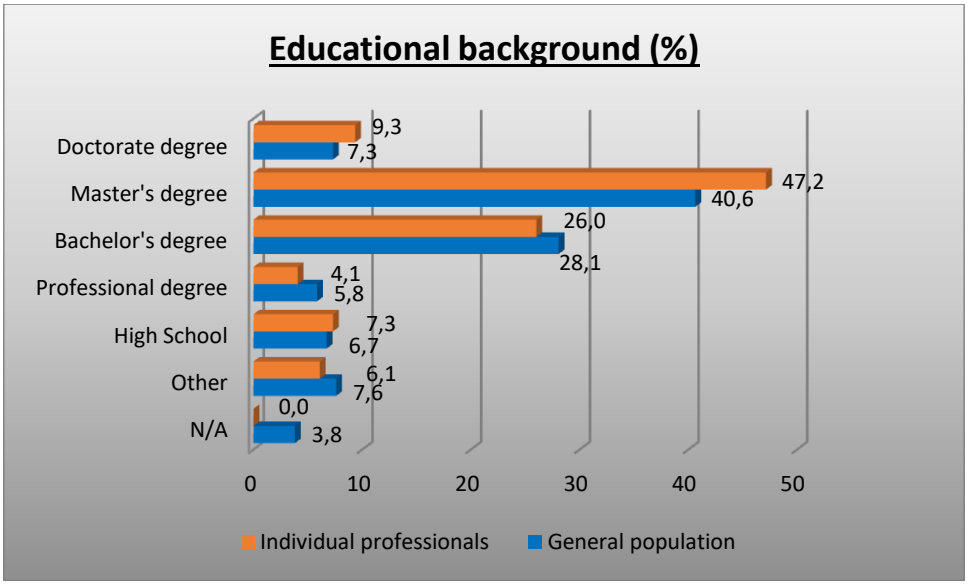

Figure 8: Educational background of all participants and individual professionals

Some people selected also the "other" option; this included mainly engineers' degrees, and in some cases higher technicians' degrees (Brevet de technicien supérieur).

Especially for the **individual professionals** participated to the survey, we studied also their gender (Table 2) and their age groups. Concerning the gender, we see that the results are unclear for the total group of respondents, but for the separate group of Individual professionals, we that the 50.4 % were males (124 people), the 40.2 % were females (99 people), whereas the rest 9.4 % (23 people) did not declare their gender.

	N/A	Female	Male	Other	**Total**
N/A	10	0	0	3	**13**
Company	0	0	0	66	**66**
Individual professional	0	99	124	23	**246**
Municipality, Local Collectivity, City Council, Policy Maker, Government Organization	0	0	0	11	**11**
Social Partner, NGO, International Organization	0	0	0	6	**6**
Total	**10**	**99**	**124**	**109**	**342**

Table 2: Gender of respondents

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	N/A	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-70	> 70	Total
N/A	13	0	0	0	0	0	0	0	0	0	0	0	**13**
Company	66	0	0	0	0	0	0	0	0	0	0	0	**66**
Individual professional	0	7	47	33	51	35	22	21	11	8	8	3	**246**
Municipality et al.	11	0	0	0	0	0	0	0	0	0	0	0	**11**
Social Partners et al	6	0	0	0	0	0	0	0	0	0	0	0	**6**
Total	**96**	**7**	**47**	**33**	**51**	**35**	**22**	**21**	**11**	**8**	**8**	**3**	**342**

Table 3: Age groups of respondents

Especially concerning the individual professionals participated to the survey, we see that **the group 25 – 44 years old includes the 67.5 % of the participants** (166 people), therefore **we understand that the sector employs mainly young people, less than 50 years old, who face the challenge of career advancement, and according to their age they will be more open and volunteer to participate to professional development activities**.

The individual professionals were also asked to declare their professional status and the wider sectors their organizations (if they are employers) or those that they work for, operate. In Figure 9 we see that **more than half (52.0 %) of the individuals participated to the survey are employees, whereas the 26 % declare self-employed.** The individual professionals participated to the survey operate in the areas of lighting design / lighting consulting (17.9 %), in Education / Research (12.6 %), in the Lighting industry (11.8%), and in an architecture studio / company (11.0 %) (Figure 10).

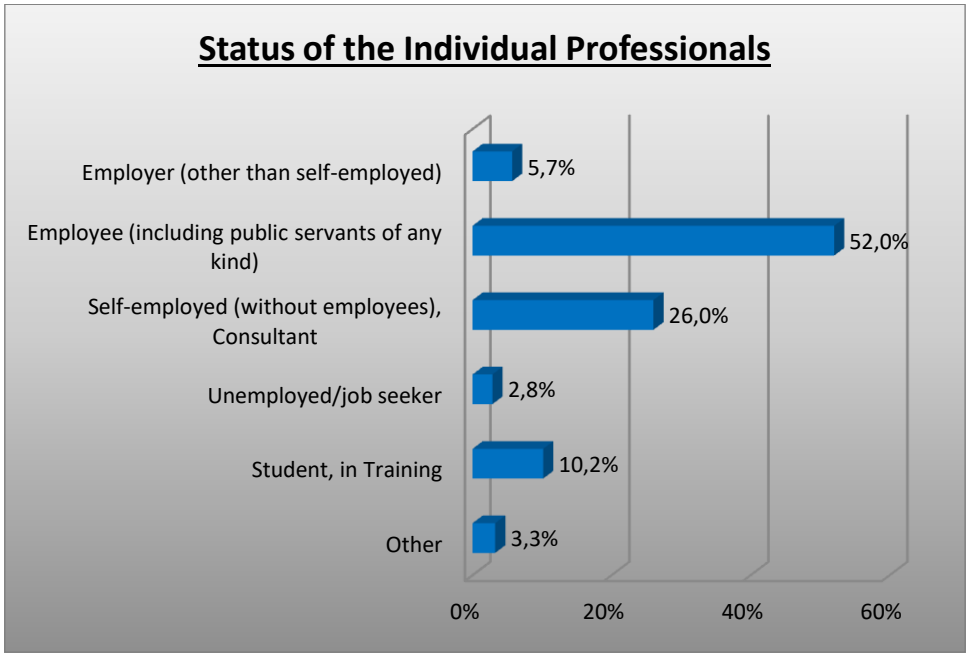

Figure 9: Professional status of individuals

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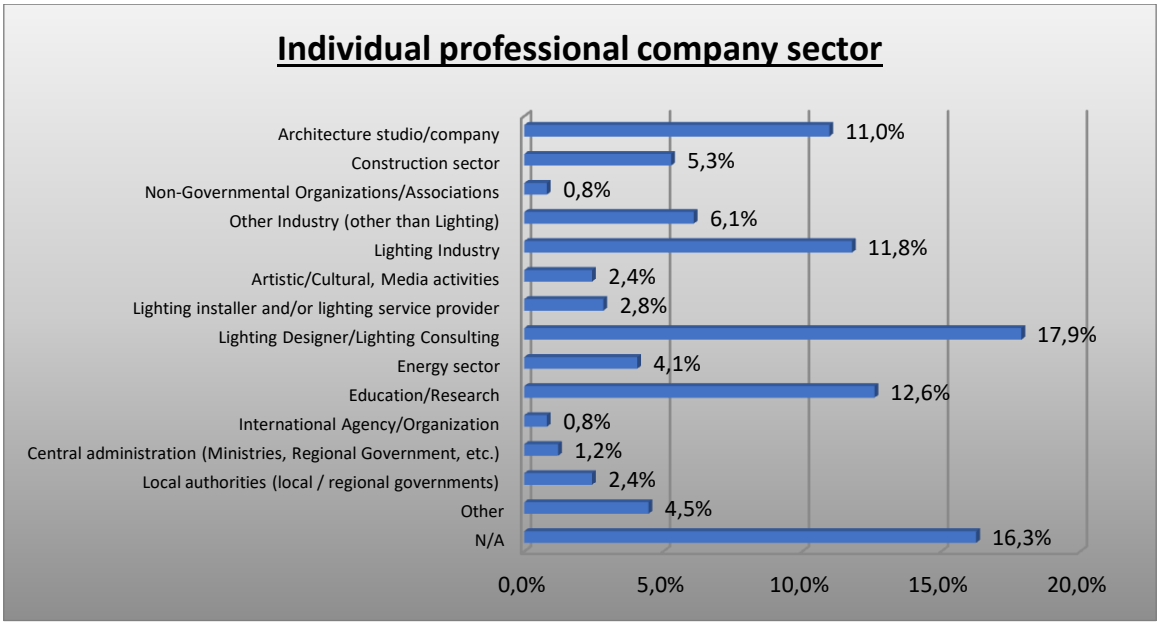

Figure 10: Individual professional company sector

In a separate question, the 55 % of the individual professionals declared that their job is not related to any R & D activity. The 63 % of the individual professionals denoted that their company is considered and SME.

Next, we present the **professional profile** of the participant to the ECOSLIGHT survey. Concerning **companies**, we separated them in three categories. The Very Small Businesses (less than 50 employees), the Small and medium-sized businesses (SMEs) with 50 – 249 employees[3], and the Large companies with more than 250 employees. Results indicate that the **63 % of the participating companies are SMEs** (Figure 11). The latest Eurostat data indicate that in 2018, the EU-27 included 3.283.211 enterprises in the Construction sector, out of which, the 3.264.291 had less than 50 employees (99.4 %). The 17.000 of them had 50 – 249 employees (0.52%), and the rest employed more than 250 persons. **Interestingly, we understand that the lighting sector is dominated by quite larger companies (mainly SMEs) than the rest of the sector in Europe.**

[3] SMEs are defined by the European Commission as having less than 250 persons employed. They should also have an annual turnover of up to EUR 50 million, or a balance sheet total of no more than EUR 43 million (Commission Recommendation of 6 May 2003).

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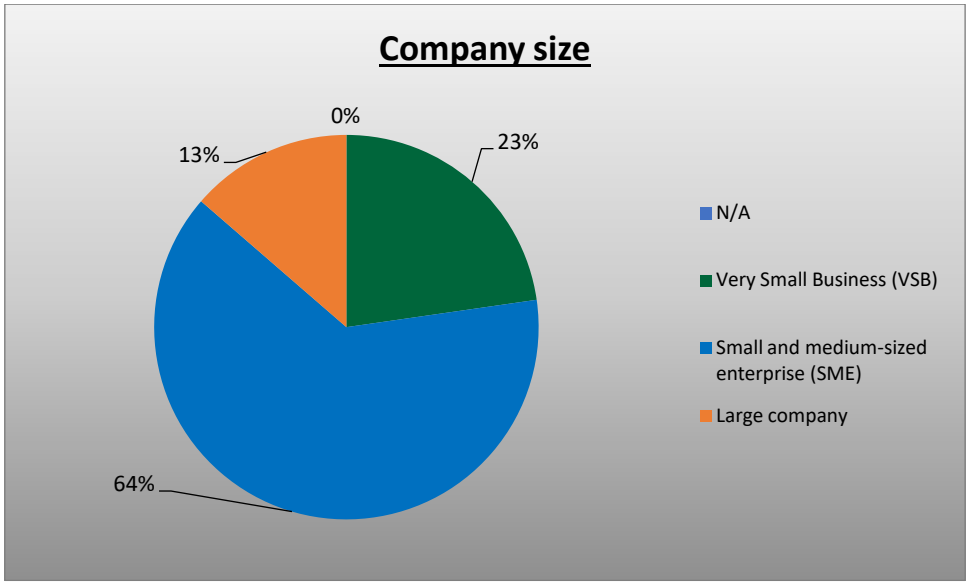

Figure 11: Size of companies participated to the survey

The companies were also asked to declare whether they manufacture products or provide services (Figure 12). We see that the percentages are almost equal between the two different types, with a 22.7 % of the participating companies having manufacturing facilities and providing services in parallel. The companies that selected the "other" option fold mainly between the two aforementioned categories.

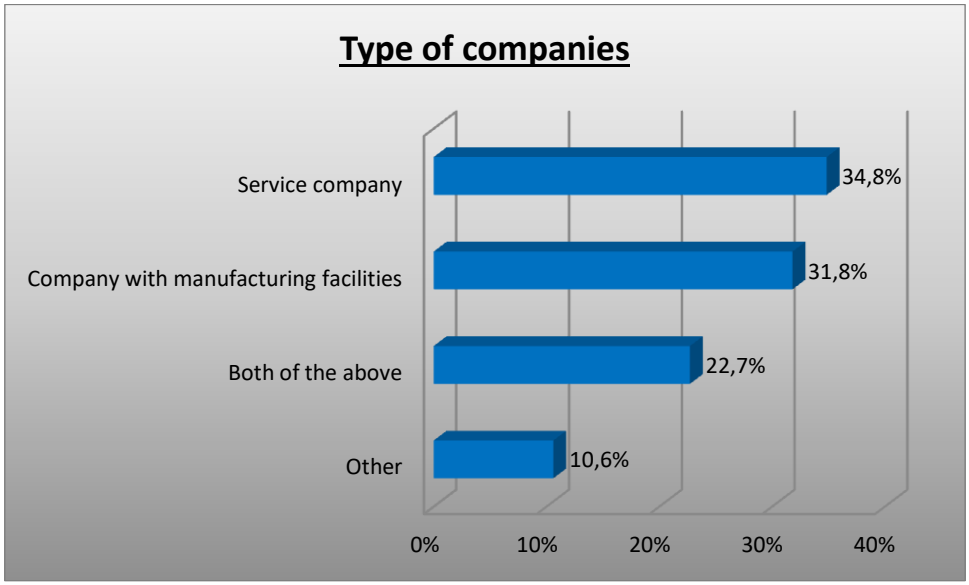

Figure 12: Types of companies

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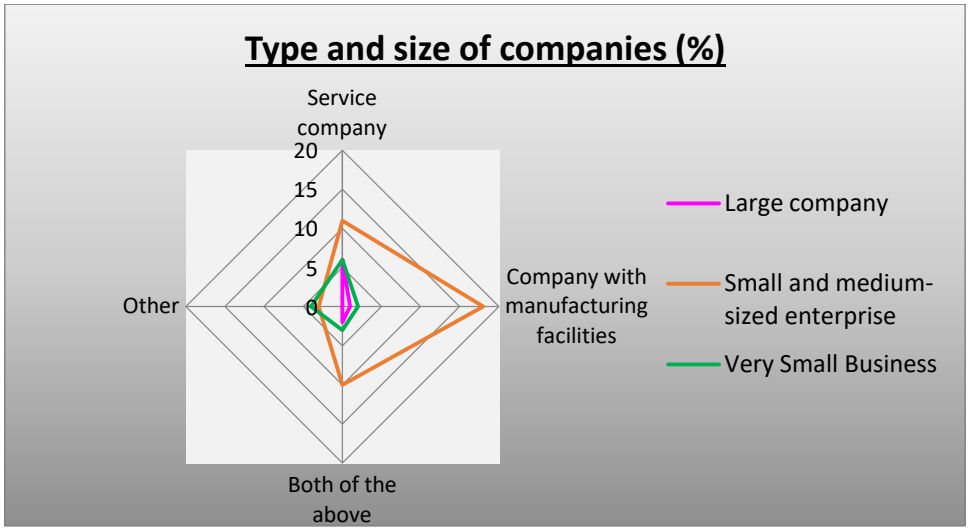

Figure 13: Type and size of companies

Interestingly, in Figure 13 we see that the majority of SMEs that seem to dominate the sector, have manufacturing facilities, whereas the companies that provide services or both, are estimated at the same percentage. Therefore, it is obvious that **the professionals will be called to work mainly in Small and medium enterprises with manufacturing facilities**.

The six (6) Social partners / NGOs or International Organizations participated to the survey were provided the options of "association or similar body", "social partner", "private organization with public interest", "Non-governmental organization", or other. The half of them (3 or 50%) declared associations or similar bodies, the two of them (33.3 %) of them private organizations with public interest, and one (16.7 %) a Non-governmental organization. Their limited number does now allow for generalization of results.

The eleven (11) governmental organizations participated to the survey were provided the options "Municipality/local collectivity", City Council (more than 100,000 inhabitants)", "Regional / Departmental authority", "National policy making body", "International institution", "Government / public institution / agency", or "other".

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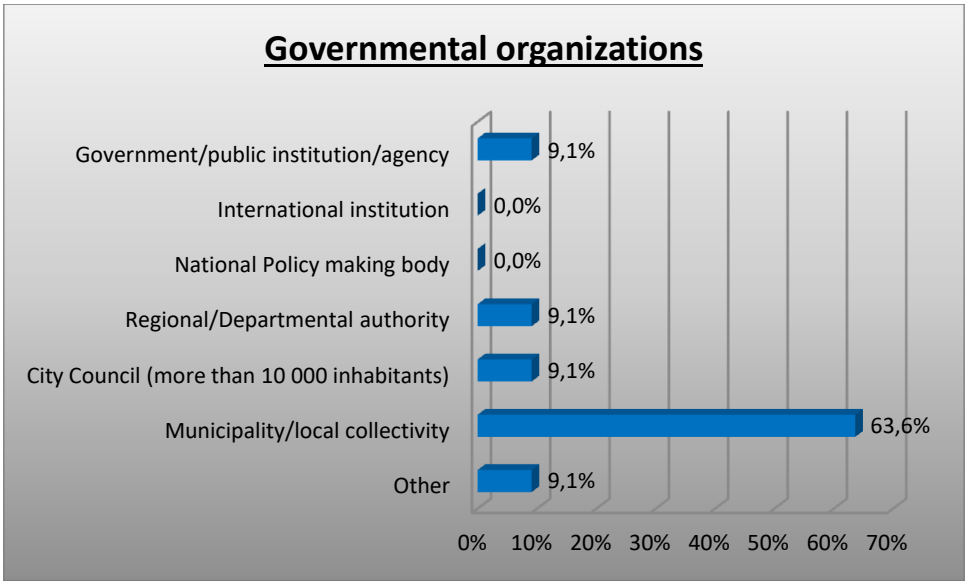

Figure 14: Types of governmental organizations

The vast majority of them (63,6 %) were municipalities or local collectivities; although the number of the participants of this type is not adequate to generalize results, one may claim that the domination of this type of organizations is related to the fact that, the local authorities have under their responsibility or intend to implement lighting-related projects in the "city" or "wider area" levels. Therefore, the results of this study may be quite valuable for this type of organizations.

All types of organizations participated to the survey (companies, governmental and non-governmental organizations) and individual professionals were also asked to declare their related economic activities based on the ESCO classification.

Economic activity	Percentage
Agriculture, Forestry, Fishery	3.5 %
Arts, entertainment and recreation	18.1 %
Hospitality and Tourism	11.4 %
Human health and social services activities	5.6 %
ICT service activities	5.8 %
Manufacturing of food, beverages and tobacco	1.5 %
Manufacturing of textile, apparel, leather, footwear, and related products	2.6 %
Mining and heavy industry	1.8 %

Economic activity	Percentage
Education	19.6 %
Energy and water supply, sewerage and waste management	8.8 %
Finance, insurance and real estate	1.5 %
Manufacturing of electrical equipment, computer, electronic and optical products	10.5 %
Manufacturing of transport equipment (cars, trains, ships, aircrafts)	1.2 %
Media	3.2 %
Scientific and technical activities	21.3 %
Manufacturing of lighting systems, lighting system's parts (lamps, fixtures,	22.5 %

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Transportation and storage	5.3 %
Retail and repair activities, renting and leasing	5.8 %
Business administration	3.2 %
Chemical industry	1.8 %
Construction (including Painting and Decoration activities)	24.6 %

ballasts/drives, lighting poles, etc.)	
Consulting Activities & Engineering Services	34.8 %
Museum, Exposition, Convention center, Stadium/Gymnasium, Library/Media Center.	8.2 %
Public Administration/collectivity	9.1 %
Other	7.0 %

Table 4: Economic activities of companies

In Table 4 we see that the participating organizations and professionals operate in many sectors (economic activities), proving the interest of almost all the economic activities for lighting design issues. Indeed, the economic activities that are the most popular among the survey participants are the **Consulting Activities & Engineering Services (34.8 %), the Construction (including Painting and Decoration activities) (24.6 %), the Manufacturing of lighting systems, lighting system's parts (lamps, fixtures, ballasts/drives, lighting poles, etc.) (22.5 %), the Scientific and technical activities (21.3 %), the Education (19.6 %) and the Arts, entertainment and recreation (18.1 %).**

3.2.2 Existing competence levels

The next topic ECOSLIGHT explored in the context of the survey were the competence levels in particular scientific areas related to the skills uptaking of the professionals of the sector, their ecological engagement, and for governmental organizations additionally, the ecological engagement of their country.

	Very low	Low	Moderate	High	Very high	N/A
Lighting skills	4.7%	7.0%	21.6%	39.8%	21.6%	5.3%
Digital skills	0.9%	5.6%	27.8%	43.0%	17.8%	5.0%
Life skills (personal, social and learning to learn skills)	0.0%	0.6%	14.6%	51.8%	26.6%	6.4%
Entrepreneurial skills	3.8%	12.9%	32.7%	35.1%	7.9%	7.6%
Green skills	1.5%	5.6%	36.0%	36.5%	11.1%	9.4%

Table 5: Self-estimation of competence levels in various domains

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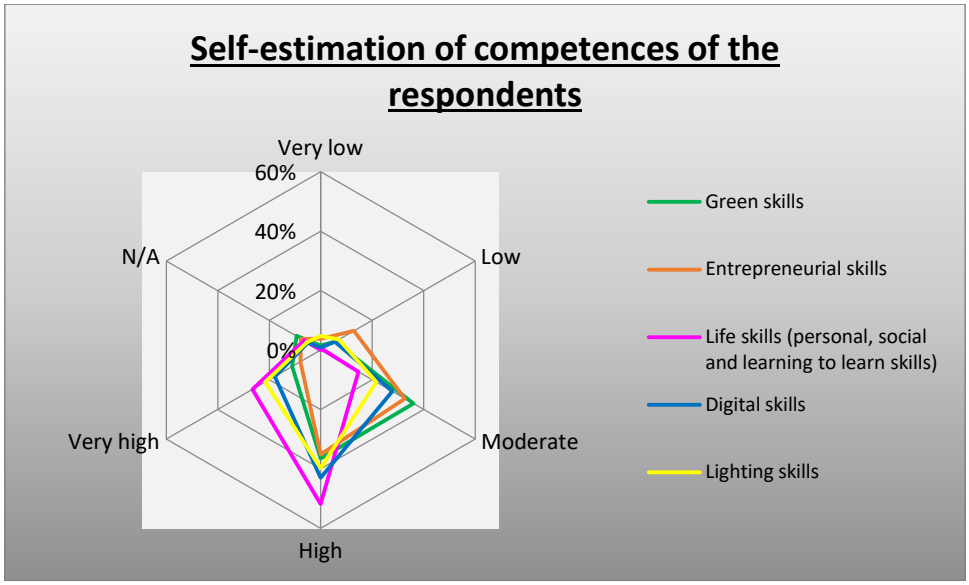

Figure 15: Self-estimation of competence levels of the respondents in various domains

In general, **all respondents declared *moderate* to *very high* in all areas of skills**, i.e. lighting related skills, digital skills, life skills, entrepreneurial skills and green skills (Table 5). In detail, they declared:

- **Lighting skills: high (4) to very high (5) in a degree of 61.4 %**
- **Digital skills: moderate (3) to high (4) in a degree of 70.8 %**
- **Life skills: high (4) to very high (5) in a degree of 78.4 %**
- **Entrepreneurial skills: moderate (3) to high (4) in a degree of 67.8 %**
- **Green skills: moderate (3) to high (4) in a degree of 72.5 %**

In the radar (Figure 15) we see clearly that the respondents present higher skills levels of life skills (personal, social and learning to learn skills), followed by lighting skills and green skills. Digital and entrepreneurial skills seem to lack a bit behind, indeed with a great degree.

Concerning the different types of respondents, the results are as follows.

- **Lighting skills: Companies and governmental organizations (municipalities et al) present higher levels of lighting skills than the other groups** (Figure 16).
- **Digital skills: Apart from companies, all other types of respondents present higher self-estimations** (Figure 17).
- **Life skills: Social partners present quite higher self-estimations than the other stakeholders, but their low number (6) does not allow for generalization** (Figure 18).
- **Entrepreneurial skills: Companies and NGOs present higher estimations than individual professionals and governmental organizations** (Figure 19).
- **Green skills: The self-estimation in Green skills is a bit decreased in respect to the other skills areas** (Figure 20).

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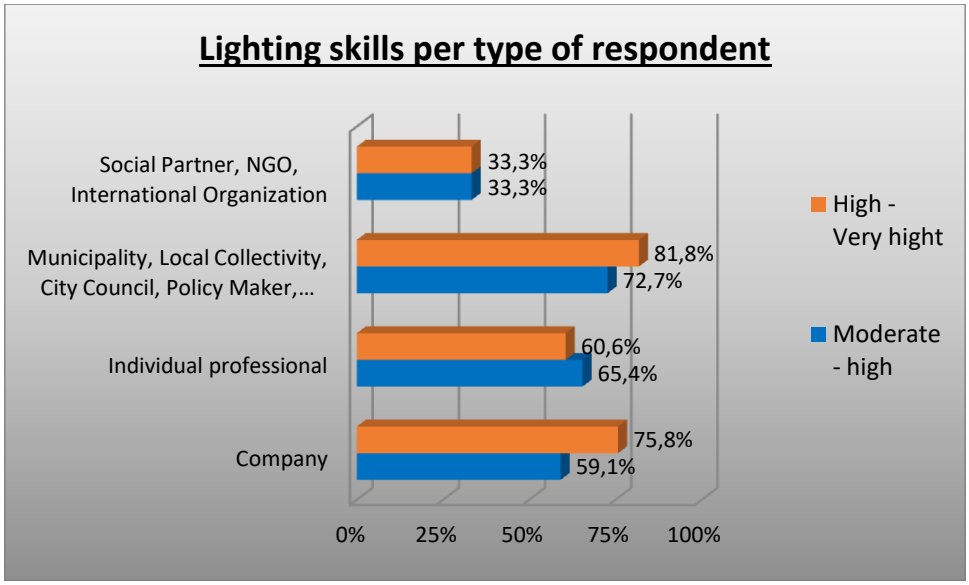

Figure 16: Self-estimation of lighting skills per type of respondent

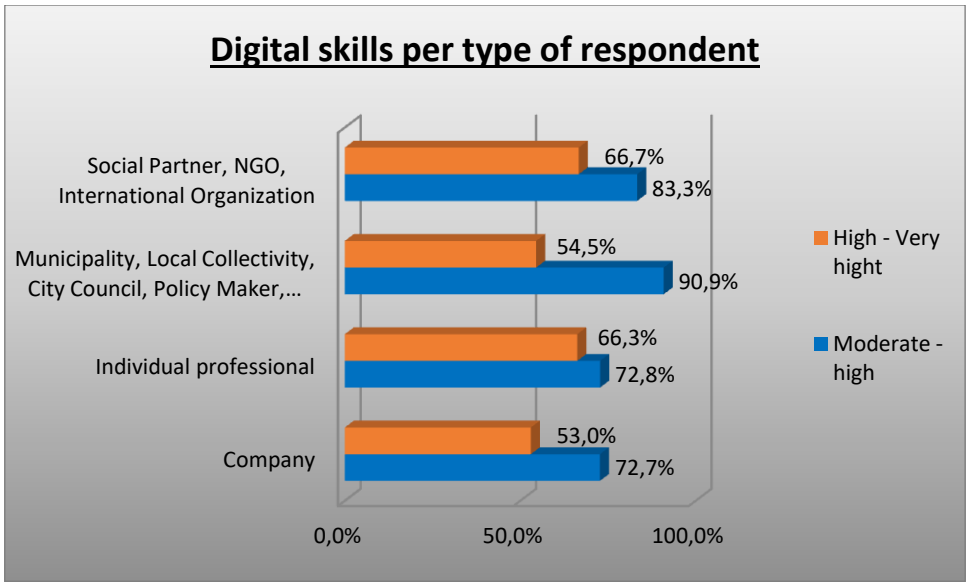

Figure 17: Self-estimation of Digital skills per type of respondent

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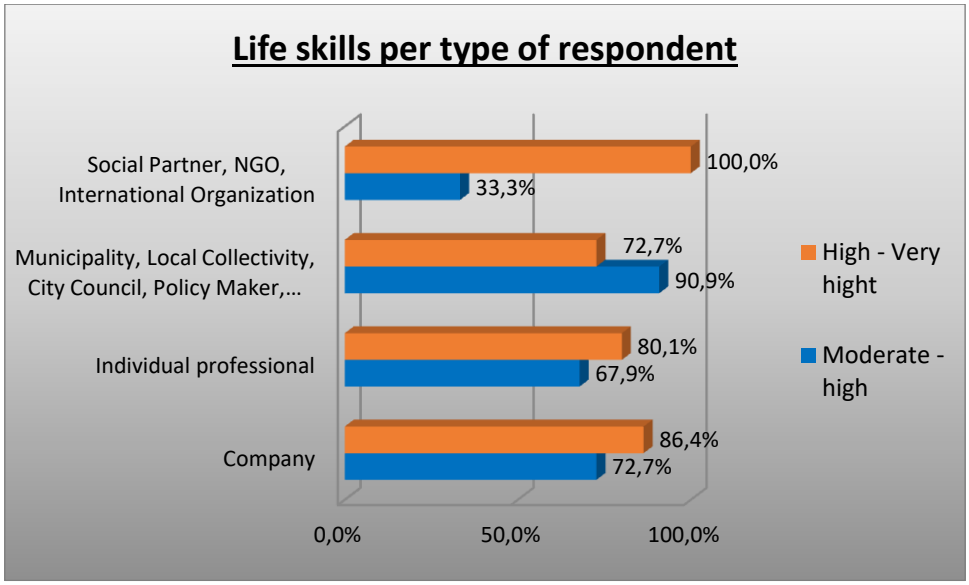

Figure 18: Self-estimation of Life skills per type of respondent

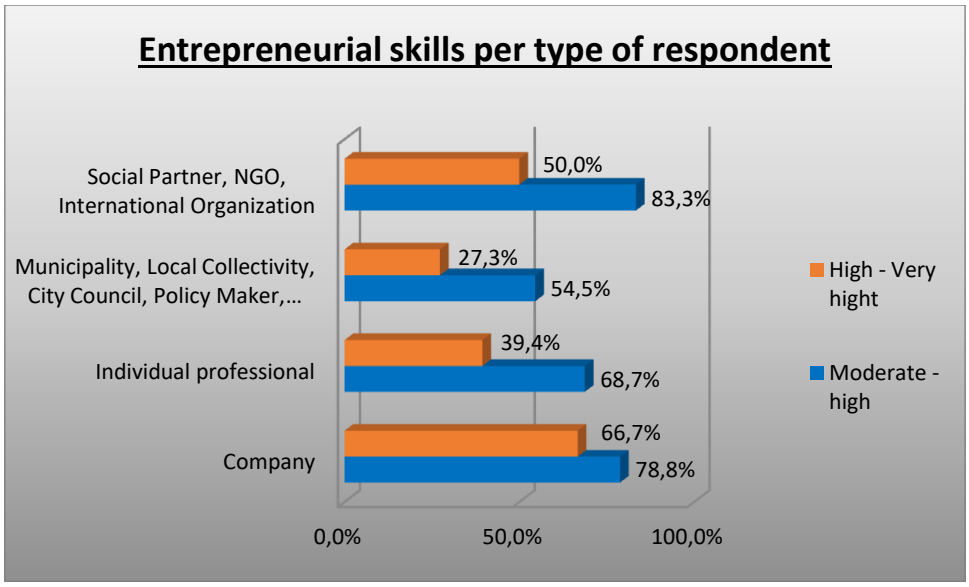

Figure 19: Self-estimation of Entrepreneurial skills per type of respondent

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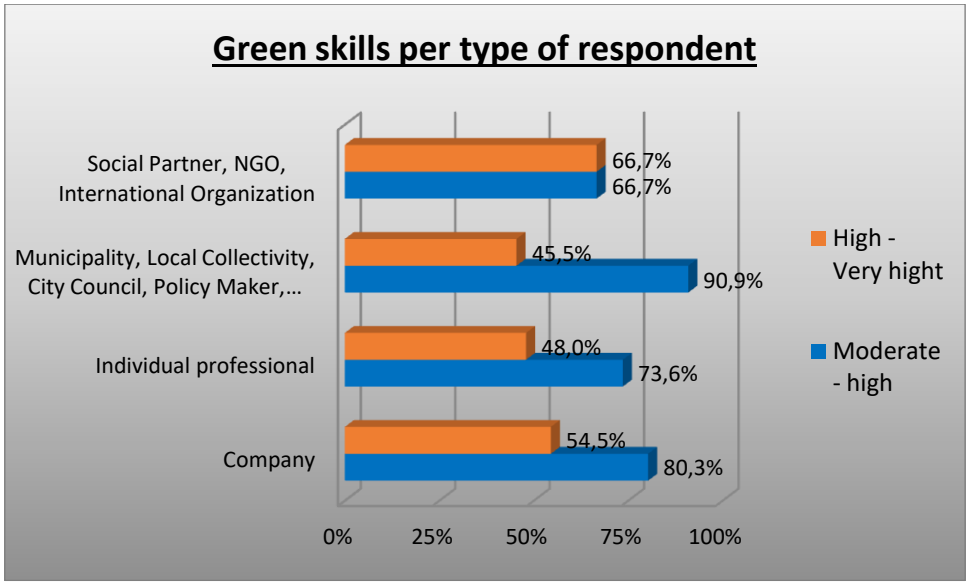

Figure 20: Self-estimation of Green skills per type of respondent

The results per country follow. The reader should have in mind that only 11 people from Germany provided valid results, so the findings are not representative for this country. Concerning the self-estimation per skills area per country, the results are as follows:

- The self-estimation of lighting skills is higher in France and Greece than Germany and Italy (Figure 21).
- The self-estimation of digital skills is quite higher in Greece than the other countries, with France following (Figure 22).
- Concerning life skills, Germany and Greece present higher results, followed by France, with Italy being the last among the four project countries (Figure 23).
- The entrepreneurials skills in Greece are estimated higher, followed by France and Germany (Figure 24).
- Concerning Green skills, the self-estimation appears to be greater in France and Greece than the other project countries (Figure 25).
- Aggregately, France and Greece present higher self-estimations in the identified skills areas, whereas Italian respondents declared lower results. The low degree of replies from Germany do not provide a clear picture, but apart from Life skills, in the other categories seem not to be rated very high.

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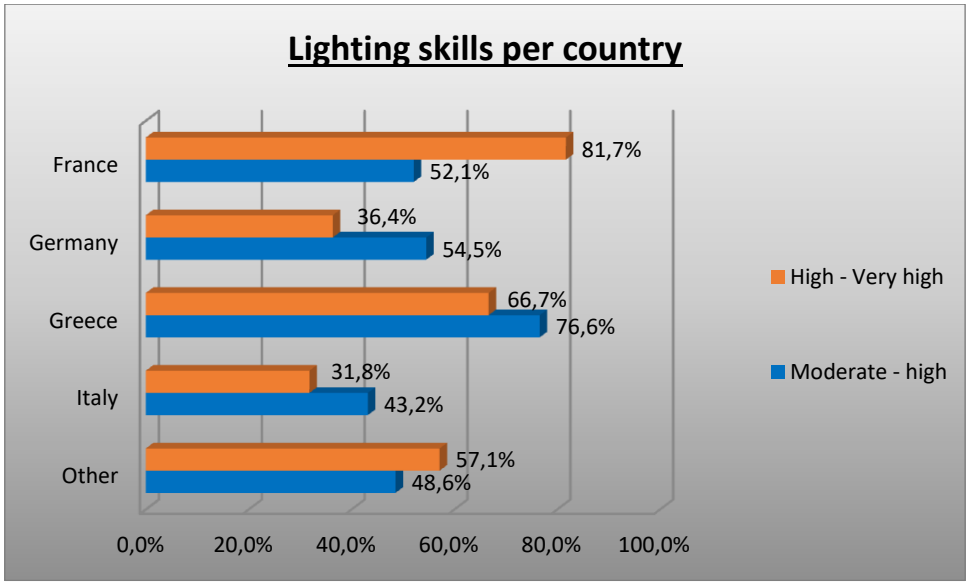

Figure 21: Self-estimation of lighting skills per country

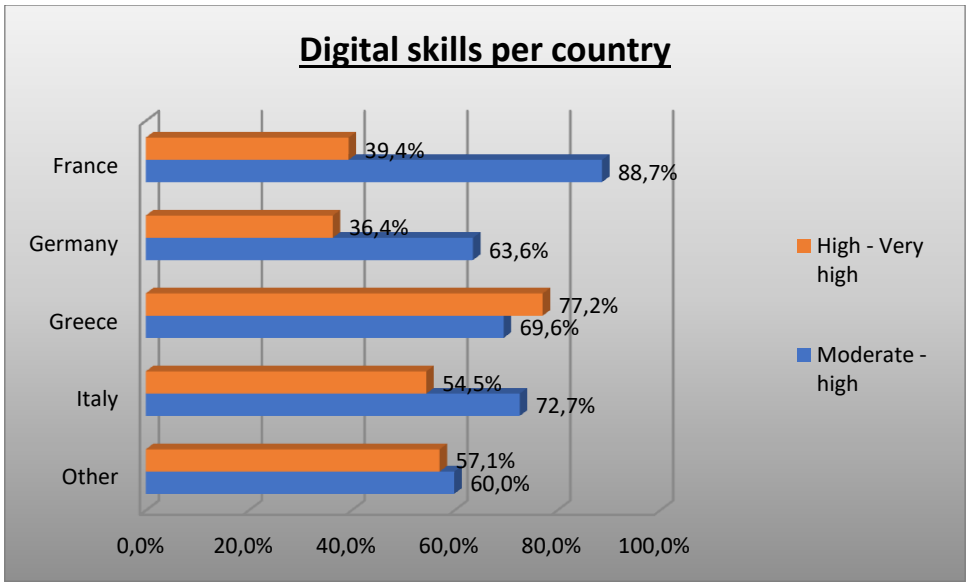

Figure 22: Self-estimation of Digital skills per country

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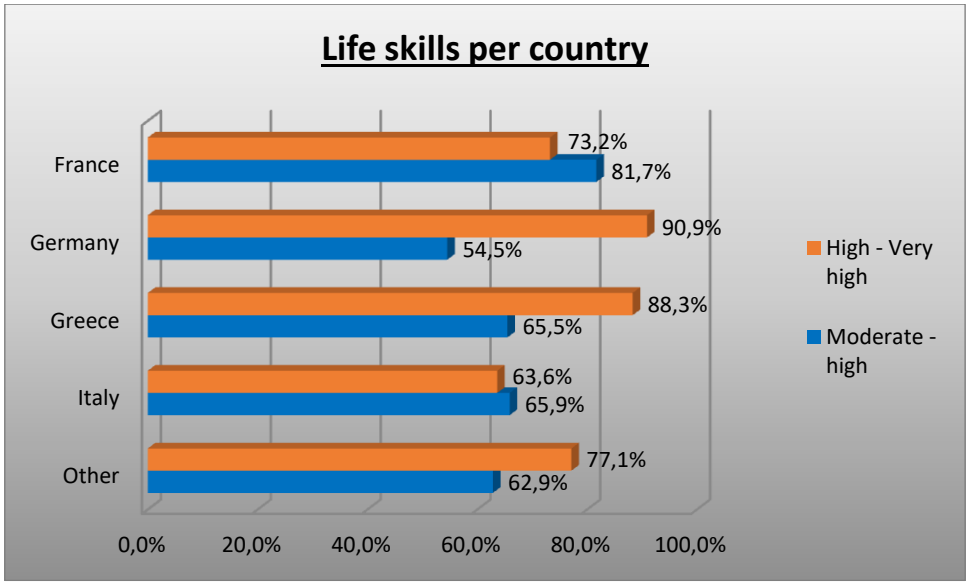

Figure 23: Self-estimation of Life skills per country

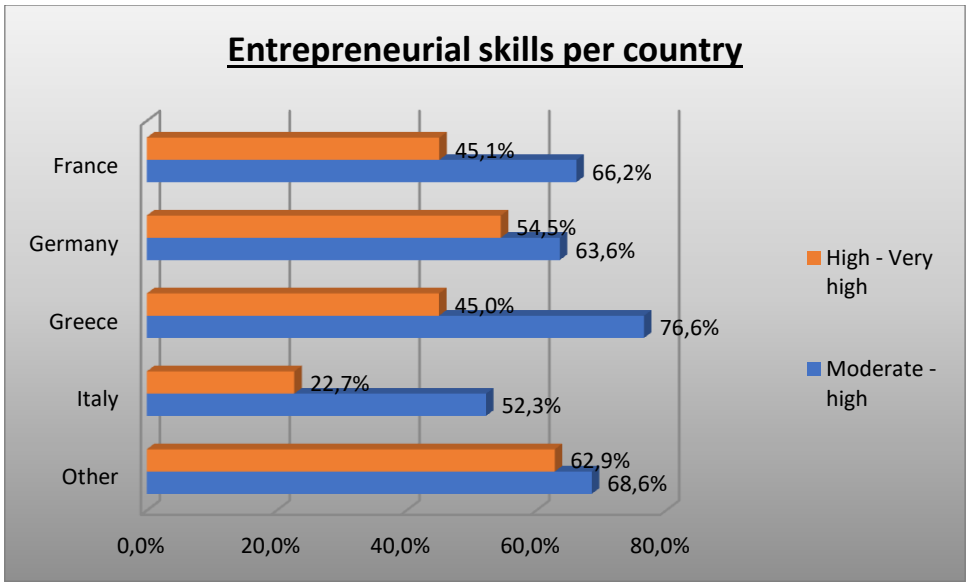

Figure 24: Self-estimation of Entrepreneurial skills per country

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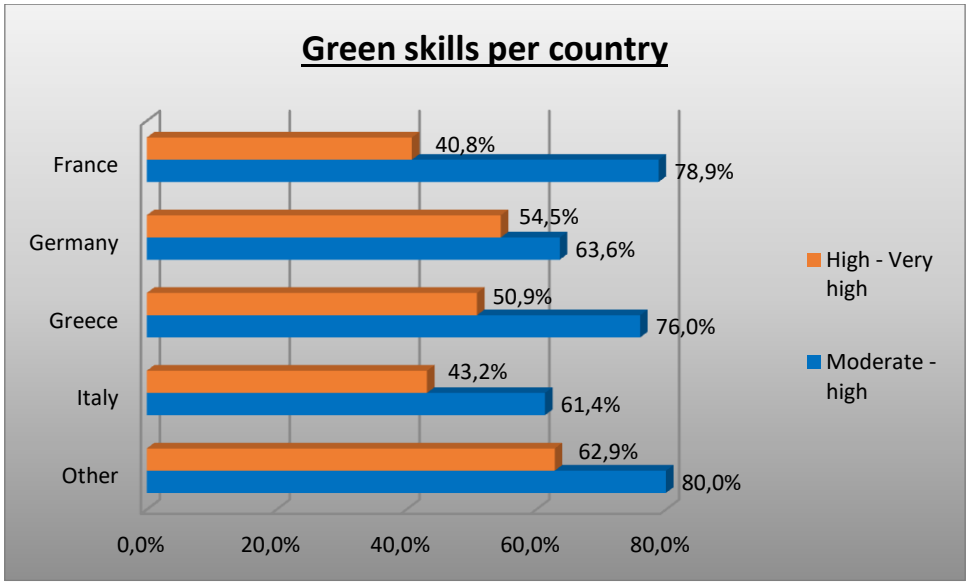

Figure 25: Self-estimation of Green skills per country

3.2.3 Ecological engagement

Participants were also asked to declare their views about the **Ecological Engagement of their organization** (Companies, Governmental organizations, Non-governmental organizations), their **personal Ecological Investment** (Individual professionals), and their **Country Ecological Engagement** (Governmental organizations).

As far as it concerns the **Ecological engagement** of governmental (municipalities, etc), non-governmental (social partners, etc) and companies, the respondents were asked to estimate the how strong they tend to consider the respective attitude of their organization. Results indicate (Figure 26) that they consider it seriously (high to strong) in a degree of near 70%.

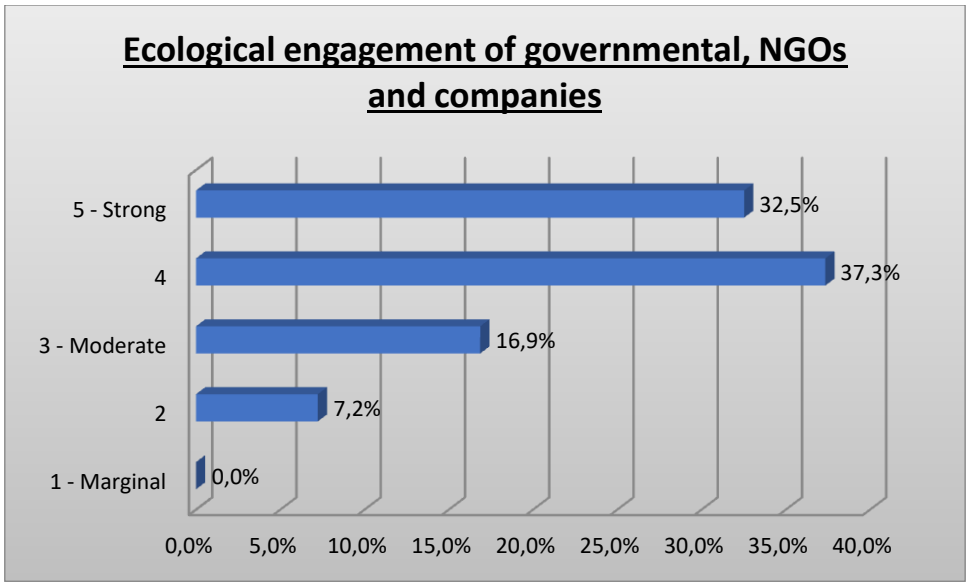

Figure 26: Ecological engagement of governmental, non-governmental organizations, and companies

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Especially for companies, the respective degree was accumulating even higher, i.e. 74.3%, denoting the increased awareness on the issue (Figure 27). The ecological engagement was also assessed in terms of the size of the companies (Figure 28). Results indicate that **large companies present higher ecological engagement than SMEs and quite higher than very small companies; therefore, one may claim that policy makers and country policies should focus more on increasing the ecological engagement of smaller companies, identifying in parallel the reasons for this discrepancy.** Additionally, as we see in Figure 29, companies that include both manufacturing facilities and provide services tend to present higher ecological engagement than companies that operate in one of the two business lines. This finding seems to be irrelevant with the size of company, taken into account the respective cross-tabulation presented in Figure 13.

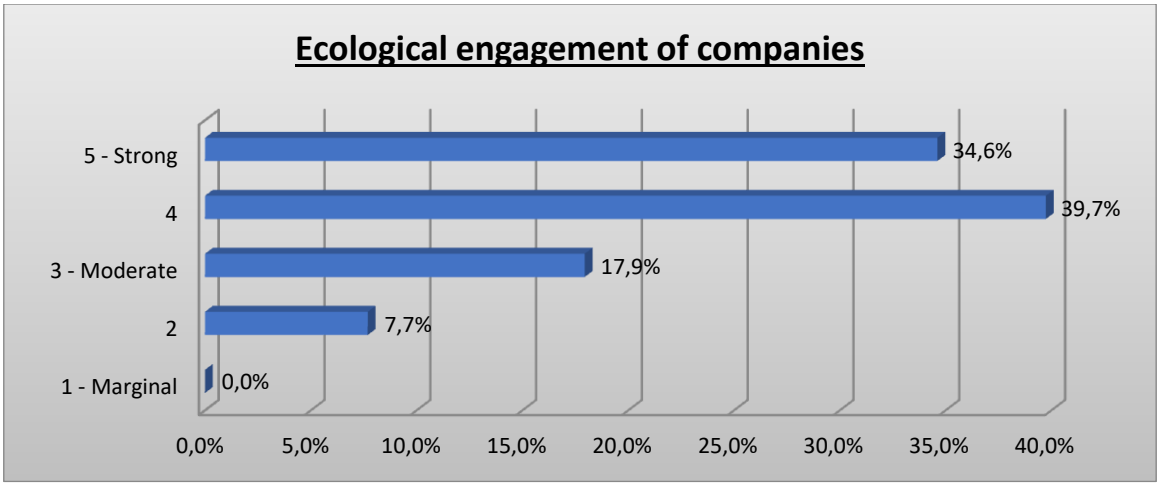

Figure 27: Ecological engagement of companies

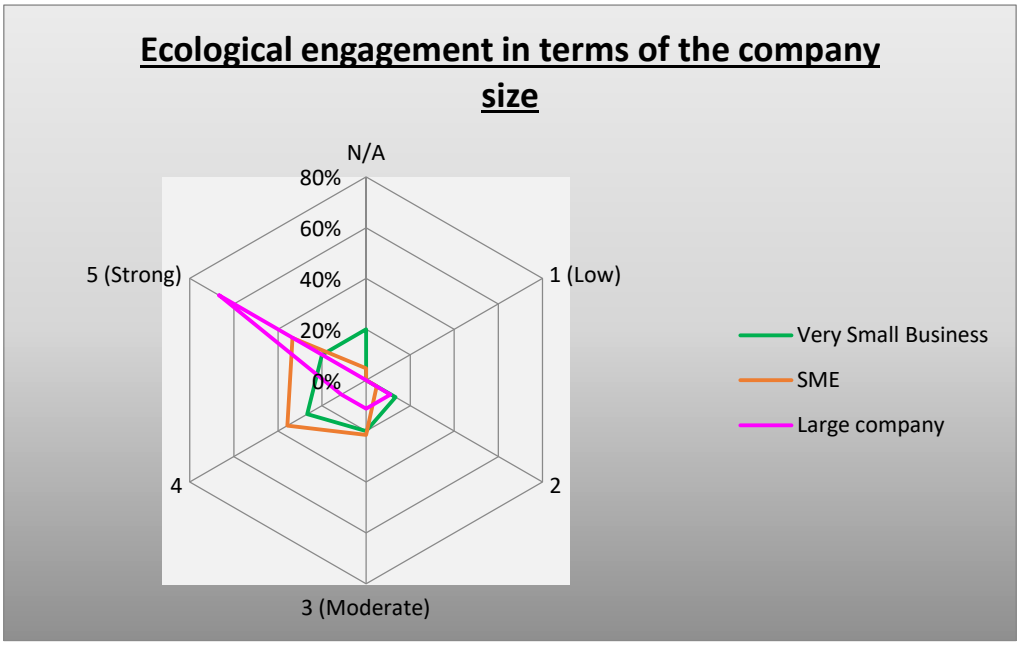

Figure 28: Ecological engagement per company size

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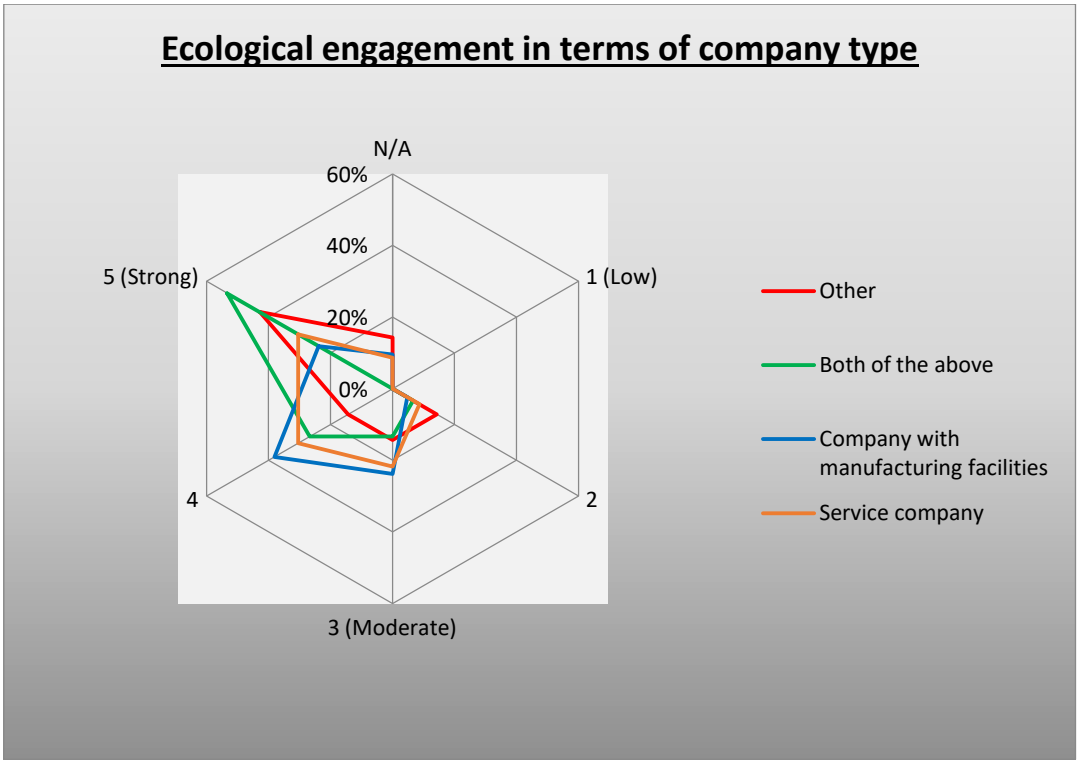

Figure 29: Ecological engagement per company type

In the country level and for companies especially, results (Figure 30, Table 6) indicate that complete survey high (4) to strong (5) ecological engagement is assessed in a degree of 74.4%, with both France and Italy assessed above (88.9% and 85.7% respectively), while Greece and Germany are scoring below (60% and 50% respectively). Thus, **companies in France and Italy seem to be characterized by larger ecological engagement than in Greece and Germany**[4].

Large companies appear to present strong ecological engagement in France, and high in Greece and Italy. In Greece, SMEs present hight ecological engagement than large companies and very small businesses, whereas in Italy very small present the highest ecological engagement (Figure 34). More detailed findings on the company type and country levels can be seen in Figure 31, Figure 32 and Figure 33.

[4] The reader should have in mind that only 11 people from Germany provided valid results, so the findings are not representative for this country.

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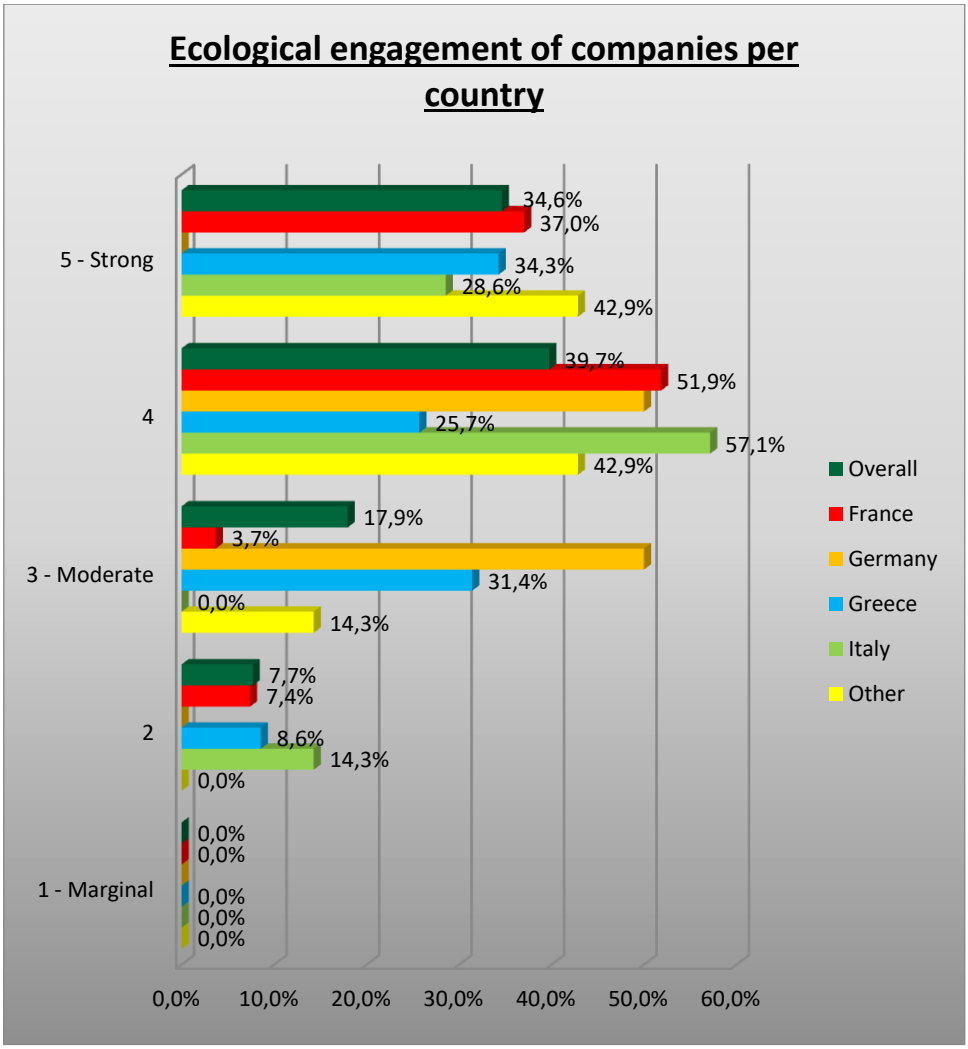

Figure 30: Ecological engagement of companies in the ECOSLIGHT countries

	1 – Marginal	2	3 – Moderate	4	5 - Strong	*(4 -5)*
Overall	0.0%	7.7%	17.9%	39.7%	34.6%	*74.4%*
France	0.0%	7.4%	3.7%	51.9%	37.0%	*88.9%*
Germany	0.0%	0.0%	50.0%	50.0%	0.0%	*50.0%*
Greece	0.0%	8.6%	31.4%	25.7%	34.3%	*60.0%*
Italy	0.0%	14.3%	0.0%	57.1%	28.6%	*85.7%*
Other	0.0%	0.0%	14.3%	42.9%	42.9%	*85.7%*

Table 6: Ecological engagement of companies in the ECOSLIGHT countries

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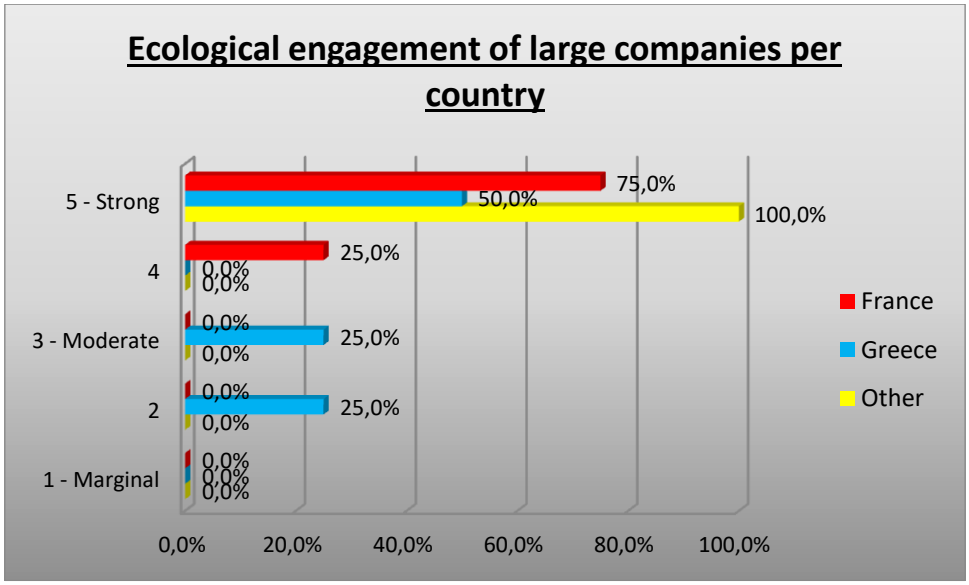

Figure 31: Ecological engagement of large companies in terms of country

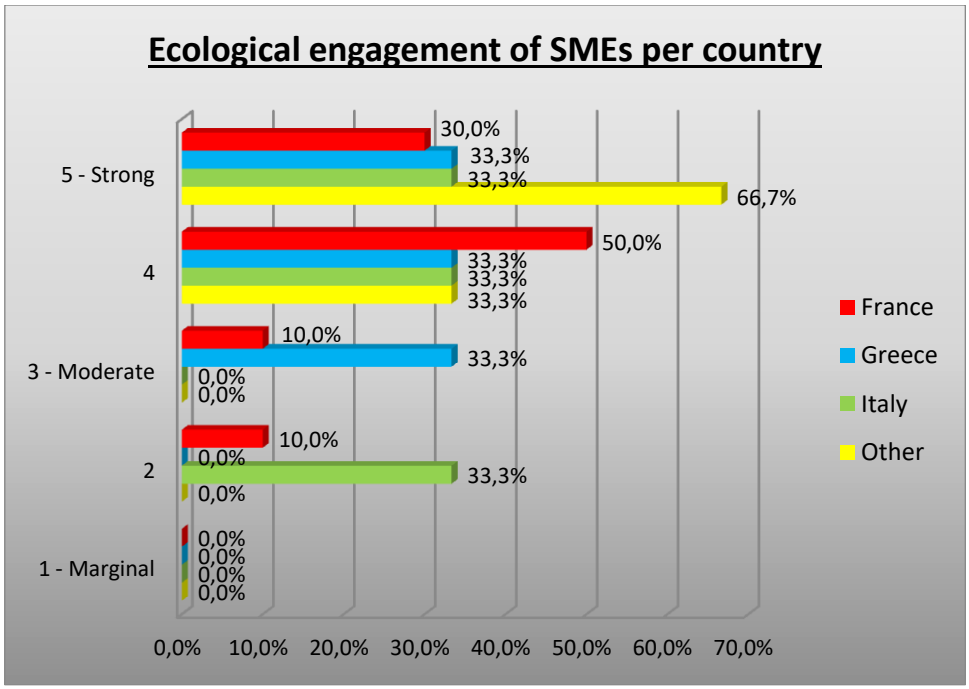

Figure 32: Ecological engagement of SMEs in terms of country

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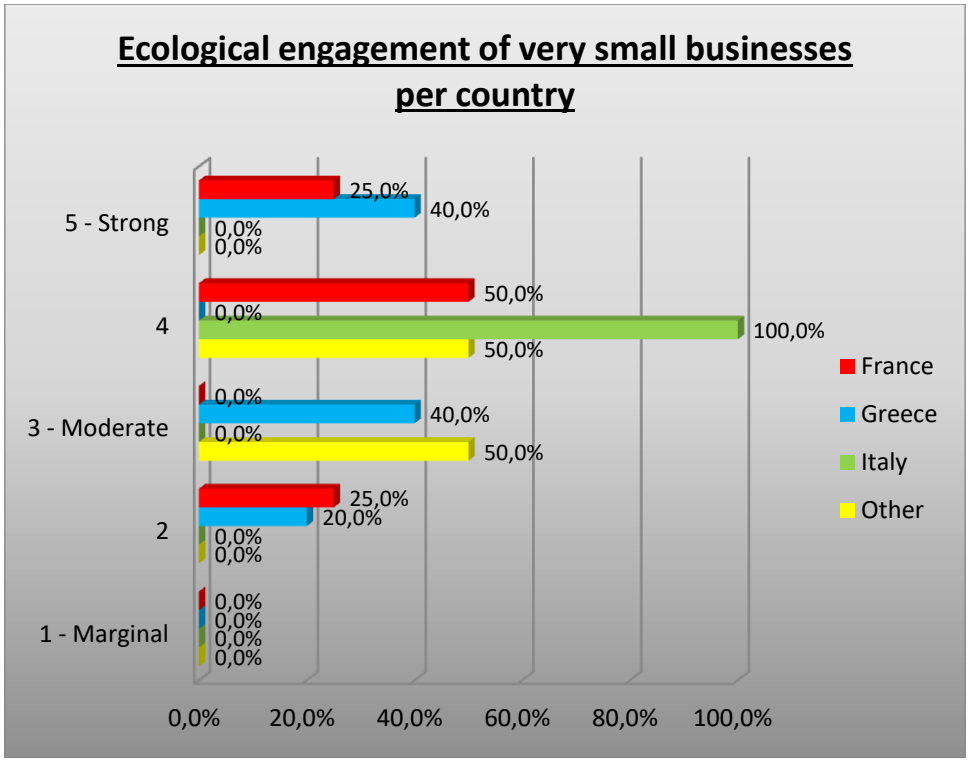

Figure 33: Ecological engagement of very small businesses in terms of country

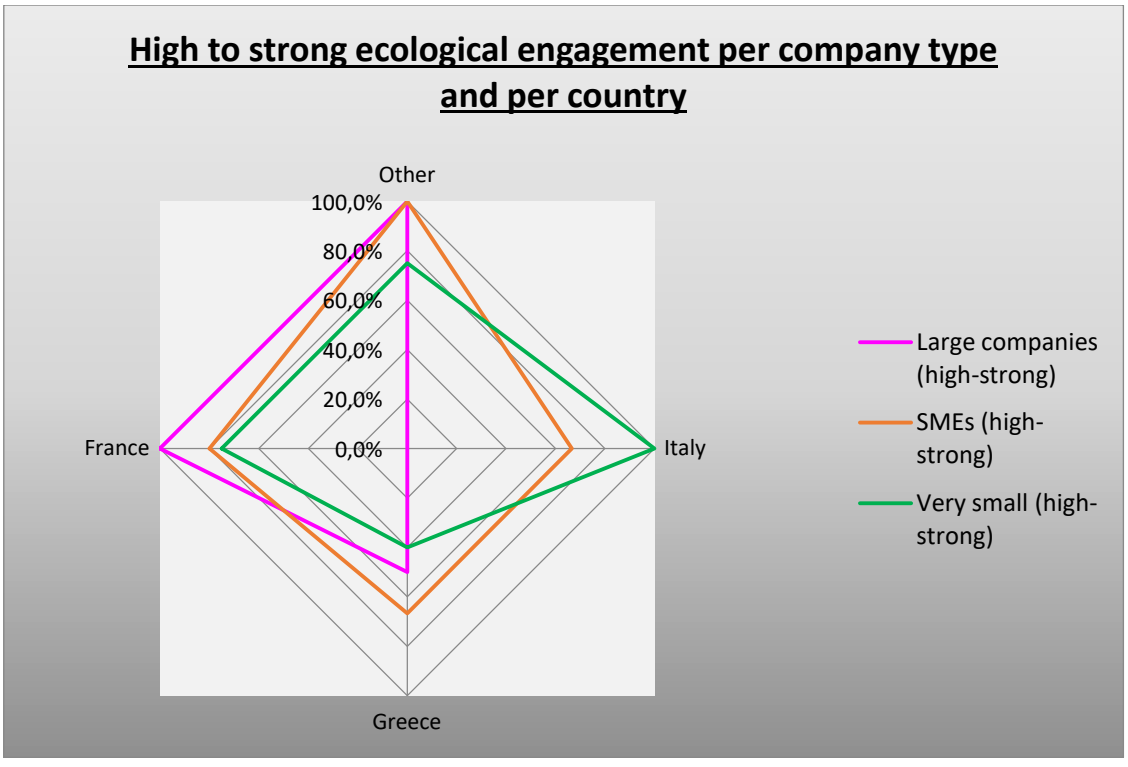

Figure 34: High to strong ecological engagement per company type and per country

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Concerning the individual professionals that provided data for the survey, results (Figure 35) indicate that the vast majority of them, i.e. the 65.9% present high (4) to strong (5) attitudes. This degree is a bit lower than the respective one of the companies (Figure 27), probably because companies are able to follow predefined procedure in accordance with that objective.

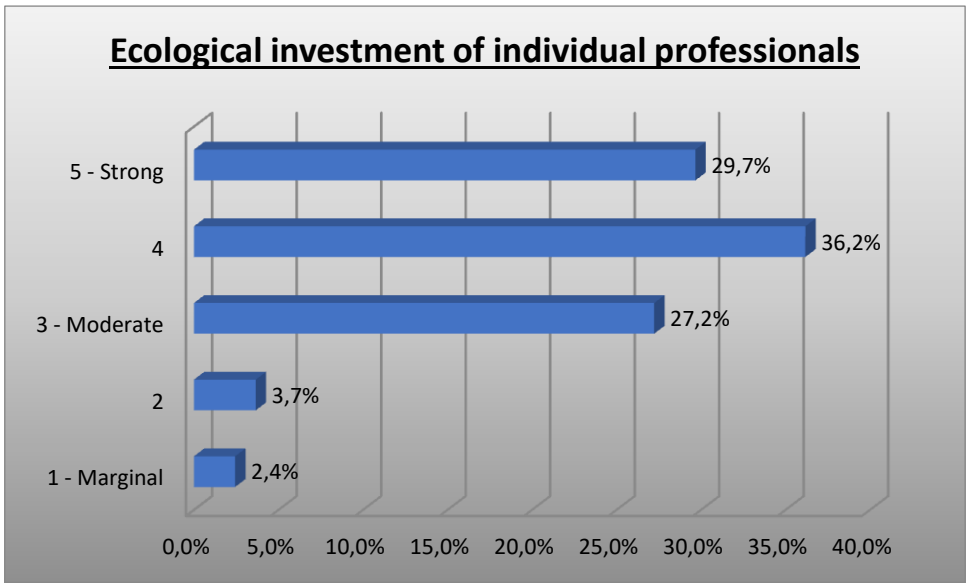

Figure 35: Ecological investment of individual professionals

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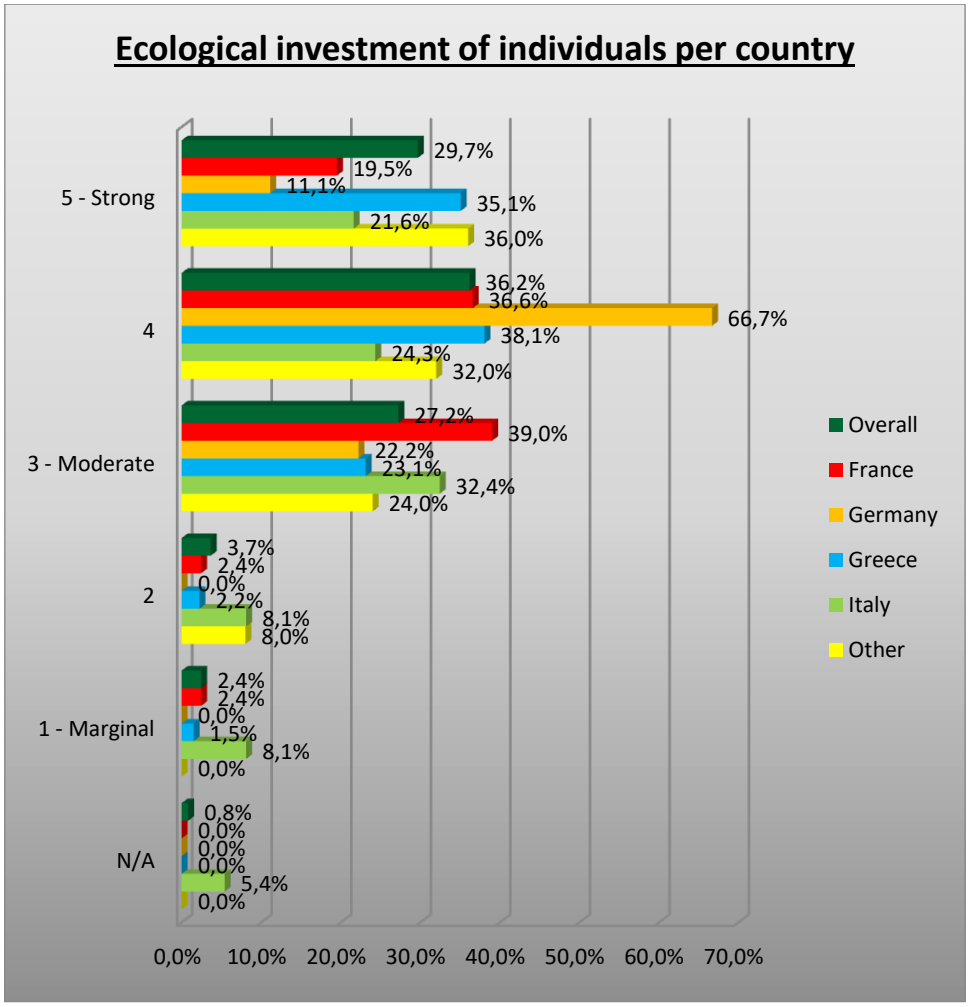

Figure 36: Ecological investment of individual professionals per country

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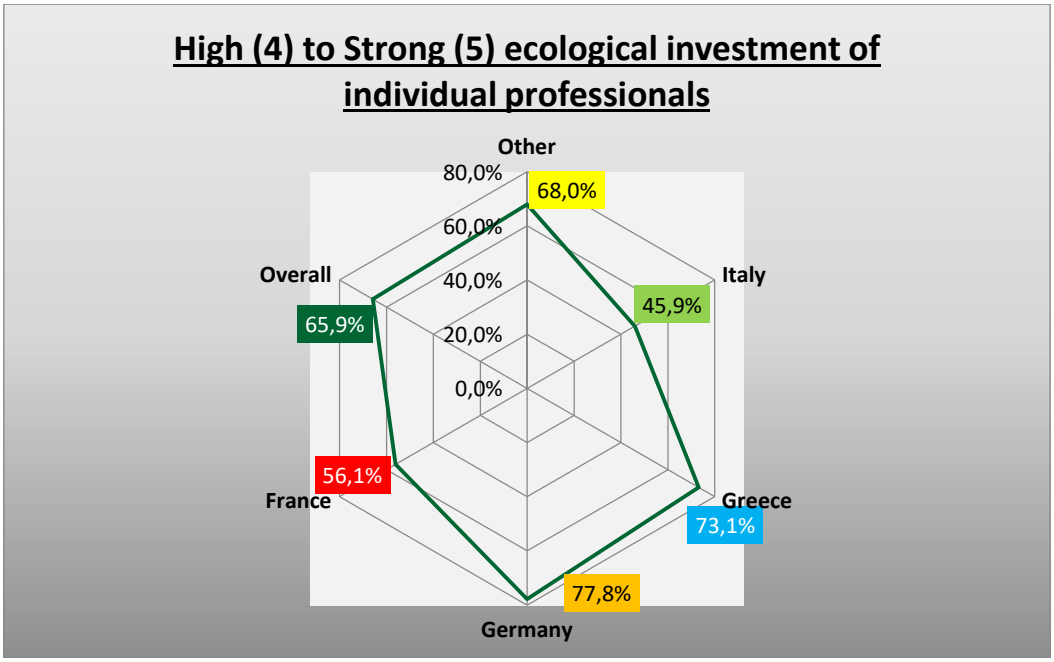

Figure 37: High to strong ecological investment of individuals

On the country level, we see that **individual professionals in Greece and Germany[5] present higher ecological investment attitudes than their colleagues in France, and much higher than their colleagues in Italy. This finding is totally opposite from the one presented by the companies in the aforementioned countries** (Table 6), where **France and Italy is quite ahead than Greece and Germany!** This discrepancy of the ecological attitudes between individual professionals and companies in France, Germany, Greece and Italy should be explored further.

This finding motivated the ECOSLIGHT research team to explore further the differences in the attitudes between the different types of individual professionals, mainly in respect to their professional status. Results (Figure 38) indicate that overall in all participating countries, self-employed people, employees and employers tend to have high to strong ecological investment attitudes than unemployed people and students. Thus, "working" people tend to present much higher ecological investment attitudes than "non-working" people. **The highest numbers are declared by employers and employees in France, by employees and students in Germany, by self-employed and employees in Greece, by self-employed and employers in Italy**, and by students and unemployed people in other countries (but here we speak about a very decreased participation, therefore this results is not representative).

[5] The reader should have in mind that only 11 people from Germany provided valid results, so the findings are not representative for this country.

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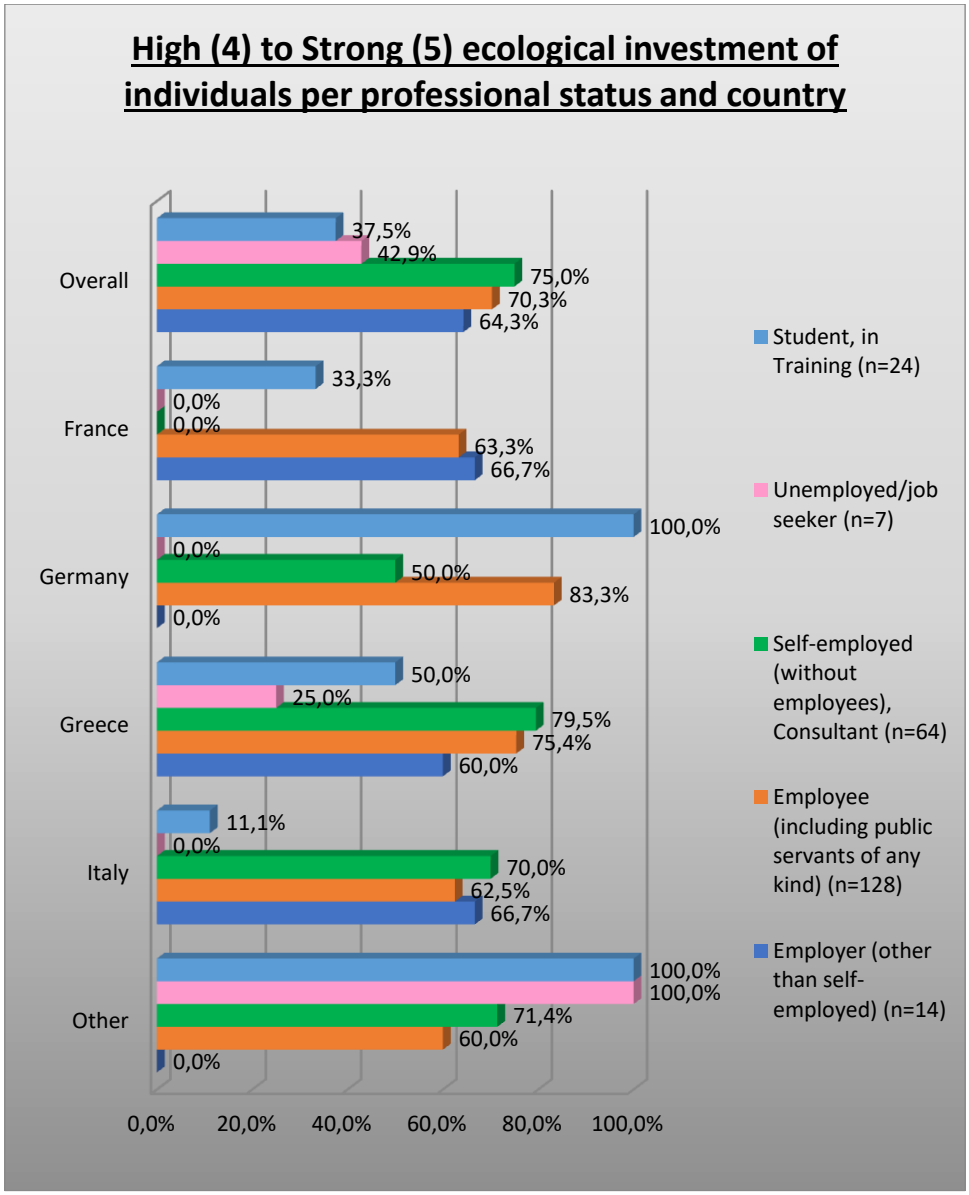

Figure 38: High to strong ecological investment of individual professionals per country and professional status

Additional analyses were conducted also to identify further dimensions of ecological investment of individuals. In Table 7 and Figure 39 we see that **the individual professionals that declare high (4) to strong (5) ecological investment work mostly in education / research, energy, lighting design / consulting, architecture studios / companies, central and local authorities, artistic / cultural and media, the lighting industry in general, and interestingly, in other sectors that are not related to the lighting sector.** On the other hand, **construction sector, lighting installers / lighting service providers, and international agencies / organizations present the lower degrees of ecological investment.**

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	1 - Marginal	2	3 - Moderate	4	5 - Strong	*High (4) to Strong (5)*
Architecture studio/company	0.0%	7.4%	22.2%	48.1%	22.2%	*70.4%*
Artistic/Cultural, Media activities	0.0%	0.0%	33.3%	50.0%	16.7%	*66.7%*
Central administration (Ministries, National/regional Government, National Agencies, etc.)	0.0%	0.0%	33.3%	0.0%	66.7%	*66.7%*
Construction sector	7.7%	7.7%	46.2%	30.8%	7.7%	*38.5%*
Education/Research	0.0%	0.0%	9.7%	51.6%	38.7%	*90.3%*
Energy sector	0.0%	10.0%	10.0%	40.0%	40.0%	*80.0%*
International Agency/Organization	0.0%	0.0%	50.0%	0.0%	50.0%	*50.0%*
Lighting Designer/Lighting Consulting	0.0%	2.3%	20.5%	38.6%	38.6%	*77.3%*
Lighting Industry	0.0%	0.0%	34.5%	34.5%	31.0%	*65.5%*
Lighting installer and/or lighting service provider	0.0%	0.0%	57.1%	28.6%	14.3%	*42.9%*
Local authorities (local / regional governments)	16.7%	0.0%	16.7%	66.7%	0.0%	*66.7%*
Non-Governmental Organizations/Associations	0.0%	0.0%	50.0%	0.0%	50.0%	*50.0%*
Other	9.1%	9.1%	18.2%	18.2%	45.5%	*63.6%*
Other Industry (other than Lighting)	0.0%	0.0%	20.0%	20.0%	60.0%	*80.0%*

Table 7: Ecological investment of individual professionals per sector

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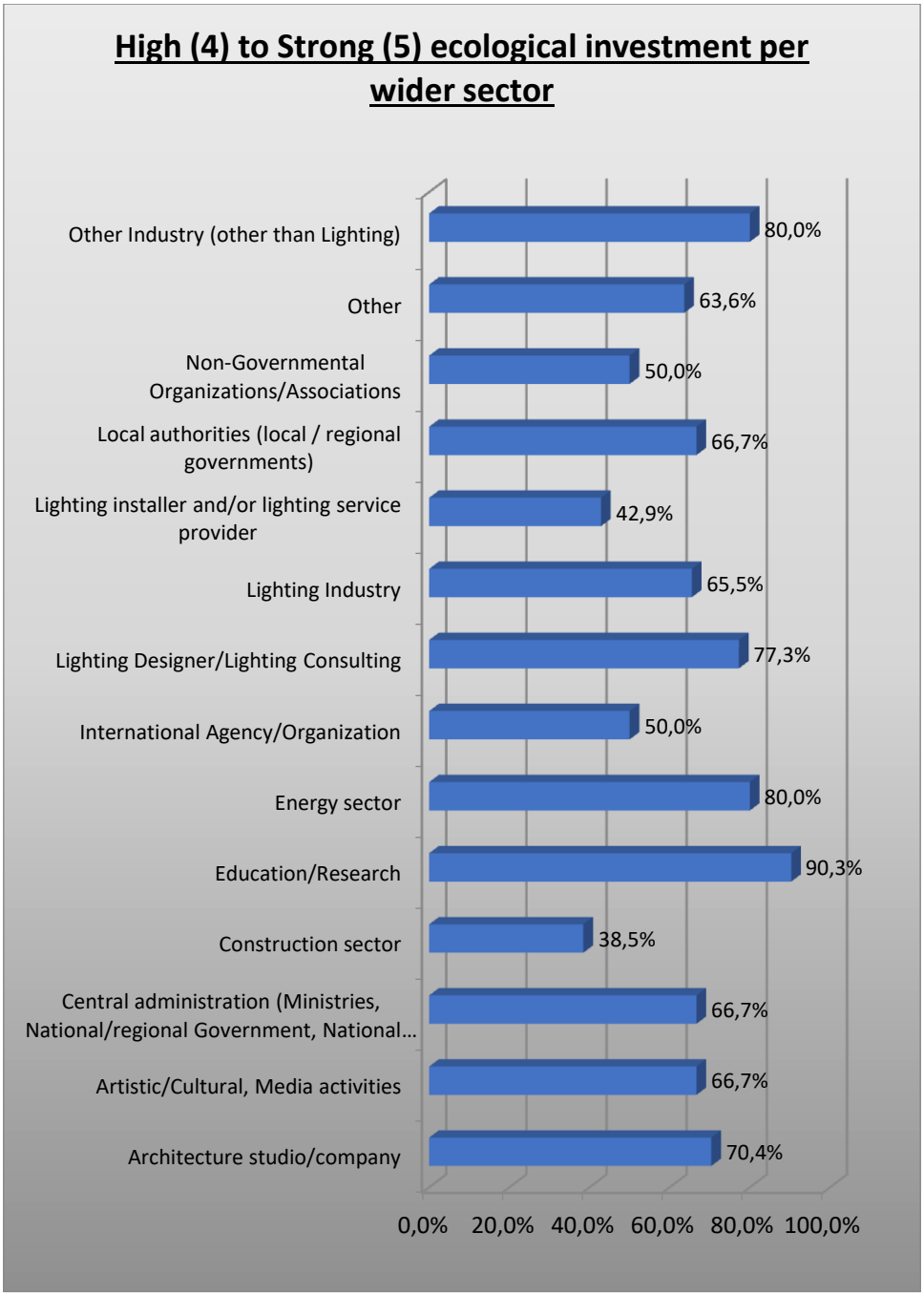

Figure 39: Ecological investment of individual professionals per wider sector

Additional analyses were conducted for State representative bodies (Municipalities, Local Collectivities, City Councils, Policy Makers, Government Organizations) concerning the ecological engagement of the country and the ecological engagement of the organization. We remind the reader that 8 respondents in this category originate from France, 1 from Italy and 2 from Greece.

- Concerning the government initiatives in setting up actively environmental policies (Figure 40), we observe that France is engaged in a degree of Moderate to High in a percentage of 87.5%, whereas

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Greece in 100% (as Italy, but with one respondent only). In the three project country level, this result accumulates to 91%.

- Concerning the significance of market demand for environmental protection or energy saving (Figure 41Figure 40), we observe that France is engaged in a degree of Moderate to High in a percentage of 87.5% (but higher on average than the case of the previous estimation concerning the setting up of environmental policies, whereas Greece in 100% (as Italy, but with one respondent only). In the three project country level, this result accumulates again to 91%.
- Municipalities, City Councils, Authorities, National Policy Making Bodies, International Institutions etc were also asked to declare their environmental engagement (Figure 42). Results indicate that in general high to strong demand for France, Italy and overall, with the respective numbers in Greece being lower.

Overall, **State representatives in France, Greece and Italy denote moderately to high indications concerning government initiatives setting up environmental policies, as the market requests for environmental protection or energy saving. Similar results, with the exception of Greece that presents moderate results, are declared for the environmental engagement of those organizations.**

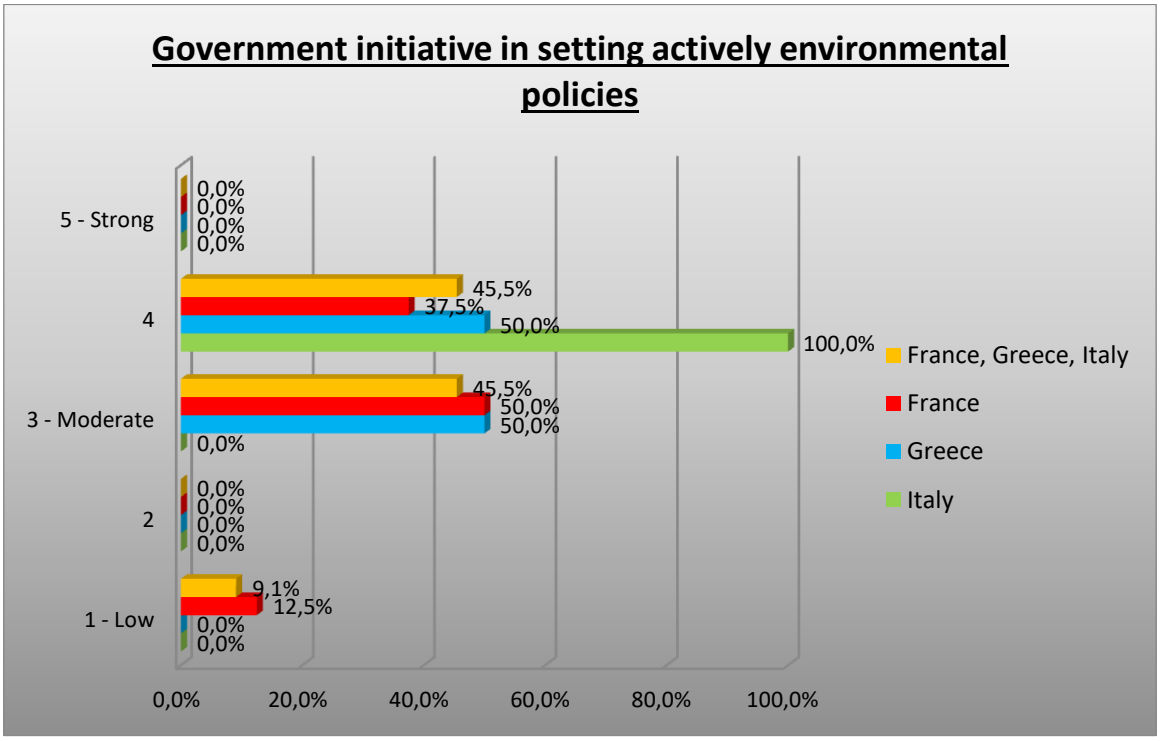

Figure 40: Government initiatives in setting actively environmental policies per country

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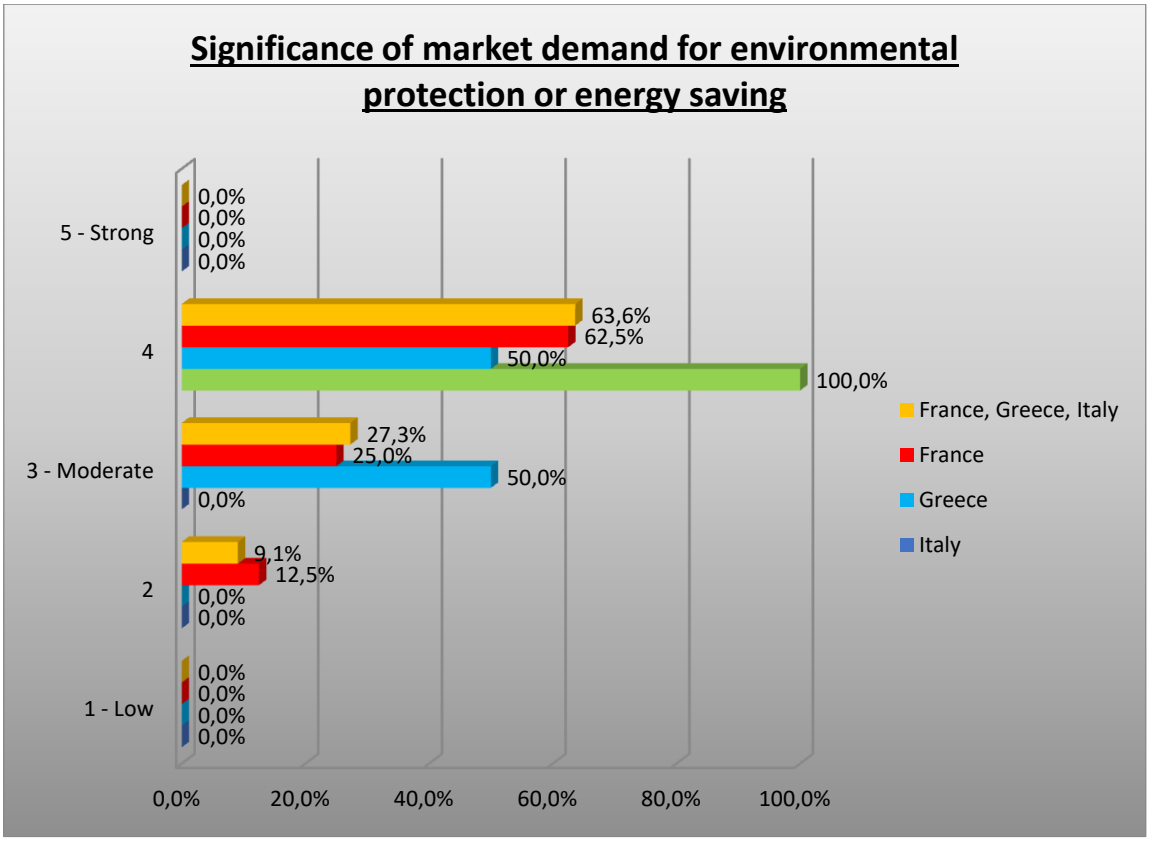

Figure 41: Significance of market demand for environmental protection or energy saving per country

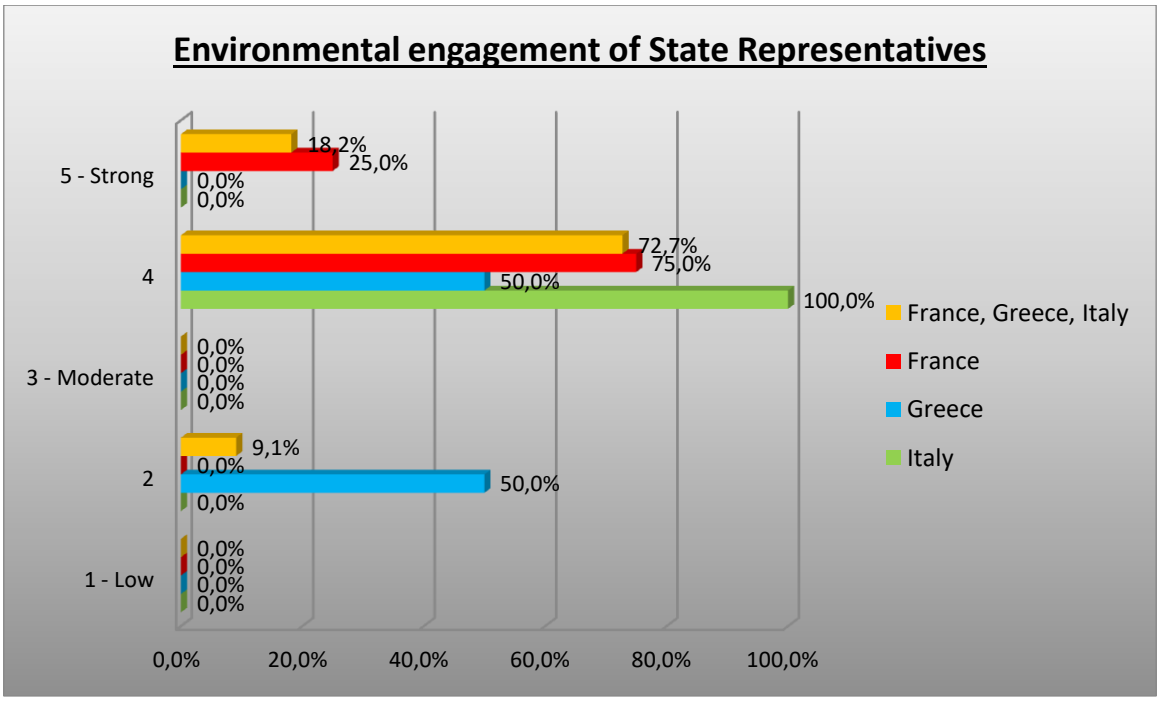

Figure 42: Environmental engagement of State representatives per county

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4 The human capital of the lighting sector and training needs

In the second part of the survey, respondents were asked to present their views about the human capital of the lighting sector. The survey oriented mainly to the emerging challenges, the level of staff and job profiles will be in need the following years, the identified skills shortage, and the need for training.

4.1 The status of training programs related to the lighting sector

The respondents were first asked to declare the issues that organizations currently face in respect to the human capital for lighting-related activities. As we see in Figure 43 – were respondents were allowed to select more than options – most of them believe that the training currently offered is not adapted to the scholar level of the professionals of the sector (36.5%), followed by the lack of training programs related to lighting for professionals (30.7%) as well as the provision of outdated training programs not adapted to the emerging needs (28.1%). **Therefore, it is obvious that new training programs are required for the professionals of the lighting sector, adapted to their scholar level, and oriented to the current and emerging needs of the lighting sector activities**.

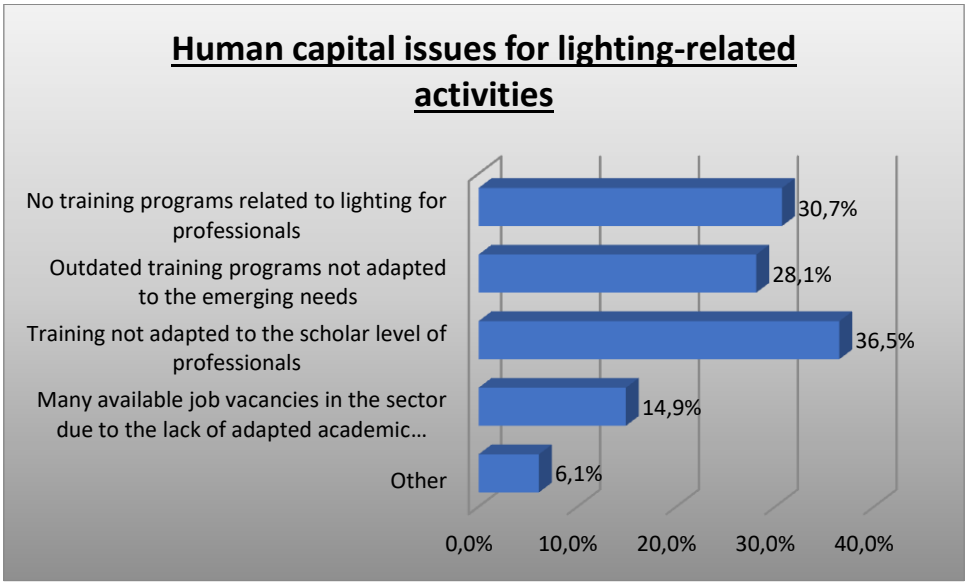

Figure 43: Issues organizations face in respect to the human capital for lighting-related activities

Next, the identified issues were examined in the country level (ECOSLIGHT countries and above). The lack of training programs related to lighting for professionals appear to be an issue mostly for Greece and Italy, and almost not at all in France (Figure 44). Outdated training programs appear to be mainly a problem in Germany (more than 50%) and in a lower degree in the other 3 project countries (Figure 45). The training not adapted to the scholar level of lighting professionals is an issue primarily for Greece (46.2%) and Italy (43.2%), and secondary for France (23.9%) and Germany (18.2%) (Figure 46). Last, all project countries seem to face a limited problem (with the exception of Italy) with the availability of job vacancies in the sector due to the lack of adapted academic curricula (Figure 47).

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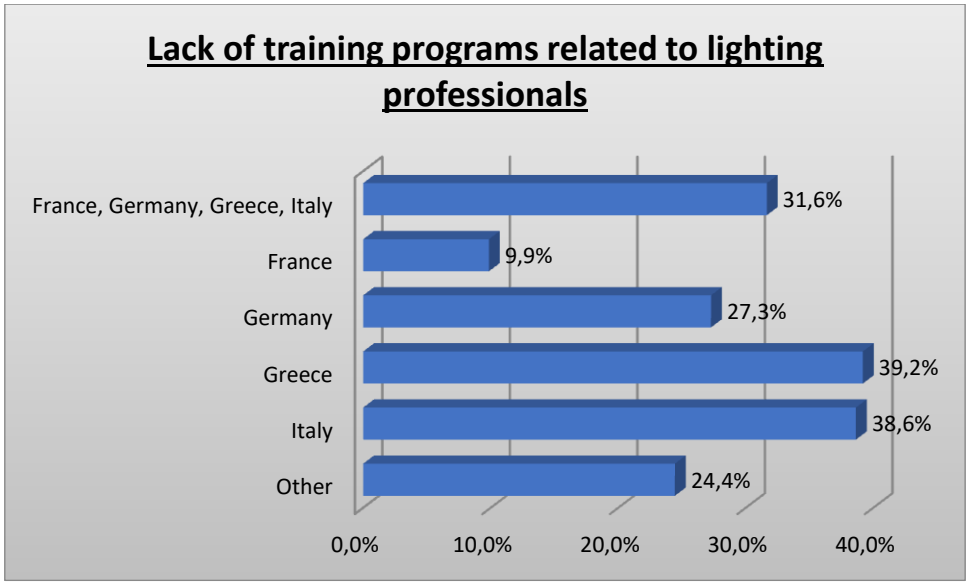

Figure 44: Lack of training programs related to lighting professionals per country

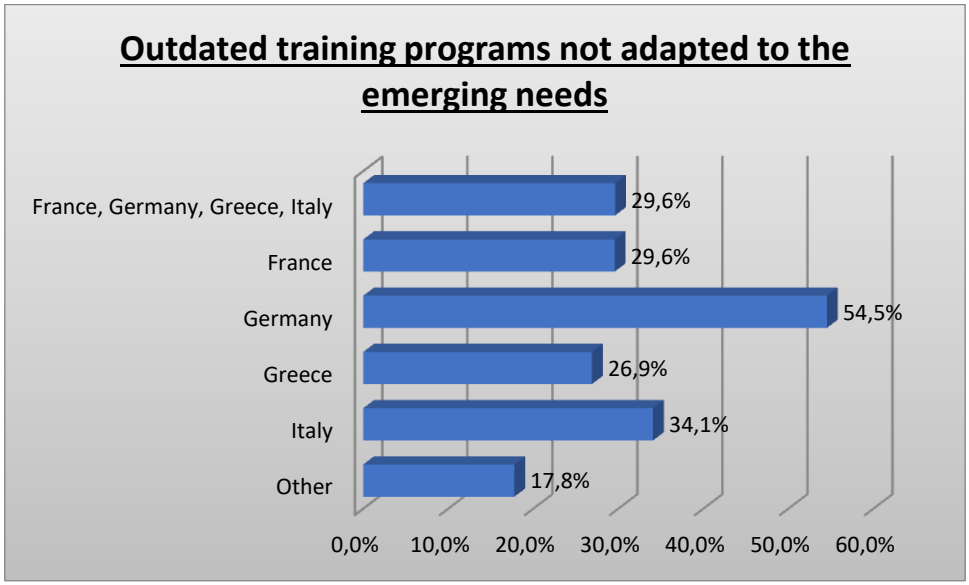

Figure 45: Outdated training programs not adapted to the emerging needs per country

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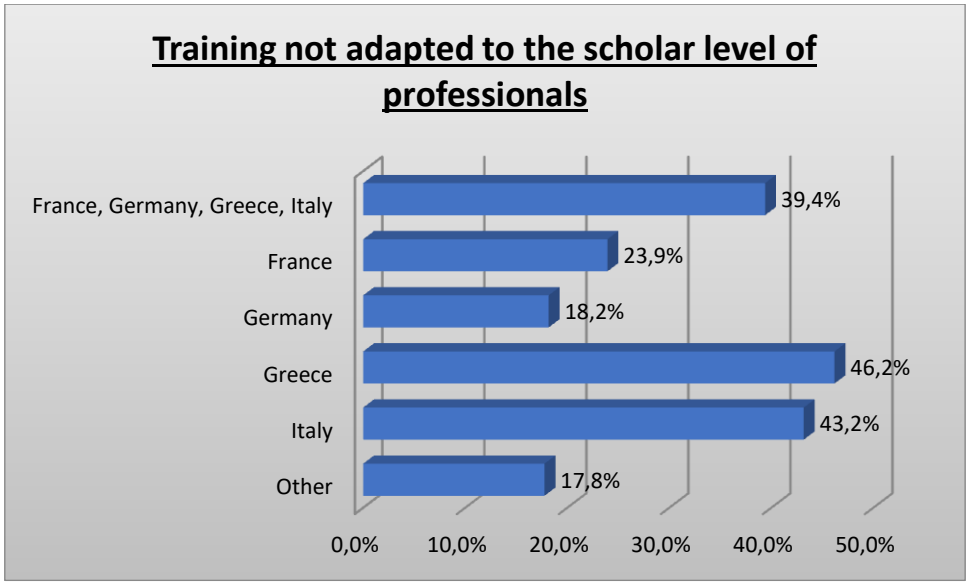

Figure 46: Training not adapted to the scholar level of professionals per country

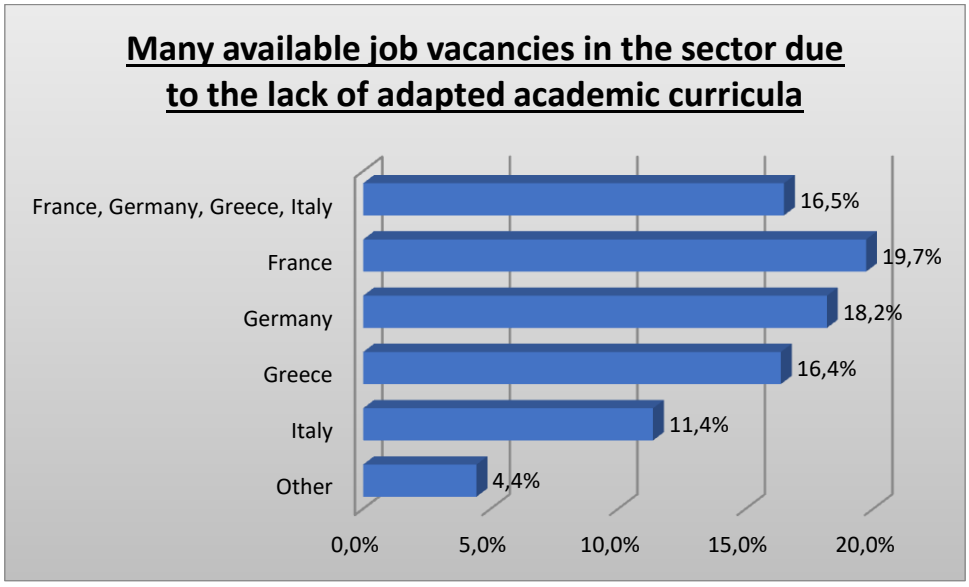

Figure 47: Many available job vacancies in the sector due to the lack of adapted academic curricula per country

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	France, Germany, Greece, Italy	France	Germany	Greece	Italy
No training programs related to lighting for professionals	31.6 %	9.9 %	27.3 %	39.2 %	38.6 %
Outdated training programs not adapted to the emerging needs	29.6 %	29.6 %	54.5 %	26.9 %	34.1 %
Training not adapted to the scholar level of professionals	39.4 %	23.9 %	28.2 %	46.2 %	43.2 %
Many available job vacancies in the sector due to the lack of adapted academic curricula	16.5 %	19.7 %	18.2 %	16.4 %	11.4 %

Table 8: Issues an organization faces in respect to the human capital for lighting-related activities per country

Overall, we see that (Table 8),

- France faces problem mainly with the outdated training programs not adapted to the emerging needs and training not adapted to the scholar level of professionals, i.e. and orientation type of training for lighting professionals.
- For Germany, the low participation does not allow to produce sound conclusions.
- Greece confronts with training not adapted to the scholar level of professionals and the lack of training programs related to the lighting professionals, thus new and oriented training programs are required.
- Italy faces the issues of training programs not adapted to the level of professionals, outdated programs and the lack of programs for lighting professionals.

Therefore, all project countries need new and oriented training programs covering the needs of the lighting market and the related professionals' needs.

Further analyses were conducted according to the type of respondent. In Table 9 we see that

- Companies and individual professionals underline the existence of outdated training programs, the availability of jobs due to the lack of adapted curricula and the training not adapted to the needs of the professionals.
- Governmental organizations (municipalities, etc) focus mostly to the existence of outdated training programs not adapted to the market needs.
- Non-governmental organization (social partners, etc) underline mostly the outdated programs and availability of job vacancies due the lack of adapted academic curricula.

Therefore, all different types of actors agree that the currently available training programs are outdated and do not cover the emerging needs, therefore new training programs are required.

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	Company	Individual professional	Municipality, Local collectivity, City council, Policy maker, Governmental organization	Social partner, NGO, International organization, other
No training programs related to lighting for professionals	21.2%	14.2%	9.1%	16.7%
Outdated training programs not adapted to the emerging needs	37.9%	37.4%	36.4%	50.0%
Training not adapted to the scholar level of professionals	31.8%	29.3%	18.2%	16.7%
Many available job vacancies in the sector due to the lack of adapted academic curricula	33.3%	31.7%	18.2%	50.0%

Table 9: Type of respondent and issues organizations face in respect to the human capital for lighting-related activities

4.2 Staff of the sector

The survey concentrated also to the staff of the sector, and especially the supply and demand. Indicatively, it explored the current staff availability, the difficulties to find personnel, and the reasons for that. It also studied the need for staff in the following five years, in respect to the level, the job role profiles demanded, the skills gaps per type of professional, and the demand for staff in the different lighting sub-sectors.

4.2.1 Availability

Next, the survey explored the availability of suitable trained staff in the lighting sector and, in case of lack / difficulty to find, the reasons for that.

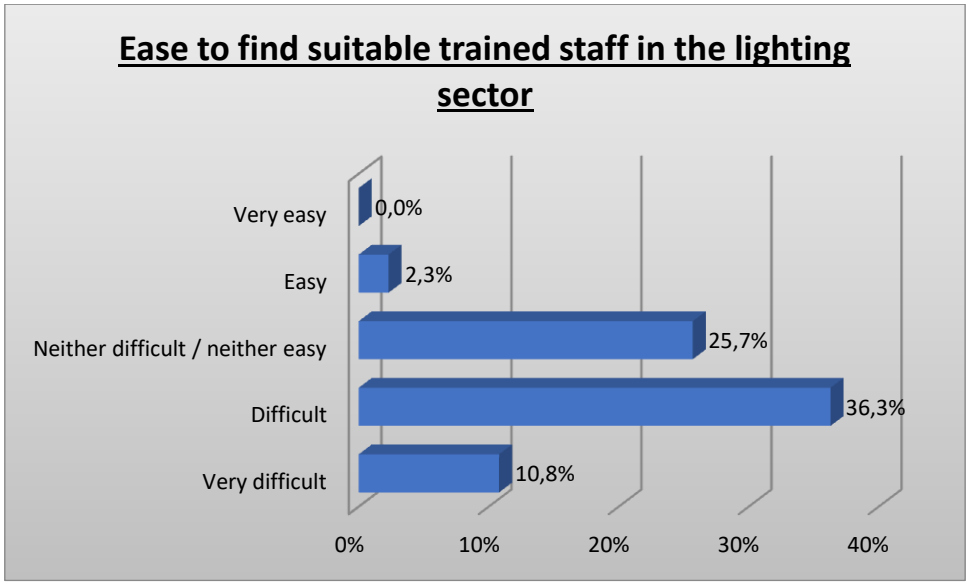

Figure 48: How easy it is for an organization in your country to find suitable trained staff in the lighting sector

As we see in Figure 48, the 47.1% of the participants believe that it is difficult to very difficult to find suitable trained staff for the lighting sector. In Table 10 we see that **the respective percentage for four project countries are 50.2%, for France 47.9%, for Germany 63.6%, for Greece 48.6% and for Italy 56.9%.**

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Thus, the problem seems to be more serious in Germany[6], and less in France, but around 50% in all cases. Interestingly, neither one respondent answered that it is "very easy", a finding underlying the problem.

	France, Germany, Greece, Italy	France	Germany	Greece	Italy	Other
N/A	20.9%	28.2%	27.3%	20.5%	9.1%	51.1%
Very difficult	11.8%	11.3%	9.1%	12.3%	11.4%	4.4%
Difficult	38.4%	36.6%	54.5%	36.3%	45.5%	22.2%
Neither difficult / neither easy	27.3%	21.1%	9.1%	29.2%	34.1%	15.6%
Easy	1.7%	2.8%	0.0%	1.8%	0.0%	6.7%
Very easy	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 10: Easy to find the suitable – for the lighting sector – trained staff per country

The results were also analyzed per type of respondent. As we see in Table 11 , **the 56 % of companies, the 46.7 % of individual professionals, the 36.4 % of governmental organizations and the 66.6 % of non-governmental organizations consider difficult to very difficult to find the suitable trained staff for their lighting related activities.** Thus, more than 50 % of the companies declare this serious difficulty.

	Company	Individual professional	Municipality, Local collectivity, City council, Policy maker, Governmental organization	Social partner, NGO, International organization, other	N/A
N/A	19.7 %	22.8 %	27.3 %	16.7 %	92.3 %
Very difficult	22.7 %	7.7 %	9.1 %	33.3 %	0.0 %
Difficult	33.3 %	39.0 %	27.3 %	33.3 %	7.7 %
Neither difficult / neither easy	22.7 %	27.6 %	36.4 %	16.7 %	0.0 %
Easy	1.5 %	2.8 %	0.0 %	0.0 %	0.0 %
Very easy	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %

Table 11: Easy to find the suitable – for the lighting sector – trained staff per type of respondent

These results were analysed further; respondents were asked to identify the most important reasons for this difficulty (Figure 49). **The most popular reason was the lack of required skills of those professionals (53.1 %) followed by the decreased availability of the respective professionals (36.3 %)**.

[6] The reader should have in mind that only 11 people from Germany provided valid results, so the findings are not representative for this country.

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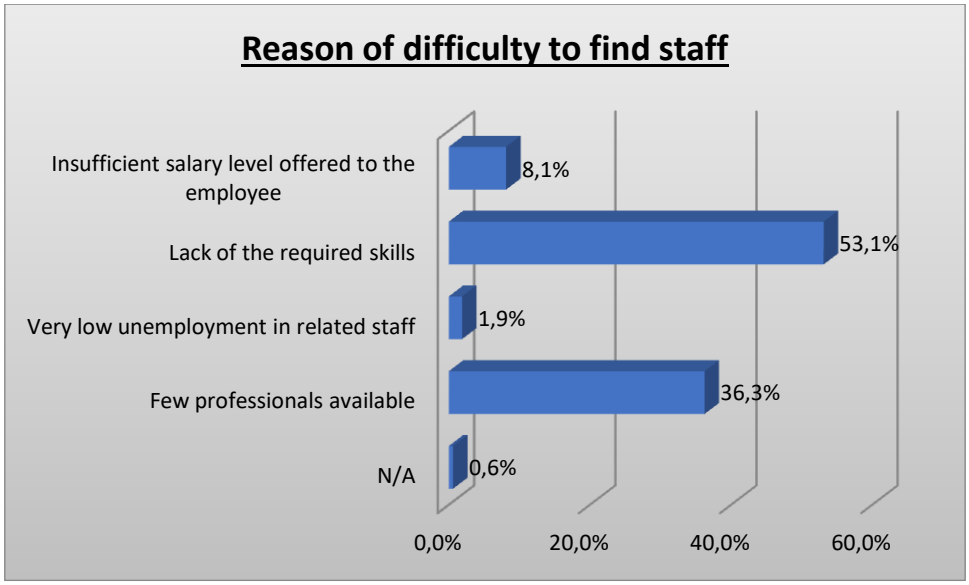

Figure 49: Reason of difficulty to find the suitable trained staff for the lighting activities

On the country level (Table 12), results indicate that on the four project countries level, **the lack of required skills is the most popular reasons for the difficulty to find the suitable staff for the lighting sector. This is the case mainly for Greece and Italy. Interestingly, in France and Germany, the most popular reason appear to be the lack of professionals, followed by the lack of required skills. Therefore, it seems that – for the particular case - Southern Europe suffers from lack of skills whereas northern Europe from lack of staff**!

	France, Germany, Greece, Italy	France	Germany	Greece	Italy
Few professionals available	34.9 %	61.8 %	57.1 %	21.7 %	36.0 %
Very low unemployment in related staff	0.7 %	0.0 %	0.0 %	1.2 %	0.0 %
Lack of the required skills	54.4 %	32.4 %	42.9 %	62.7 %	60.0 %
Insufficient salary level offered to the employee	8.7 %	5.9 %	0.0 %	12.0 %	4.0 %
Other	1.3 %	0.0 %	0.0 %	2.4 %	0.0 %

Table 12: Important reasons for difficulty to find suitable trained staff for the lighting sector per country

Results were also analysed per type of respondent (Table 13). All types of respondents rated first the lack of required skills (especially the non-governmental organizations), followed by the lack of professionals.

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	Few professionals available	Insufficient salary level offered to the employee	Lack of the required skills	Very low unemployment in related staff	Other
Company	38.2%	2.9%	58.8%	0.0%	0.0%
Individual professional	34.9%	9.4%	52.8%	0.9%	1.9%
Municipality, Local Collectivity, City Council, Policy Maker, Government Organization	25.0%	25.0%	50.0%	0.0%	0.0%
Social Partner, NGO, International Organization	25.0%	0.0%	75.0%	0.0%	0.0%

Table 13: Important reasons for difficulty to find suitable trained staff per type of respondent in the project countries

Overall, we see that the lack of required skills is the most important reason for the difficulty to find the appropriate staff for the sector. In the following section, we discuss more on the skills needed.

4.2.2 Staff demand

Currently, the sector employs professionals mainly in the roles of managers, R&D engineers (i.e. scientists with MSc level and above), Lighting professionals (with engineering background), Lighting designers (with artistic background), Technicians (Lighting technicians, installers and associate professionals), technical-commercial staff, and other specialties. The demand for these different roles in the next five years is presented below.

	N/A	1-Most likely	2-Likely	3-Possible	4-Unlikely	5-Most unlikely	*(1 –2)*
Managers	39.8 %	5.0 %	14.9 %	24.6 %	11.4 %	4.4 %	*19.9 %*
R&D engineers / scientists (MSC-level and above)	33.6 %	22.5 %	19.0 %	20.8 %	1.5 %	2.6 %	*41.5 %*
Lighting professionals (Engineering background)	27.5 %	33.9 %	20.5 %	14.6 %	0.9 %	2.6 %	*54.4 %*
Lighting designers (Artistic background)	30.1 %	21.1 %	21.1 %	20.8 %	5.6 %	1.5 %	*42.2 %*
Lighting technicians, installers and associate professionals	29.2 %	27.2 %	19.0 %	20.2 %	1.5 %	2.9 %	*46.2 %*
Technical-commercial staff	31.9 %	11.7 %	19.0 %	27.5 %	7.6 %	2.3 %	*30.7 %*
Other	95.3 %	1.5 %	1.2 %	0.9 %	0.3 %	0.9 %	*2.7 %*

Table 14: Demand for staff in the next five years

In Table 14 we see that the next five years the sector will need mostly Lighting Professionals with engineering background (54.4 %) followed by Lighting technicians, installers and associate professionals (46.2 %), Lighting Designers with artistic background (42.2 %) and R&D engineers / scientists (41.5 %). Apart from the Lighting designers with artistic background and the technicians (which typically correspond to the EQF level 5), the rest fold in EQF 6 and above.

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	France, Germany, Greece, Italy	France	Germany	Greece	Italy	Other countries	N/A
Managers	20.2 %	25.4 %	45.5 %	14.6 %	27.3 %	22.9 %	0.0 %
R&D engineers / scientists (MSc-level and above)	43.1 %	40.8 %	63.6 %	38.6 %	59.1 %	40.0 %	0.0 %
Lighting professionals (Engineering background)	56.9 %	56.3 %	63.6 %	52.6 %	72.7 %	48.6 %	0.0 %
Lighting designers (Artistic background)	44.4 %	33.8 %	45.5 %	42.7 %	68.2 %	34.3 %	0.0 %
Lighting technicians, installers and associate professionals	49.2 %	57.7 %	54.5 %	43.9 %	54.5 %	34.3 %	0.0 %
Technical-commercial staff	32.7 %	43.7 %	36.4 %	28.1 %	31.8 %	22.9 %	0.0 %

Table 15: Demand for staff in the next five years on the country level (1-Most likely to 2- Likely)

In Table 15 we see that in the next five years,

- In France, there will be a demand for Lighting technicians, installers and associate professionals (57.7 %), Lighting professionals (engineering background) (56.3 %), and technical-commercial staff (43.7 %).
- In Germany, there will be a demand for R&D engineers / scientists (MSc-level and above) (63.6 %), Lighting professionals (engineering background) (63.6 %), and Lighting technicians, installers and associate professionals (54.5 %).
- In Greece, there will be a demand for Lighting professionals (engineering background) (52.6 %), followed by Lighting technicians, installers and associate professionals (43.9 %) and Lighting designers (artistic background) (43.9 %).
- In Italy, there will be a demand for Lighting professionals (engineering background) (72.7 %), followed by Lighting designers (artistic background) (68.2 %) and &D engineers / scientists (MSc-level and above) (59.1 %).

The skills shortages of those professionals were also examined in the context of the study. Specifically, the following types of skills shortages were identified and placed for selection to the respondents:

- Shortage of engineering or technical skills
- Shortage of lighting related skills
- Shortage of digital skills
- Shortage of eco-responsibility consciousness and green skills
- Shortage of entrepreneurial skills
- Shortage of life skills (personal, social and learning to learn skills)
- Shortage of artistic skills
- Insufficient workplace experience

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	Managers	R&D Engineers / Scientists	Lighting Professionals (engineering background)	Lighting Designers (artistic background)	Lighting Technicians, Installers and Associate Professionals	Technical-Commercial Staff
Shortage of engineering or technical skills	26.0 %	9.9 %	12.3 %	29.5 %	19.0 %	24.3 %
Shortage of lighting related skills	26.0 %	17.0 %	13.5 %	14.0 %	22.5 %	31.6 %
Shortage of digital skills	19.9 %	6.7 %	12.0 %	14.0 %	27.8 %	22.8 %
Shortage of eco-responsibility consciousness and green skills	29.2 %	11.4 %	18.1 %	19.6 %	31.9 %	29.2 %
Shortage of entrepreneurial skills	6.4 %	23.4 %	19.9 %	21.3 %	20.2 %	15.8 %
Shortage of life skills (personal, social and learning to learn skills)	12.0 %	12.9 %	11.7 %	7.3 %	19.9 %	14.9 %
Insufficient of artistic skills	25.7 %	31.6 %	28.4 %	5.0 %	32.5 %	31.0 %
Insufficient workplace experience	14.0 %	25.7 %	21.6 %	24.6 %	14.3 %	16.7 %

Table 16: Shortage of skills per staff roles

As we see in detail in Table 16,

- **Managers** face a shortage mostly in eco-responsibility consciousness and green skills (29.2 %), in engineering or technical skills (26.0 %) and lighting related skills (26.0 %).
- **R&D engineers / scientists (MSc-level)** and **Lighting professionals with engineering background** face a shortage firstly in artistic skills, and secondarily in entrepreneurial skills and insufficient workplace experience.
- **Lighting designers with an artistic background** face a shortage of insufficient workplace experience (24.6 %) and entrepreneurial skills (21.3 %).
- **Lighting Technicians, Installers and Associate Professionals** face a shortage mainly in artistic skills (32.5 %), followed by eco-responsibility consciousness and green skills (31.9 %) and digital skills (27.8 %).
- **Technical-commercial staff** face a shortage of lighting related skills (31.6 %), followed by the insufficient artistic skills (31.0 %) and eco-responsibility consciousness and green skills (29.2 %).

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Next, the study explored the skills shortages per role on the country level.

Managers	France, Germany, Greece, Italy	France	Germany	Greece	Italy	Other countries
Shortage of engineering or technical skills	27.6%	25.4%	36.4%	26.9%	31.8%	27.6%
Shortage of lighting related skills	27.9%	29.6%	27.3%	26.9%	29.5%	27.9%
Shortage of digital skills	21.2%	15.5%	45.5%	22.8%	18.2%	21.2%
Shortage of eco-responsibility consciousness and green skills	30.3%	21.1%	45.5%	33.3%	29.5%	30.3%
Shortage of entrepreneurial skills	6.4%	4.2%	9.1%	7.0%	6.8%	6.4%
Shortage of life skills (personal, social and learning to learn skills)	12.8%	9.9%	27.3%	12.9%	13.6%	12.8%
Insufficient of artistic skills	26.9%	23.9%	27.3%	28.1%	27.3%	26.9%
Insufficient workplace experience	15.2%	28.2%	0.0%	12.9%	6.8%	15.2%

Table 17: Managers' skills shortages per country

Managers seem to face shortages,

- In lighting skills, workplace experience and engineering or technical skills in France.
- In eco-responsibility consciousness and green skills, digital skills and engineering or technical skills in Germany[7].
- In eco-responsibility consciousness and green skills, artistic skills, lighting, and engineering or technical skills in Greece.
- In eco-responsibility consciousness and green skills, lighting and engineering or technical skills in Italy.

R&D Engineers / Scientists (MSc-level and above)	France, Germany, Greece, Italy	France	Germany	Greece	Italy	Other countries
Shortage of engineering or technical skills	10.4%	7.0%	9.1%	12.9%	6.8%	10.4%
Shortage of lighting related skills	16.8%	14.1%	18.2%	18.7%	13.6%	16.8%
Shortage of digital skills	6.4%	7.0%	9.1%	5.8%	6.8%	6.4%
Shortage of eco-responsibility consciousness and green skills	12.1%	8.5%	36.4%	12.3%	11.4%	12.1%
Shortage of entrepreneurial skills	24.2%	21.1%	36.4%	24.0%	27.3%	24.2%
Shortage of life skills (personal, social and learning to learn skills)	12.8%	9.9%	9.1%	11.7%	22.7%	12.8%
Insufficient of artistic skills	33.0%	33.8%	36.4%	30.4%	40.9%	33.0%
Insufficient workplace experience	27.6%	32.4%	18.2%	30.4%	11.4%	27.6%

Table 18: R& Engineers / Scientists' skills shortages per country

[7] The reader should have in mind that only 11 people from Germany provided valid results, so the findings are not representative for this country.

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R&D Engineers / Scientists (MSc-level and above) seem to face shortages,

- In artistic skills, workplace experience and entrepreneurial skills in France.
- In artistic skills, eco-responsibility consciousness and green skills, and entrepreneurial skills in Germany[8].
- In artistic skills, workplace experience and entrepreneurial skills in Greece.
- In artistic skills, entrepreneurial and life skills in Italy.

Lighting Professionals (engineering background)	France, Germany, Greece, Italy	France	Germany	Greece	Italy	Other countries
Shortage of engineering or technical skills	12.8%	11.3%	18.2%	14.6%	6.8%	12.8%
Shortage of lighting related skills	13.8%	8.5%	27.3%	17.0%	6.8%	13.8%
Shortage of digital skills	11.1%	15.5%	9.1%	10.5%	6.8%	11.1%
Shortage of eco-responsibility consciousness and green skills	18.2%	15.5%	36.4%	19.3%	13.6%	18.2%
Shortage of entrepreneurial skills	20.2%	14.1%	9.1%	22.2%	25.0%	20.2%
Shortage of life skills (personal, social and learning to learn skills)	11.1%	8.5%	0.0%	12.3%	13.6%	11.1%
Insufficient of artistic skills	29.6%	25.4%	27.3%	30.4%	34.1%	29.6%
Insufficient workplace experience	23.2%	22.5%	9.1%	26.9%	13.6%	23.2%

Table 19: Lighting professionals (engineering background) skills shortages per country

Lighting professionals (engineering background) seem to face shortages,

- In artistic skills and workplace experience in France.
- In eco-responsibility consciousness and green skills, artistic skills and lighting related skills in Germany.
- In artistic skills, workplace experience and entrepreneurial skills in Greece.
- In artistic skills, workplace experience and entrepreneurial in Italy.

[8] The reader should have in mind that only 11 people from Germany provided valid results, so the findings are not representative for this country.

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Lighting Designers (artistic background)	France, Germany, Greece, Italy	France	Germany	Greece	Italy	Other countries
Shortage of engineering or technical skills	32.3%	25.4%	36.4%	33.9%	36.4%	32.3%
Shortage of lighting related skills	15.5%	11.3%	45.5%	11.7%	29.5%	15.5%
Shortage of digital skills	14.5%	16.9%	9.1%	12.9%	18.2%	14.5%
Shortage of eco-responsibility consciousness and green skills	20.9%	16.9%	36.4%	19.9%	27.3%	20.9%
Shortage of entrepreneurial skills	22.6%	7.0%	36.4%	27.5%	25.0%	22.6%
Shortage of life skills (personal, social and learning to learn skills)	6.7%	4.2%	9.1%	5.8%	13.6%	6.7%
Insufficient of artistic skills	5.1%	2.8%	0.0%	5.8%	6.8%	5.1%
Insufficient workplace experience	25.6%	22.5%	18.2%	26.3%	29.5%	25.6%

Table 20: Lighting designers (artistic background) skills shortages per country

Lighting designers (artistic background) seem to face shortages,

- In engineering or technical skills and workplace experience in France.
- In lighting related skills, engineering or technical skills, eco-responsibility consciousness and green skills, and entrepreneurial skills in Germany[9].
- In engineering or technical skills, entrepreneurial skills and workplace experience in Greece.
- In engineering or technical skills, lighting related skills and workplace experience in Italy.

Lighting Technicians, Installers and Associate Professionals	France, Germany, Greece, Italy	France	Germany	Greece	Italy	Other countries
Shortage of engineering or technical skills	19.9%	32.4%	9.1%	17.0%	13.6%	19.9%
Shortage of lighting related skills	23.6%	26.8%	27.3%	24.0%	15.9%	23.6%
Shortage of digital skills	30.0%	38.0%	27.3%	29.8%	18.2%	30.0%
Shortage of eco-responsibility consciousness and green skills	35.0%	25.4%	27.3%	39.2%	36.4%	35.0%
Shortage of entrepreneurial skills	21.5%	16.9%	18.2%	24.6%	18.2%	21.5%
Shortage of life skills (personal, social and learning to learn skills)	20.2%	26.8%	18.2%	19.3%	13.6%	20.2%
Insufficient of artistic skills	33.7%	32.4%	27.3%	35.1%	31.8%	33.7%
Insufficient workplace experience	14.8%	11.3%	18.2%	17.5%	9.1%	14.8%

Table 21: Lighting technicians, Installers and Associate professionals skills shortages per country

[9] The reader should have in mind that only 11 people from Germany provided valid results, so the findings are not representative for this country.

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Lighting technicians, installers and associate professionals seem to face shortages,

- In digital skills, artistic skills and life skills in France.
- In lighting, digital, green and artistic skills in Germany[10].
- In green, artistic and digital skills in Greece.
- In green, artistic and digital skills in Italy.

Technical-commercial staff	France, Germany, Greece, Italy	France	Germany	Greece	Italy	Other countries
Shortage of engineering or technical skills	25.6%	25.4%	18.2%	25.7%	27.3%	25.6%
Shortage of lighting related skills	33.0%	23.9%	45.5%	36.8%	29.5%	33.0%
Shortage of digital skills	24.2%	14.1%	36.4%	28.1%	22.7%	24.2%
Shortage of eco-responsibility consciousness and green skills	31.3%	21.1%	27.3%	35.1%	34.1%	31.3%
Shortage of entrepreneurial skills	16.5%	7.0%	9.1%	20.5%	18.2%	16.5%
Shortage of life skills (personal, social and learning to learn skills)	14.5%	15.5%	0.0%	14.0%	18.2%	14.5%
Insufficient of artistic skills	32.0%	26.8%	18.2%	36.3%	27.3%	32.0%
Insufficient workplace experience	16.2%	14.1%	9.1%	19.3%	9.1%	16.2%

Table 22: Technical-commercial staff skills shortages per country

Technical-commercial staff seems to face shortages,

- In artistic, engineering or technical and lighting related skills in France.
- In lighting, digital and green skills in Germany.
- In lighting, artistic and green skills in Greece.
- In green, lighting and artistic skills in Italy.

Next, the study oriented to particular job role profiles. These profiles are not established officially, and correspond more to roles (groups of tasks) operated in the sector. Of course, one person may implement more than one of these roles in a company. These roles (groups of tasks) introduced include the following:

1. Light Pollution & Environmental Impact of Lighting Specialists
2. Human-Centric Lighting Specialists
3. Road Lighting Safety and Lighting Security Specialists
4. Smart Lighting System Specialists
5. Lighting Designers

[10] The reader should have in mind that only 11 people from Germany provided valid results, so the findings are not representative for this country.

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	N/A	1-Low demand	2	3-Moderate demand	4	5-High demand	*(3 –5)*	*(4 –5)*
Light pollution and environmental impact of lighting specialists	27.5 %	3.5 %	5.6 %	18.4 %	21.6 %	23.4 %	*63.4 %*	*45.0 %*
Human-centric lighting specialists	31.3 %	2.6 %	8.2 %	17.5 %	20.5 %	19.9 %	*57.9 %*	*40.4 %*
Road lighting safety and lighting security specialists	28.9 %	1.5 %	4.1 %	19.9 %	25.4 %	20.2 %	*65.5 %*	*45.6 %*
Smart lighting system specialists	28.1 %	1.5 %	0.3 %	8.8 %	17.0 %	44.4 %	*70.2 %*	*61.4 %*
Lighting designers	28.9 %	0.9 %	4.4 %	23.4 %	24.0 %	18.4 %	*65.8 %*	*42.4 %*
Other	96.5 %	0.0 %	0.0 %	0.9 %	1.2 %	1.5 %	*3.6 %*	*2.7 %*

Table 23: Demand for job role profiles in the next five years

In Table 23 we see that in the next five years, **there will be a high demand for Smart Lighting System Specialists (61.4%), followed by Road Lighting Safety and Lighting Security Specialists (45.6%), Light Pollution and Environmental Impact of Lighting Specialists (45.0%), and Lighting Designers (42.4 %). The Human Centric Lighting Specialists are rated last among the pre-selected profiles, accumulating a demand of 40.4 %.** We remind the reader that, although these are defined as job role profiles, they consider in practice a group of tasks, therefore further research is required to agree that these groups of tasks could be upscaled to stand-alone profiles.

If we exclude the N/A option, the results are as follows:

ECOSLIGHT Job Role Profile	Moderate to high demand (3-5) (excluding the N/A option)
Light pollution and environmental impact of lighting specialists	83.8 %
Human-centric lighting specialists	76.5 %
Road lighting safety and lighting security specialists	86.5 %
Smart lighting system specialists	92.7 %
Lighting designers	86.9 %

Table 24: Demand for job role profiles in the next five years (excluding the N/A option)

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	France, Germany, Greece, Italy	France	Germany	Greece	Italy	Other countries	N/A
Light pollution and environmental impact of lighting specialists	47.1 %	46.5 %	63.6 %	46.2 %	47.7 %	40.0 %	0.0 %
Human-centric lighting specialists	41.1 %	23.9 %	63.6 %	46.2 %	43.2 %	45.7%	0.0 %
Road lighting safety and lighting security specialists	48.8 %	33.8 %	54.5 %	52.6 %	56.8 %	31.4 %	0.0 %
Smart lighting system specialists	64.6 %	54.9 %	72.7 %	67.8 %	65.9 %	51.4 %	0.0 %
Lighting designers	43.8 %	26.8 %	63.6 %	47.4 %	52.3 %	42.9 %	0.0 %

Table 25: Demand for job role profiles in the next five years per country (4-5)

On the country level (Table 25) we see that:

- Smart lighting systems specialists will be the most demand in all four project countries.
- In France, the Smart lighting system specialists are followed by Light pollution and environmental impact of lighting specialists.
- In Germany, the Smart lighting system specialists are followed by Light pollution and environmental impact of lighting specialists, human-centric lighting specialists, and Lighting designers.
- In Greece and Italy, they are followed by Road lighting safety and lighting security specialists.

Last, the study explored the sub-sectors of the lighting market that will face a great demand of trained staff (on each one of the aforementioned job role profiles (i.e. groups of tasks) in the next five years.

	Light pollution and environmental impact of lighting specialists	Human-centric lighting specialists	Road lighting safety and Lighting security specialists	Smart lighting system specialists	Lighting designers
Lighting system manufacturing	37.4 %	27.5 %	26.9 %	40.6 %	21.9 %
Lighting installations	28.4 %	21.6 %	35.4 %	45.3 %	22.8 %
Lighting operation and maintenance	21.9 %	19.3 %	37.1 %	43.6 %	14.3 %
Policy and regulatory framework design	42.7 %	31.3 %	29.2 %	20.5 %	22.8 %
Consultancy, lighting studies, etc.	38.3 %	36.3 %	27.5 %	38.0 %	40.6 %

Table 26: Lighting sub-sectors and job role profiles

In Table 26 we see that,

- Light pollution and environmental impact lighting specialists will be needed more in the sub-sector of policy regulatory framework design, in consultancy, lighting studies, and lighting system manufacturing.
- Human-centric lighting specialists will be demanded most in consultancy, policy regulatory framework design and lighting system manufacturing.

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- Road lighting safety and Lighting security specialists will be needed mostly in lighting operation and maintenance, and lighting installations.
- Smart lighting system specialists will be needed mostly in consultancy, lighting studies, etc.

4.3 Skills needs for the lighting sector

The survey delved into the skills demanded from the lighting sector. In order to gain rich insights in the skills needs, these were grouped into five main categories (Figure 6). The first category includes the **"lighting"**-related competences, i.e. competences oriented to pure lighting related activities. The second includes **digital competences**. These are grouped into basic and advanced, originating from two European frameworks. Basic digital competences originate from the DigComp 2.1 framework, whereas advanced digital competences come from the e-CF 3.0 framework. The third category considers the **green competences**; these originate mainly from the European Construction Sector Observatory (ECSO) analytical reports, the Lighting Europe Strategic Roadmap 2025 of the European Lighting Industry, the Lighting Europe Position Paper on the Roadmap on a Circular Economy Action Plan (January 2020), and the Cedefop's report on Skills for Green Jobs (2018). The fourth category refers to the **entrepreneurship competences,** that originate from the EntreComp framework. Last, the required **"horizontal" or "transversal" competences** originate from the LifeComp European framework.

4.3.1 Lighting competences needs

In this part of the study, the respondents were asked to declare the skills need in particular lighting areas. These were the following:

a) Lighting design and solving technical problems
b) Indoor lighting for buildings and artificial lighting / Daylight integration
c) Light for outdoor installations (Cities, Stadiums, Airports, Tunnels, etc) including road lighting safety and security
d) Lighting system and components technologies including smart lighting (indoor and outdoor): Light source, drives, fixtures, sensors, controls and metering
e) Light influence on human health, well-being and working performance (lighting ergonomics)
f) Energy efficiency and lighting performance
g) Lighting policy, regulation, energy labeling, procurement, incentives and planning
h) Economic models related lighting (investment, funding models, micro-credits, costs evaluation, life cycle cost models, Light-as-a-Service)
i) End-user's behavior studies (satisfaction, acceptability, needs, etc)
j) Environmental impact of lighting (ecosystem, recycling, life cycle assessment)

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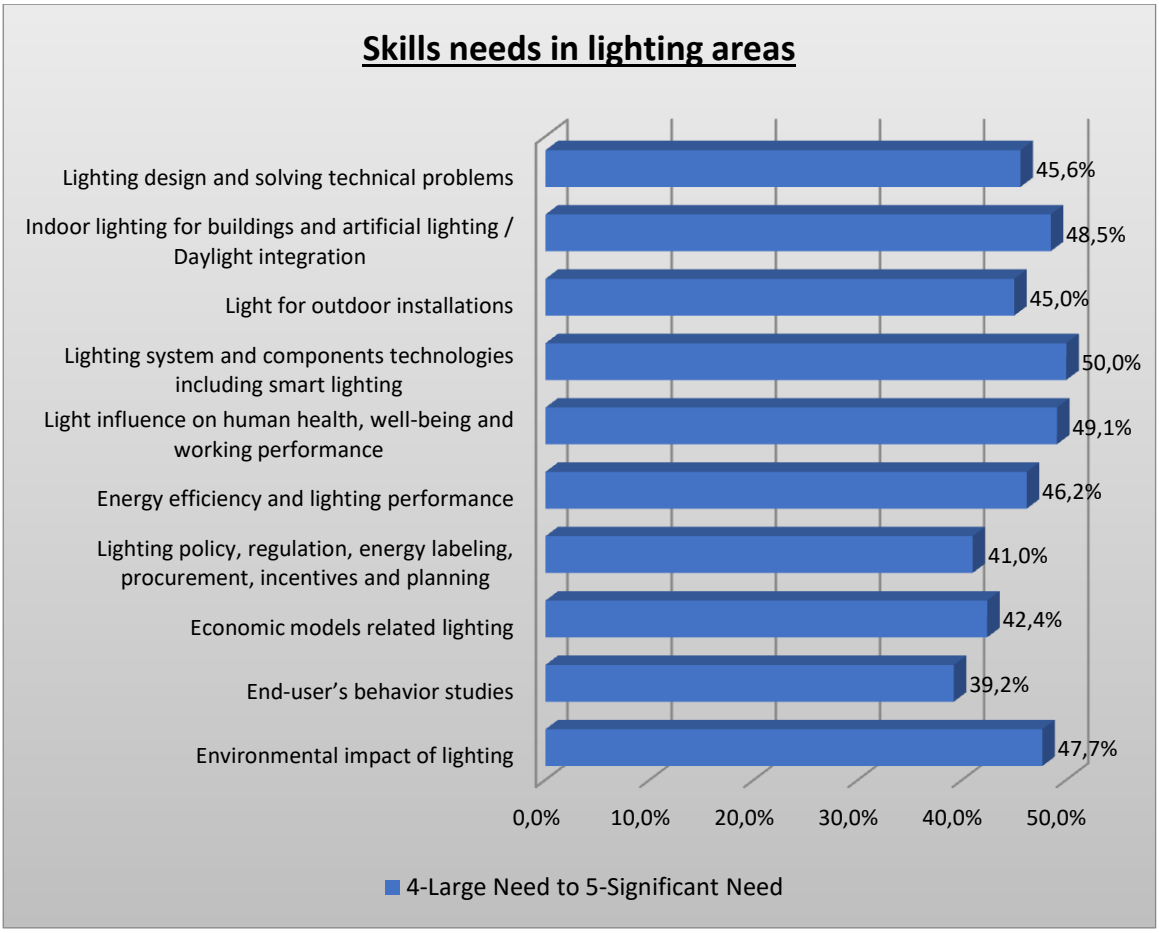

Figure 50: Skills needs in lighting areas (large to significant need)

	N/A	1-No need at all	2	3-Moderate need	4	5-Significant need	*(4 – 5)*
Lighting design and solving technical problems	38.3%	0.3%	0.3%	15.5%	14.6%	31.0%	*45.6%*
Indoor lighting for buildings and artificial lighting / Daylight integration	38.6%	0.9%	0.6%	11.4%	21.9%	26.6%	*48.5%*
Light for outdoor installations	38.3%	0.3%	0.6%	15.8%	18.1%	26.9%	*45.0%*
Lighting system and components technologies including smart lighting	38.6%	0.0%	1.2%	10.2%	15.5%	34.5%	*50.0%*
Light influence on human health, well-being and working performance	38.9%	0.9%	1.2%	9.9%	14.3%	34.8%	*49.1%*
Energy efficiency and lighting performance	38.3%	0.3%	2.0%	13.2%	16.4%	29.8%	*46.2%*
Lighting policy, regulation, energy labeling, procurement, incentives and	39.5%	0.6%	3.2%	15.8%	16.1%	24.9%	*41.0%*

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planning							
Economic models related lighting	38.6%	0.9%	4.1%	14.0%	19.3%	23.1%	*42.4%*
End-user's behavior studies	39.7%	0.6%	4.1%	16.4%	17.0%	22.2%	*39.2%*
Environmental impact of lighting	38.9%	0.6%	3.8%	9.1%	15.2%	32.5%	*47.7%*

Table 27: Skills needs in lighting areas

In Figure 50 and Table 27 we see that the following areas appear to be the most popular for skills uptake of the professionals working to the sector:

a) Lighting system and components technologies including smart lighting (indoor and outdoor): Light source, drives, fixtures, sensors, controls and metering
b) Light influence on human health, well-being and working performance (lighting ergonomics)
c) Indoor lighting for buildings and artificial lighting / Daylight integration
d) Environmental impact of lighting (ecosystem, recycling, life cycle assessment)
e) Energy efficiency and lighting performance
f) Lighting design and solving technical problems

While, the less popular appear to be the "End-user's behavior studies (satisfaction, acceptability, needs, etc)". The first sets the needs towards IoT and smart technologies, therefore we have to explore its relation with specific digital competences. The second should be studied in relation to particular horizontal ("LifeComp") oriented competences. The third relates directly to the indoor lighting. The fourth and the fifth relate directly with the environment, whereas the last one to pure lighting design.

On the country level (Table 28), the results indicate:

- In France, *Lighting system and components technologies including smart lighting* is the most demanded one (47.9 %) followed by *Lighting design and solving technical problems* (38.0 %) and the *Environmental impact of lighting* (36.6 %).
- In Germany, the most demanded ones are *Lighting design and solving technical problems*, *Light for outdoor installations*, *Lighting policy, regulation, energy labeling, procurement, incentives and planning* and *Environmental impact of lighting* (36.4 % each).
- In Greece, which notes much higher results than other countries indicating the more prominent need, the *Light influence on human health, well-being and working performance* (58.5 %), the *Energy efficiency and lighting performance* (57.9 %), the *Indoor lighting for buildings and artificial lighting / Daylight integration* (57.3 %), the *Lighting design and solving technical problems* (56.7 %), the *Lighting system and components technologies including smart lighting* (56.7 %), the *Environmental impact of lighting* (55.0 %), and the *Light for outdoor installations* (53.8 %) are the most demanded ones.
- In Italy, the Indoor lighting for buildings and artificial lighting / Daylight integration (59.1 %), the Light influence on human health, well-being and working performance (59.1 %), the Lighting system and components technologies including smart lighting (54.5 %), and the Energy efficiency and lighting performance (54.5 %) are the skills areas of greatest need.

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	France, Germany, Greece, Italy	France	Germany	Greece	Italy	Other countries	N/A
Lighting design and solving technical problems	48.8 %	38.0 %	36.4 %	56.7 %	38.6 %	24.4 %	0.0 %
Indoor lighting for buildings and artificial lighting / Daylight integration	51.2 %	35.2 %	27.3 %	57.3 %	59.1 %	31.1 %	0.0 %
Light for outdoor installations	47.8 %	33.8 %	36.4 %	53.8 %	50.0 %	75.6 %	0.0 %
Lighting system and components technologies including smart lighting	53.2 %	47.9 %	27.3 %	56.7 %	54.5 %	28.9 %	0.0 %
Light influence on human health, well-being and working performance	51.9 %	35.2 %	27.3 %	58.5 %	59.1 %	31.1 %	0.0 %
Energy efficiency and lighting performance	49.8 %	31.0 %	27.3 %	57.9 %	54.5 %	22.2 %	0.0 %
Lighting policy, regulation, energy labeling, procurement, incentives and planning	42.8 %	23.9 %	36.4 %	49.1 %	50.0 %	28.9 %	0.0 %
Economic models related lighting	44.4 %	28.2 %	27.3 %	50.3 %	52.3 %	28.9 %	0.0 %
End-user's behavior studies	40.7 %	31.0 %	27.3 %	46.2 %	38.6 %	28.9 %	0.0 %
Environmental impact of lighting	50.2 %	36.6 %	36.4 %	55.0 %	56.8 %	31.1 %	0.0 %

Table 28: Skills needs in lighting areas per country (4-Large need to 5-Significant need)

4.3.2 Digital competences needs

The needs for digital competences of the lighting sectors were examined in two areas; the basic digital competences areas originating from the DigComp 2.1 framework, and the advanced digital competences originating from the e-CF 3.0 framework.

Basic Digital Competences areas (DigComp 2.1)	Advanced Digital Competences areas (e-CF 3.0)
Information and data literacy	Plan ICT
Communication and collaboration	Build ICT
Digital content creation	Run ICT
Safety	Enable ICT
Problem solving	Manage ICT

Table 29: Basic and advanced digital competences areas

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In detail, the Basic Digital Competences areas include the following competences, according to the DigComp 2.1 framework (Table 30).

Area 1: Information and digital literacy
1.1 Browsing, searching and filtering data, information and digital content
1.2 Evaluating data, information and digital content
1.3 Managing data, information and digital content
Area 2: Communication and collaboration
2.1 Interacting through digital technologies
2.2 Sharing through digital technologies
2.3 Engaging in citizenship through digital technologies
2.4 Collaborating through digital technologies
2.5 Netiquette
2.6 Managing digital identity
Area 3: Digital content creation
3.1 Developing digital content
3.2 Integrating and re-elaborating digital content
3.3 Copyright and licenses
3.4 Programming

Area 4: Safety
4.1 Protecting devices
4.2 Protecting personal data and privacy
4.3 Protecting health and well-being
4.4 Protecting the environment
Area 5: Problem solving
5.1 Solving technical problems
5.2 Identifying needs and technological responses
5.3 Creatively using digital technologies
5.4 Identifying digital competence gaps

Table 30: Basic digital competences (DigComp 2.1)

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The Advanced Digital Competences areas include the following competences, according to the e-CF 3.0 framework (Table 31).

A. PLAN	B. BUILD	C. RUN	D. ENABLE	E. MANAGE
A.1 IS and business strategy alignment	B.1 Application development	C.1 User support	D.1 Information security strategy development	E.1 Forecast development
A.2 Service level management	B.2 Component integration	C.2 Change support	D.2 ICT quality strategy development	E.2 Project and portfolio management
A.3 Business plan development	B.3 Testing	C.3 Service delivery	D.3 Education and training provision	E.3 Risk management
A.4 Product/service planning	B.4 Solution deployment	C.4 Problem management	D.4 Purchasing	E.4 Relationship management
A.5 Architecture design	B.5 Documentation production		D.5 Sales proposal development	E.5 Process improvement
A.6 Application design	B.6 Systems engineering		D.6 Channel management	E.6 ICT quality management
A.7 Technology trend monitoring			D.7 Sales management	E.7 Business change management
A.8 Sustainable development			D.8 Contract management	E.8 Information security management
A.9 Innovating			D.9 Personnel development	E.9 IS governance
			D.10 Information and knowledge management	
			D.11 Needs identification	
			D.12 Digital marketing	

Table 31: Advanced digital competences (e-CF 3.0)

All types of respondents were asked to assess the need in the basic and advanced competences areas (Table 29), whereas individual professionals were asked additionally to assess the need on the separate basic (Table 30) and advanced competences (Table 31).

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	1- No need at all	2	3- Moderate need	4	5- Significant need	No answer	*4-Large need to 5-Significant need*
Information and data literacy	0.6%	3.8%	14.3%	17.0%	24.3%	40.0%	*41.3%*
Communication and collaboration	0.3%	2.0%	16.4%	19.6%	21.6%	40.0%	*41.2%*
Digital content creation	0.9%	3.8%	16.7%	19.0%	18.4%	41.2%	*37.4%*
Safety	0.3%	3.5%	12.6%	18.4%	25.1%	40.0%	*43.5%*
Problem solving	0.3%	1.2%	9.9%	21.1%	26.9%	40.6%	*48.0%*

Table 32: Basic digital competences areas needs (DigComp 2.1)

In Table 32 we see that the sector needs mostly basic digital competences from the **Area 5: Problem solving**, followed by the **Area 4: Safety**.

On the country level, the results are as follows.

	France, Germany, Greece, Italy	France	Germany	Greece	Italy	Other countries	N/A
Information and data literacy	43.4 %	31.0 %	36.4 %	50.3 %	38.6 %	26.7 %	0.0 %
Communication and collaboration	42.4 %	31.0 %	27.3 %	49.1 %	38.6 %	33.3 %	0.0 %
Digital content creation	38.7 %	23.9 %	27.3 %	43.9 %	45.5 %	28.9 %	0.0 %
Safety	45.8 %	32.4 %	27.3 %	50.3 %	54.5 %	28.9 %	0.0 %
Problem solving	50.2 %	40.8 %	36.4 %	54.4 %	52.3 %	33.3 %	0.0 %

Table 33: Basic digital competences areas needs per country (4-Large need to 5-Significant need)

Overall, we see that

- Area 5: Problem solving is in the highest need in France, Germany, Greece and other countries, followed by Area 4: Safety in France, Area 1: Information and data literacy in Germany, Area 4: Safety and Area 1: Information and data literacy in Greece, and Area 4: Safety and Area 3: Digital content creation in other countries. In Italy, the highest needs is in Area 4: Safety followed by Area 5: Problem solving
- All areas are in higher need in Greece than in the other project countries.

In detail, according to the needs expressed by the individual professionals,

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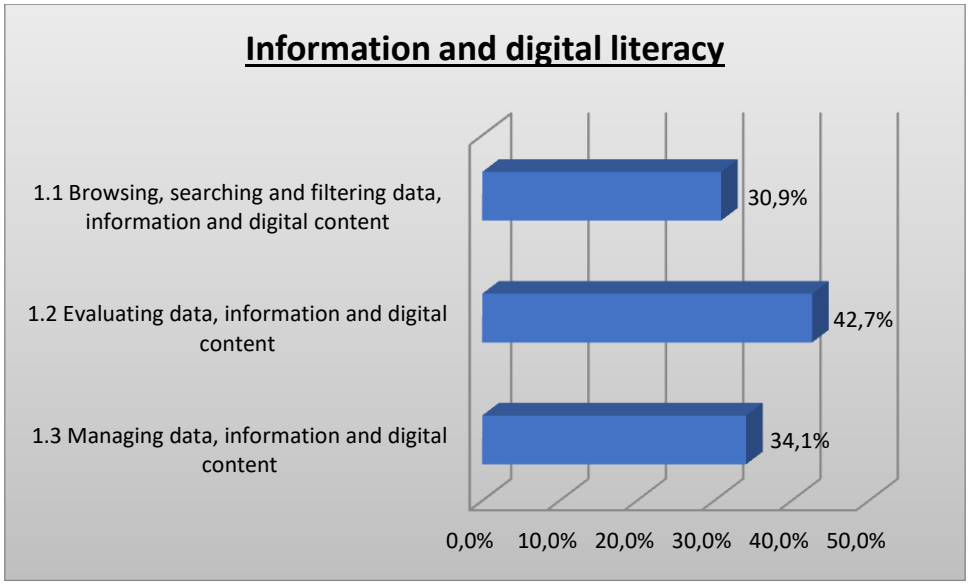

Figure 51: Information and data literacy competences needs

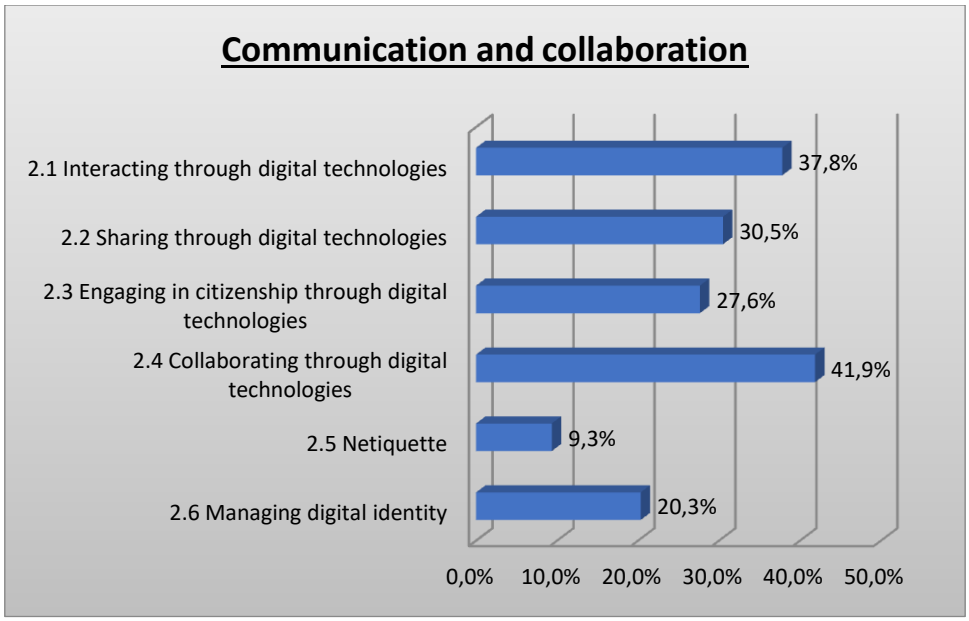

Figure 52: Communication and collaboration competences needs

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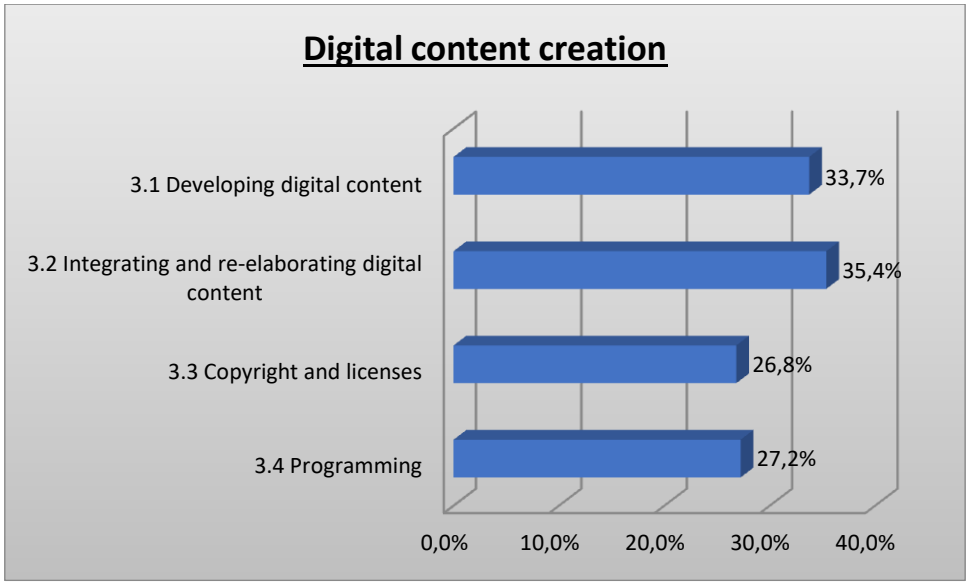

Figure 53: Digital content creation competences needs

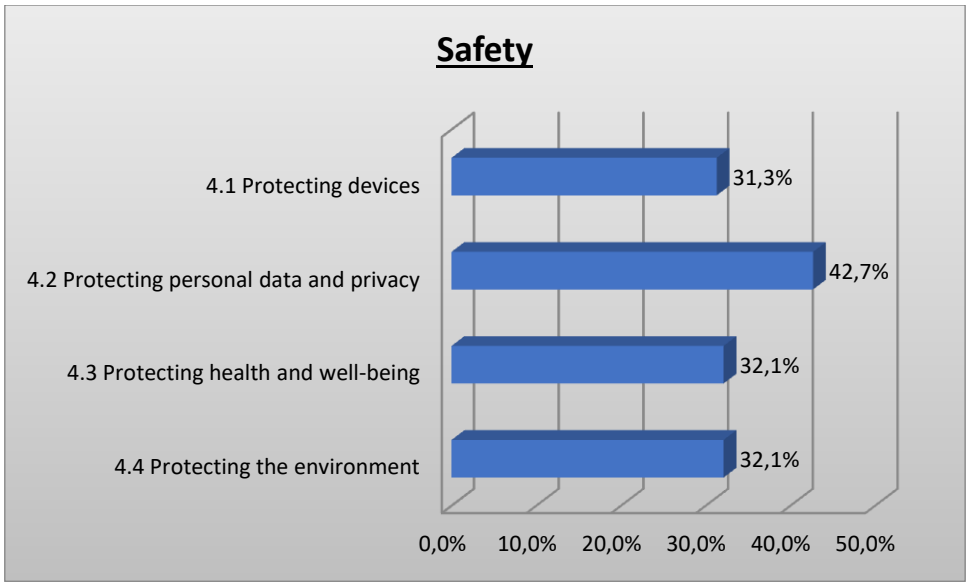

Figure 54: Safety competences needs

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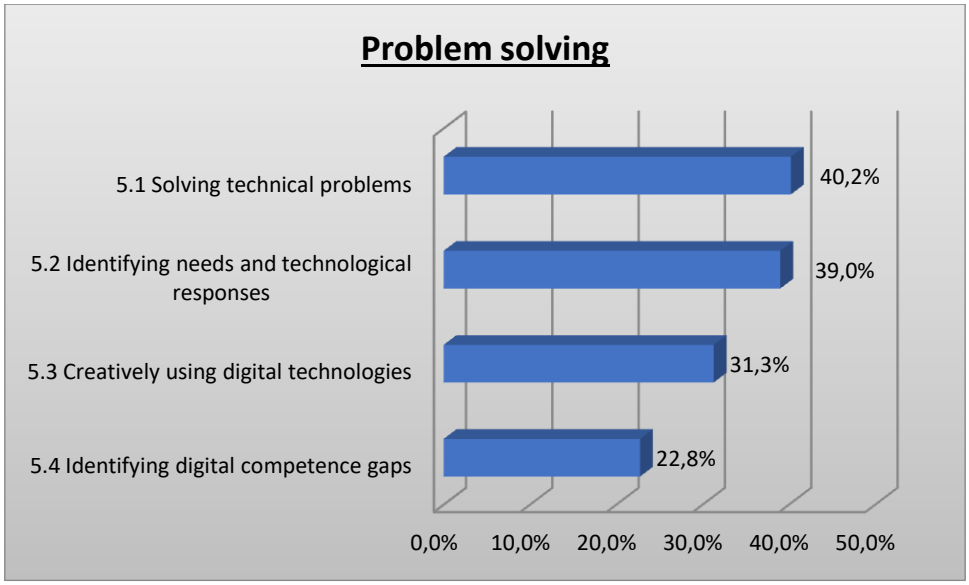

Figure 55: Problem solving competences needs

Overall, we see that,

- In the first area (Information and data literacy), *1.2 Evaluating data, information and digital content* is the most demanded competence.
- In the second area (Communication and collaboration), *2.4 Collaborating through digital technologies* and *2.1 Interacting through digital technologies* are the most demanded competences.
- In the third area of basic digital competences (Digital content creation), *3.2 Integrating and re-elaborating digital content* is the most demanded competence.
- In the fourth area (Safety), *4.2 Protecting personal data and privacy* is the most demanded competence.
- In the fifth area (Problem solving), *5.1 Solving technical problems* and *5.2 Identifying needs and technological responses* are the most demanded competences.

As far as it concerns the advanced digital competences areas, results (Table 34) indicate the need mostly for B. Build ICT, E. Manage ICT and A. Plan ICT competences.

	1- No need at all	2	3- Moderate need	4	5- Significant need	No answer	*4-Large need to 5-Significant need*
A. Plan ICT	0.3%	2.9%	13.5%	19.3%	19.9%	44.2%	*39.2%*
B. Build ICT	0.0%	3.8%	12.0%	20.2%	19.9%	44.2%	*40.1%*
C. Run ICT	0.0%	3.2%	16.4%	18.1%	19.3%	43.0%	*37.4%*
D. Enable ICT	0.3%	2.6%	14.6%	20.8%	18.1%	43.6%	*38.9%*
E. Manage ICT	0.6%	2.9%	12.9%	17.5%	22.2%	43.9%	*39.7%*

Table 34: Advanced digital competences areas needs (e-CF 3.0)

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On the country level, the results are as follows.

	France, Germany, Greece, Italy	France	Germany	Greece	Italy	Other countries	N/A
A. Plan ICT	41.4 %	22.5 %	18.2 %	52.0 %	36.4 %	24.4 %	0.0 %
B. Build ICT	42.1 %	28.2 %	18.2 %	47.4 %	50.0 %	26.7 %	0.0 %
C. Run ICT	39.4 %	28.2 %	18.2 %	45.0 %	40.9 %	24.4 %	0.0 %
D. Enable ICT	40.7 %	23.9 %	27.3 %	46.8 %	47.7 %	26.7 %	0.0 %
E. Manage ICT	41.8 %	23.9 %	18.2 %	48.0 %	52.3 %	26.7 %	0.0 %

Table 35: Basic digital competences areas needs per country (4-Large need to 5-Significant need)

Overall, we see that

- In France, areas *B. Build and C. Run ICT* are the most demanded.
- In Germany, area *D. Enable ICT* is the most demanded.
- In Greece, areas *A. Plan ICT* and *E. Manager ICT* are the most demanded, but with the other areas staying close to them.
- In Italy, areas *E. Manage ICT* and *B. Build ICT* are the most demanded.
- All areas are in higher need in Greece and Italy than in the other project countries.

The individual professionals were requested to assess their detailed needs in particular competences of each advanced area, that are related mostly with the lighting area. The results are as follows:

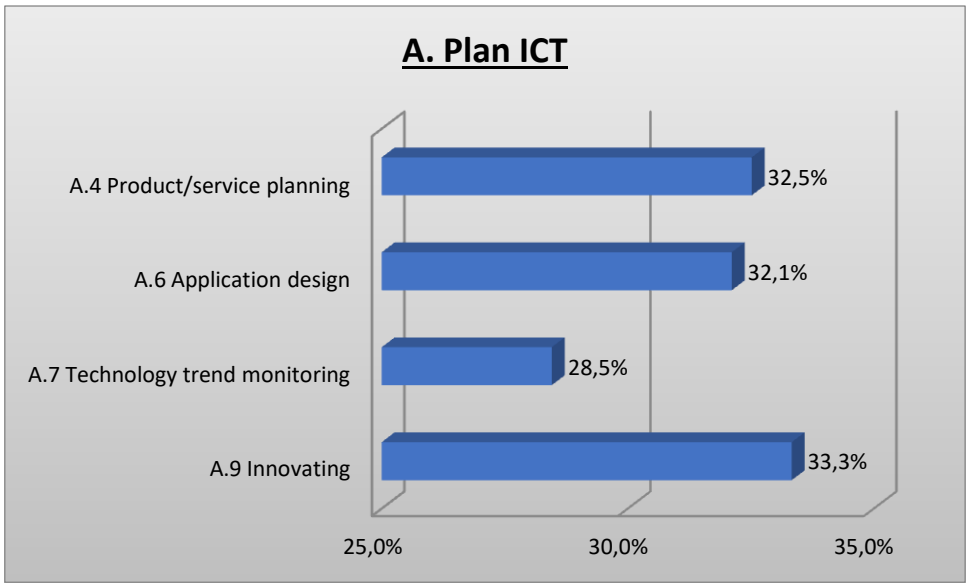

Figure 56: Plan ICT competences needs

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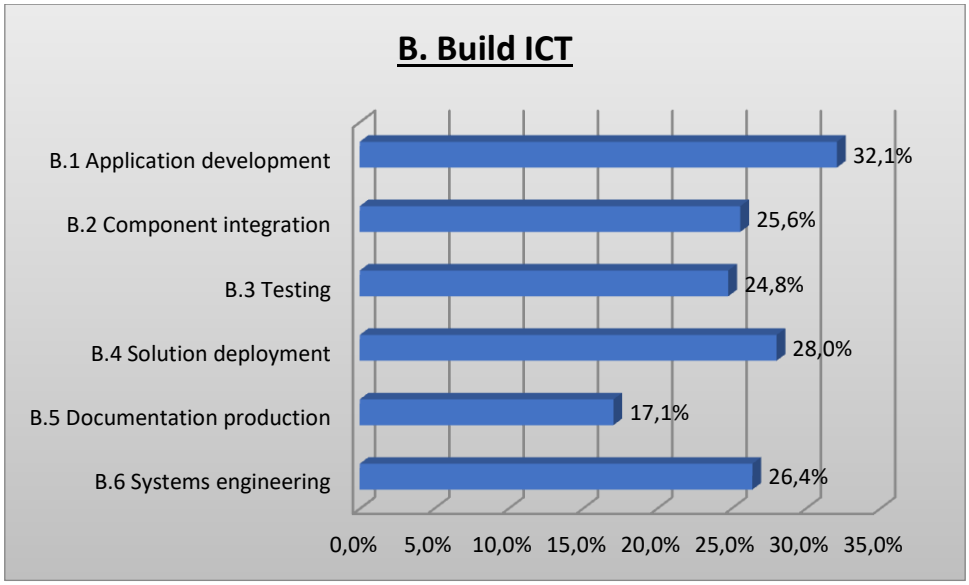

Figure 57: Build ICT competences needs

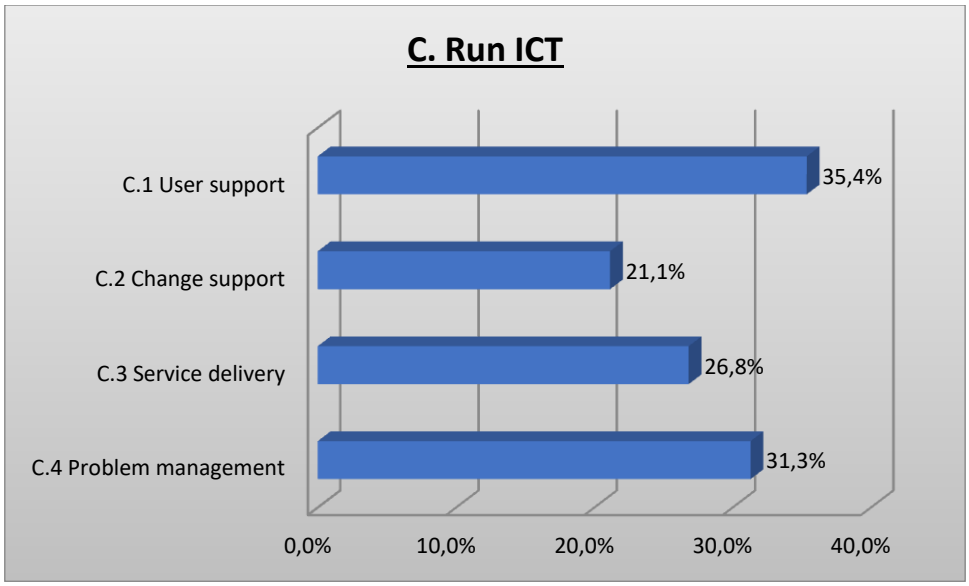

Figure 58: Run ICT competences needs

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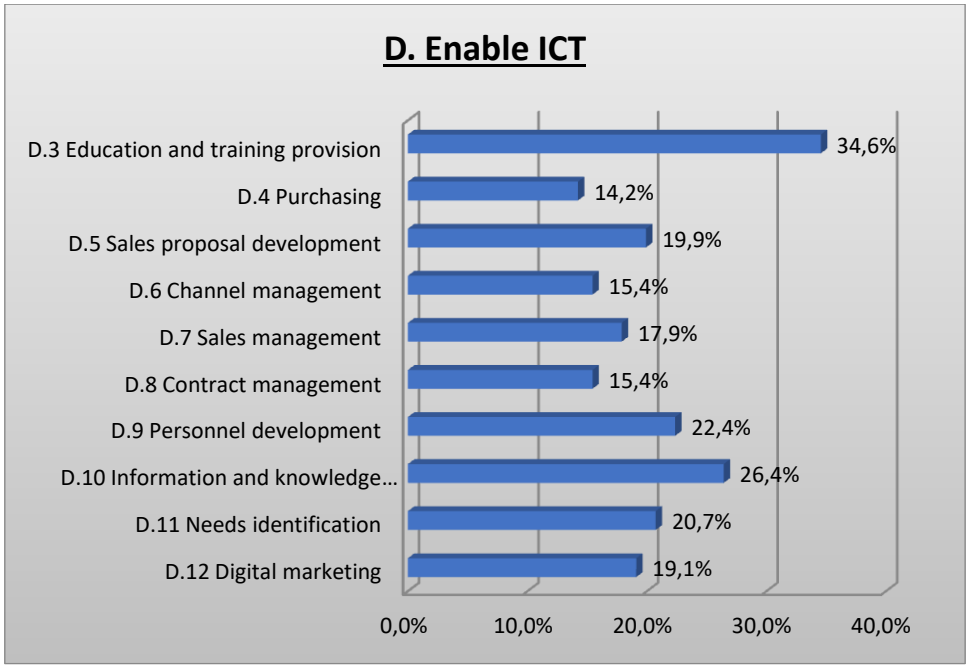

Figure 59: Enable ICT competences needs

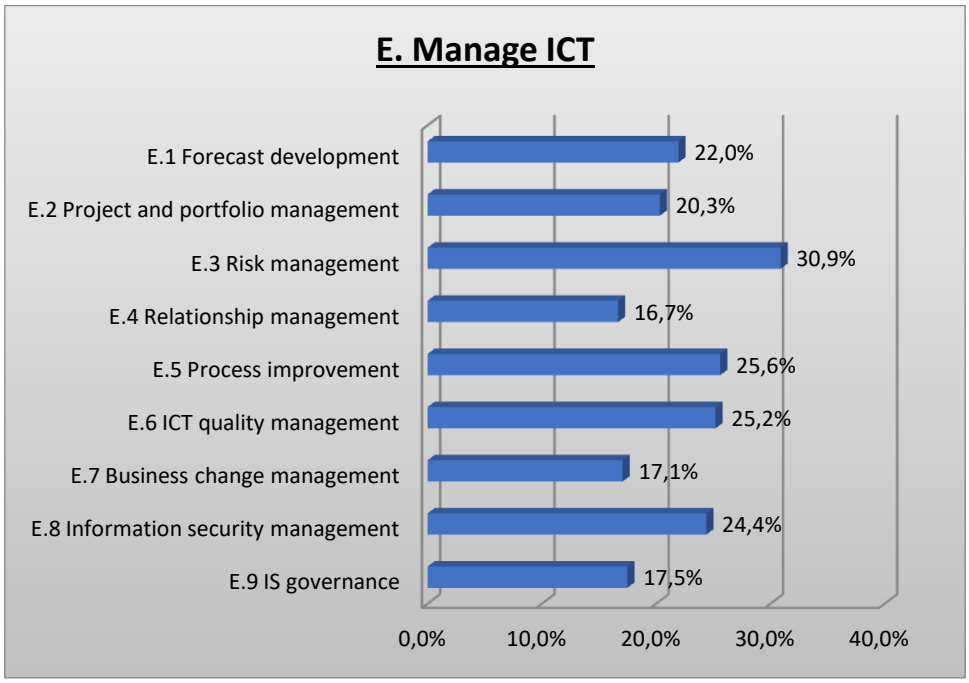

Figure 60: Manage ICT competences needs

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Overall, we see that,

- In the first area (A. Plan ICT), *A.9 Innovating* is the most demanded competence, followed by *A.4 Product/service planning* and *A.6 Application design*.
- In the second area (B. Build ICT), *B.1 Application development* is the most demanded competence, followed by *B.4 Solution deployment* and *B.6 Systems engineering*.
- In the third area (C. Run ICT), *C.1 User support* is the most demanded competence, followed by *C.4 Problem management*.
- In the fourth area (D. Enable ICT), *D.3 Education and training provision* is the most demanded competence, followed by D.10 Information and knowledge management.
- In the fifth area (E. Manage ICT), *E.3 Risk management* is the most demanded competence followed by *E.5 Process improvement*, *E.6 ICT quality management and E.8 Information security management*.

4.3.3 Human qualities competences needs

Next, the study explored the competences needs required from modern professionals that work or would like to work in the lighting sector, related to human qualities. These needs are based on the LifeComp framework, and categorized into three areas

A. Personal competences: Self-regulation, Adaptability, Wellbeing
B. Social competences: Empathy, Communication, Collaboration
C. Learning to learn competences: Growth mindset, Critical thinking, Managing learning

	1- No need at all	2	3- Moderate need	4	5- Significant need	No answer	*4-Large need to 5-Significant need*
Personal	0.3%	2.0%	14.0%	16.7%	26.3%	40.7%	*43.0%*
Social	0.3%	2.3%	12.3%	16.4%	27.8%	40.9%	*44.2%*
Learning to learn	0.0%	0.0%	5.0%	14.0%	40.1%	40.9%	*54.1%*

Table 36: Human qualities competences needs (LifeComp)

In Table 36 we see that most respondents selected the *Learning to learn* type of competences, which include *Growth mindset*, *Critical thinking*, and *Managing learning*. On the country level (Table 37), the results are as follows.

	France, Germany, Greece, Italy	France	Germany	Greece	Italy	Other countries	N/A
Personal	45.5 %	42.3 %	18.2 %	47.4 %	50.0 %	26.7 %	0.0 %
Social	46.5 %	31.0 %	18.2 %	52.6 %	54.5 %	28.9 %	0.0 %
Learning to learn	57.6 %	46.5 %	18.2 %	63.2 %	63.6 %	31.1 %	0.0 %

Table 37: Human qualities competences needs per country (LifeComp) (4-Large need to 5-Significant need)

Overall, we see that

- In all project countries and the other countries (with the exception of Germany), *Learning to learn* is the dominant competence area that requires skills uptaking.
- This is followed by *Personal competences* in France, and *Social competences* in Greece and Italy.

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4.3.4 Entrepreneurship needs

The survey also explored the competences needs required from modern professionals that work or would like to work in the lighting sector, related to Entrepreneurship. These needs are based on the EntreComp – Entrepreneurship Competence Framework, and categorized into three areas

A. Ideas and opportunities: Spotting opportunities, Creativity, Vision, Valuing ideas, Ethical and sustainable thinking.
B. Resources: Self-awareness and self-efficacy, Motivation and perseverance, Mobilizing resources, Financial and Economic literacy, Mobilizing others.
C. Into action: Taking the initiative, Planning and management, Coping with uncertainty, ambiguity and risk, Working with others, Learning through experience.

	1- No need at all	2	3- Moderate need	4	5- Significant need	No answer	*4-Large need to 5-Significant need*
Ideas and opportunities	0.9%	0.6%	9.6%	16.1%	30.7%	42.1%	46.8%
Resources	0.0%	0.9%	13.5%	22.2%	20.2%	43.2%	42.4%
Into action	0.3%	1.5%	8.5%	17.3%	30.4%	42.0%	47.7%

Table 38: Entrepreneurship competences needs (EntreComp)

	France, Germany, Greece, Italy	France	Germany	Greece	Italy	Other countries	N/A
Ideas and opportunities	49.2 %	32.4 %	27.3 %	55.0 %	59.1 %	31.1 %	0.0 %
Resources	44.4 %	25.4 %	18.2 %	50.9 %	56.8 %	28.9 %	0.0 %
Into action	50.5 %	35.2 %	18.2 %	56.1 %	61.4 %	28.9 %	0.0 %

Table 39: Entrepreneurship competences needs per country (EntreComp) (4-Large need to 5-Significant need)

Overall, we see that

- In France, the most demanded are the *Ideas and opportunities* and *Into action*.
- In Germany, the most demanded entrepreneurship competences fall under *Ideas and opportunities*.
- In Greece and Italy, the most demanded entrepreneurship competences fall under *Into action* and *Ideas and opportunities*.

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4.3.5 Green competences needs

Green competence needs were examined in the survey in the context of the lighting-sector needs. In this regard, a set of green competences was identified, originating mainly from the European Construction Sector Observatory (ECSO) analytical reports, the Lighting Europe Strategic Roadmap 2025 of the European Lighting Industry, the Lighting Europe Position Paper on the Roadmap on a Circular Economy Action Plan (January 2020), and the Cedefop's report on Skills for Green Jobs (2018). The results are presented in the following table (Table 40).

	1- No need at all	2	3- Moderate need	4	5- Significant need	No answer	*4-Large need to 5-Significant need*
Understand and promote the value of sustainable lighting	0.3 %	1.5 %	7.6 %	17.8 %	31.3 %	1.5 %	*49.1 %*
Understand the sustainable assessment of lighting systems and solutions: purposes, methodologies, standards	0.0 %	2.0 %	8.5 %	19.3 %	28.7 %	1.5 %	*48.0 %*
Understand the new sustainable lighting techniques applied to sustainable lighting	0.0 %	0.3 %	8.8 %	19.6 %	29.5 %	1.8 %	*49.1 %*
Understand the types and principles of the basic Environmental and Energy Labelling schemes and national / international policies	0.0 %	2.9 %	14.6 %	19.0 %	21.6 %	1.8 %	*40.6 %*
Understand sustainable building certification systems in the lighting sector	0.3 %	2.0 %	15.5 %	18.4 %	21.6 %	2.0 %	*40.0 %*
Understand the use of Environmental and Energy Labelling	0.6 %	2.6 %	14.6 %	19.3 %	21.3 %	1.5 %	*40.6 %*
Understand the Environmental Product Declaration Schemes (EPDs)	0.0 %	3.5 %	14.6 %	21.1 %	17.0 %	3.2 %	*38.1 %*
Understand the selection criteria of lighting services / systems and products in terms of sustainability	0.3 %	2.9 %	9.9 %	22.5 %	21.6 %	2.6 %	*44.1 %*
Understand the circular economy approach to lighting sector: maintenance – reuse / redistribute – refurbish / remanufacture – recycle processes	0.3 %	2.3 %	8.5 %	17.3 %	29.2 %	2.3 %	*46.5 %*
Understand the Life Cycle Assessment (LCA) process and its main stages and apply the Life Cycle Assessment (LCA) process to lighting cases	0.0 %	2.6 %	14.0 %	16.1 %	24.0 %	3.2 %	*40.1 %*
Understand the Life Cycle Costing (LCC) process, apply the LCC to build environment decision-making to lighting cases	0.3 %	1.5 %	14.9 %	17.0 %	23.4 %	2.9 %	*40.4 %*
Understand the new sustainable /	0.3 %	0.6 %	10.8 %	16.7 %	28.7 %	2.9 %	*45.4 %*

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green trends in lighting and how to integrate the environmental / sustainability criteria in the lighting design process							

Table 40: Green competences for the lighting sector

As we see, the most needed green competences in the lighting sector are the following:

- Understand and promote the value of sustainable lighting
- Understand the new sustainable lighting techniques applied to sustainable lighting
- Understand the sustainable assessment of lighting systems and solutions: purposes, methodologies, standards
- Understand the circular economy approach to lighting sector: maintenance – reuse / redistribute – refurbish / remanufacture – recycle processes
- Understand the new sustainable / green trends in lighting and how to integrate the environmental / sustainability criteria in the lighting design process

On the country level, the results are presented in the following table (Table 41).

	France, Germany, Greece, Italy	France	Germany	Greece	Italy	Other countries	N/A
Understand and promote the value of sustainable lighting	51.5 %	38.0 %	27.3 %	54.4 %	68.2 %	33.3 %	0.0 %
Understand the sustainable assessment of lighting systems and solutions: purposes, methodologies, standards	50.5 %	40.8 %	27.3 %	55.0 %	54.5 %	31.1 %	0.0 %
Understand the new sustainable lighting techniques applied to sustainable lighting	51.9 %	42.3 %	27.3 %	53.8 %	65.9 %	31.1 %	0.0 %
Understand the types and principles of the basic Environmental and Energy Labelling schemes and national / international policies	43.1 %	23.9 %	18.2 %	48.5 %	59.1 %	24.4 %	0.0 %
Understand sustainable building certification systems in the lighting sector	42.8 %	23.9 %	18.2 %	49.1 %	54.5 %	22.2 %	0.0 %
Understand the use of Environmental and Energy Labelling	43.1 %	23.9 %	18.2 %	48.5 %	59.1 %	24.4 %	0.0 %
Understand the Environmental Product Declaration Schemes (EPDs)	40.4 %	23.9 %	18.2 %	45.6 %	52.3 %	22.2 %	0.0 %
Understand the selection criteria of lighting services /	46.1 %	35.2 %	18.2 %	49.7 %	56.8 %	31.1 %	0.0 %

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systems and products in terms of sustainability							
Understand the circular economy approach to lighting sector: maintenance – reuse / redistribute – refurbish / remanufacture – recycle processes	48.8 %	32.4 %	27.3 %	53.8 %	61.4 %	31.1 %	0.0 %
Understand the Life Cycle Assessment (LCA) process and its main stages and apply the Life Cycle Assessment (LCA) process to lighting cases	41.4 %	32.4 %	18.2 %	44.4 %	50.0 %	31.1 %	0.0 %
Understand the Life Cycle Costing (LCC) process, apply the LCC to build environment decision-making to lighting cases	42.1 %	29.6 %	18.2 %	46.2 %	52.3 %	28.9 %	0.0 %
Understand the new sustainable / green trends in lighting and how to integrate the environmental / sustainability criteria in the lighting design process	47.8 %	35.2 %	27.3 %	53.2 %	52.3 %	28.9 %	0.0 %

Table 41: Green competences needs per country

We see that,

- In France, the most needed green competences are *Understand the new sustainable lighting techniques applied to sustainable lighting* (42.3 %), *Understand the sustainable assessment of lighting systems and solutions: purposes, methodologies, standards* (40.8 %), and *Understand and promote the value of sustainable lighting* (38.0 %).
- In Germany, the most needed green competences are the *Understand and promote the value of sustainable lighting*, the *Understand the sustainable assessment of lighting systems and solutions: purposes, methodologies, standards*, the *Understand the new sustainable lighting techniques applied to sustainable lighting*, and the *Understand the new sustainable / green trends in lighting and how to integrate the environmental / sustainability criteria in the lighting design process*, all estimated to 27.3%.
- In Greece, the most demanded green competences are the *Understand the sustainable assessment of lighting systems and solutions: purposes, methodologies, standards* (55.0%), the *Understand and promote the value of sustainable lighting* (54.4%), the *Understand the new sustainable lighting techniques applied to sustainable lighting* (53,8%) and the *Understand the circular economy approach to lighting sector: maintenance – reuse / redistribute – refurbish / remanufacture – recycle processes* (53.8 %).
- In Italy, the most demanded green competences are the *Understand and promote the value of sustainable lighting* (68.2%), the *Understand the new sustainable lighting techniques applied to sustainable lighting* (65.9%), the *Understand the circular economy approach to lighting sector: maintenance – reuse / redistribute – refurbish / remanufacture – recycle processes* (61.4%), the

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Understand the types and principles of the basic Environmental and Energy Labeling schemes and national / international policies (59.1%) and the *Understand the use of Environmental and Energy Labeling* (59.1%).

- Interestingly, the needs in Italy and Greece are much higher (on average) than the needs in France and Germany.

4.3.6 Focus of training programs

The last part of the quantitative survey was focused to the training programs required for the sector. The participants were asked to declare their opinions in the types of professionals sectors (lighting related) a training program should focus in order to satisfy the needs of the an organization in the sector, in the country of interest. Participants could select more than one options. The results are presented in the following graph (Figure 61).

Professional (lighting) sectors that a training program should focus on
Fundamentals of lighting engineering and lighting design
Indoor lighting (Domestic, Office spaces, Stores, Exhibitions, etc)
Street / Outdoor lighting
Smart lighting systems and smart-grids (from buildings to cities)
Transport lighting (Automotive, Aircraft lighting, etc)
Specialty lighting (architectural lighting, Lighting, Scenic lighting, Green space lighting, Surgical lighting, Museum lighting, Security lighting, etc)
Non-lighting applications of light (Horticultural / Greenhouse / Fisheries lighting, Phototherapy and medical applications, Water / Air purification, etc)
Other

Table 42: Professional (lighting) sectors

In Figure 61 we see that the needed training programs should focus on smart lighting systems (46.5%), followed by street / outdoor lighting (40.4%) and indoor lighting (38.6%). Moreover, there is a need for the fundamentals of lighting engineering and lighting design (39.5%) and specialty lighting (e.g. architectural lighting, scenic lighting, etc) (37.1%). On the contrary, the need for transport lighting (e.g. automotive, aircraft lighting) and non-lighting applications of lighting is very decreased (less than 20%).

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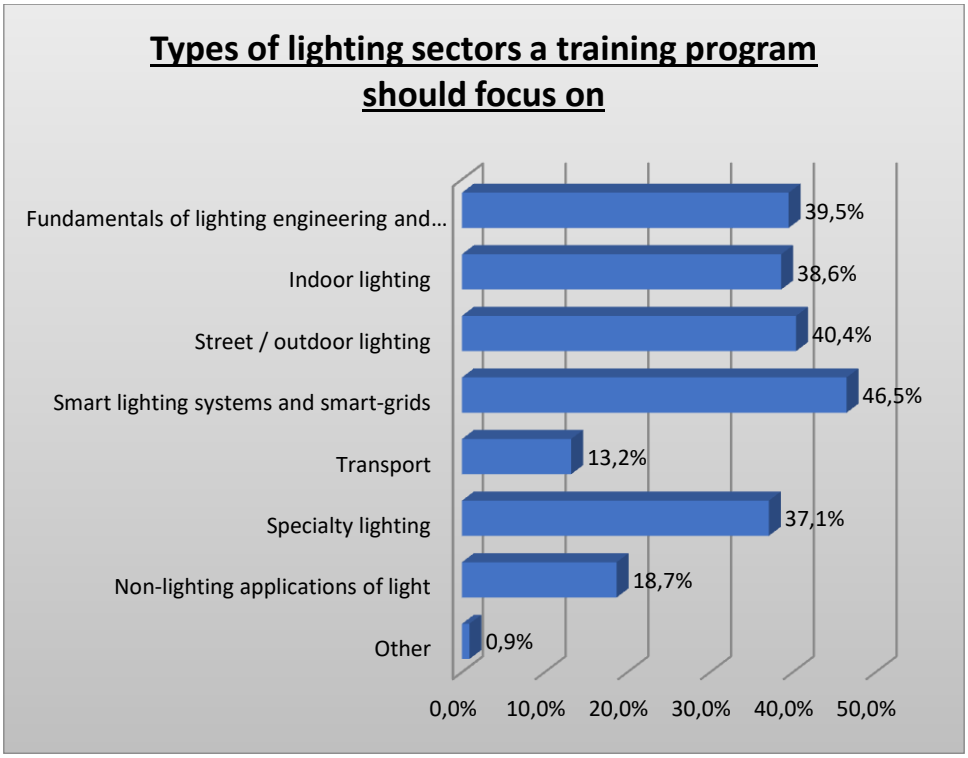

Figure 61: Professional (lighting) sectors a training program should focus on

	France, Germany, Greece, Italy	France	Germany	Greece	Italy	Other countries
Fundamentals of lighting engineering and lighting design	42.1 %	19.7 %	36.4 %	49.1 %	52.3 %	28.6 %
Indoor lighting (Domestic, Office spaces, Stores, Exhibitions, etc)	42.4 %	25.4 %	27.3 %	50.3 %	43.2 %	17.1 %
Street / Outdoor lighting	43.8 %	33.8 %	27.3 %	51.5 %	34.1 %	22.9 %
Smart lighting systems and smart-grids (from buildings to cities)	49.5 %	43.7 %	36.4 %	55.6 %	38.6 %	34.3 %
Transport lighting (Automotive, Aircraft lighting, etc)	13.8 %	1.4 %	0.0 %	19.9 %	13.6 %	11.4 %
Specialty lighting (architectural lighting, Lighting, Scenic lighting, Green space lighting, Surgical lighting, Museum	38.7 %	21.1 %	27.3 %	43.3 %	52.3 %	34.3 %

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lighting, Security lighting, etc)						
Non-lighting applications of light (Horticultural / Greenhouse / Fisheries lighting, Phototherapy and medical applications, Water / Air purification, etc)	19.9 %	14.1 %	9.1 %	22.2 %	22.7 %	14.3 %
Other	1.0 %	1.4 %	0.0 %	1.2 %	0.0 %	0.0 %

Table 43: Professional (lighting) sectors a training program should focus on, per country

On the country level (Table 43), we see that

- In France, Smart lighting systems and smart-grids is the first (43.7%) followed by street / outdoor lighting (33.8%) and indoor lighting (25.4%).
- In Germany, Smart lighting systems and smart-grids and Fundamentals of lighting engineering and lighting design are the first (36.4%).
- In Greece, Smart lighting systems and smart-grids is the most demanded (55.6%) followed by Street / outdoor lighting (51.5%) and Indoor lighting (50.3%), results that are similar to France.
- In Italy, Fundamentals of ligting engineering and lighting design together with Specialty lighting are the first (52.3%), followed by the Indoor lighting (43.2%).

Overall, in the four project countries, findings indicate that there is a need for training programs focusing (a) to smart lighting systems and smart-grids, (b) Street / Outdoor lighting, (c) Indoor lighting, (d) Fundamentals of lighting engineering and lighting design, and (e) Specialty lighting.

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5 Training supply

The quantitative survey conducted revealed (Figure 43) that the training currently provided for the sector professionals is either not adapted to the scholar level of the professionals (36.5%) or that there are no training programs related to lighting for professionals (30.7%). In order to understand better the training "supply" side, the ECOSLIGHT consortium conducted a research on the lighting related training provisions in the four project countries (France, Germany[11], Greece and Italy) and beyond.

5.1 France

In France, the training provided for the sector is delivered on the university level (EQF6+) leading to professionals licences, on the professional level (EQF5) and below (EQF4). There are also CVET training programs in lighting, and programs related to lighting specialties. Totally, 50 training programs in various levels were identified.

University lighting training in professional licenses (5)
IUT Normandie de Rouen
IUT de Béthune
IUT Université Lyon 1 - Mastery of energy, electricity, sustainable development - Intelligent lights and sustainable lighting course
CUFR Champollion, ISFME and Jean Jaurès de Saint-Affrique high school - Public lighting and EPRE energy networks
Paul Sabatier University, Toulouse and Lycée Gaston Monnerville, Cahors - Manager of energy efficiency for smart buildings G2EBI

Lighting training in engineering schools and universities (5)
ENTPE Lyon - Building engineering and lighting
ENSI Poitiers - Energy and EAT course
Polytech Orléans - Ecotechnologies, smart building and lighting
Toulouse 3 University - Master in Housing Energy, Master 2
Toulouse 2 University - Institut Couleur Image Design license

[11] In this version of the study, the training programs provided to Germany for the lighting sector are not presented separately but embedded in the section 5.4.

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Lighting training in architectural and design schools (8)
ENSA de Nantes - Architecture and lighting design • DPEA scenographer - light mention • "Lumière Everywhere", an installation by the DPEA Scenographer of ENSA Nantes • Highlighting of the ENSA Nantes footbridge • International workshop: landscape of light • Continuing education: initiation into sustainable lighting design in Nantes
ENSA de Toulouse - Architecture and urban light • Educational site: future urban light • Continuing education: sustainable city
ENSA de Lyon - Architecture and sensitive approach to light

Lighting training in landscape schools (2)
ENS Paysage de Versailles - Light and great nocturnal landscapes
ENS Nature et Paysage de Blois - Landscape, light and sound

Lighting training in vocational high schools and performing arts schools (8)
Lyon Electrician technician installer in efficient lighting - Lycée Edouard Branly, Lyon
DMA show management, lighting option • Lycée Edouard Branly, Lyon • Lycée Gabriel Guist'hau, Nantes • Lycée Pasteur, Besançon • Lycée professionnel Blaise Pascal, Marseille • Lycée technologique Claude Daunot, Nancy
ENSATT de Lyon - Lighting designer • ENSATT continuing education, lighting designer for live shows
TSN de Strasbourg - Technical and technical performance section

Lighting training in film schools (11)
Louis-Lumière National School, Saint-Denis
La Femis - National School of Image and Sound Trades, Paris
Ina Sup - School of the National Audiovisual Institute, Bry-sur-Marne
ESRA - Higher School of Audiovisual Production, Paris, Nice and Rennes
ESEC - Higher School of Film Studies, Paris

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Le Fresnoy - National Studio of Contemporary Arts, Tourcoing
3IS - International Institute of Image and Sound, Elancourt
CLCF - Book Conservatory of French Cinema, Paris
EICAR - International School of Audiovisual Creation and Production, Saint-Denis
AIS - The Image and Sound Workshops, Marseille
CinéCréatis - Frame and light operator, Nantes

Light and lighting training associations (1)
Campus Lumière in Lyon, the first campus in France dedicated to the lighting sector

Table 44: Training associations related to lighting

Continuing education centres in lighting (10)
Apricot-Formation: professional training center in architectural, stage and event lighting
CFEA - Lighting consulting and training, La Tronche
CFPE - AFE Lighting Training and Development Center, Paris
CFPTS - Vocational Training Center in Performing Techniques, Bagnolet
CNFPT - National Center for Territorial Public Service, Paris
FORMAPELEC - Continuing education in electrical engineering
IFEP - Professional Lighting Training Institute, Paris
ISFME - Higher Institute for Training in Energy Professions, Saint-Affrique
Opus Light - Lighting training organization, Paris and Caluire
ADEME - Control of Energy Demand - Public Lighting

Generally, in France various training programs in various levels are delivered. Their focus is on lighting, energy, smart buildings, sustainability, etc.

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5.2 Greece

In Greece, totally 18 training programs are offered in relation to lighting. These are presented in the following cards.

Course title	**Lighting Design (Master of Arts)**		
Provision of diploma / degree	Yes	**Degree level (EQF 4 – 8)**	EQF 7
Open to lifelong learning	Yes	**Duration**	2 years
Accreditation	Yes	**ECTS / ECVET points associated**	Yes (120 ECTS)
Institution	Hellenic Open University, School of Applied Arts	**Type of institution**	Academic
Webpage	https://www.eap.gr/el/spoudes-sto-eap/sxoles-k-programmata/sxoli-efarmosmenwn-texnwn		

Course title	**Lighting Technology (Lesson in BSc)**		
Provision of diploma / degree	No	**Degree level (EQF 4 – 8)**	-
Open to lifelong learning	No	**Duration**	4 hours
Accreditation	Yes	**ECTS / ECVET points associated**	Yes (5 ECTS)
Institution	National Technical University of Athens, School of Electrical and Computer Engineering	**Type of institution**	Academic
Webpage	www.ece.ntua.gr/en/undergraduate/courses/3103		

Course title	**Lighting Technology (Lesson in BSc)**		
Provision of diploma / degree	No	**Degree level (EQF 4 – 8)**	-
Open to lifelong learning	No	**Duration**	13 weeks (4 hours / week)
Accreditation	Yes	**ECTS / ECVET points associated**	Yes (6 ECTS)
Institution	University of West Attica, Faculty of Engineering / Department of Electrical & Electronics Engineering, Division of Electrical Industrial Systems and Automations	**Type of institution**	Academic
Webpage	http://www.eee.uniwa.gr/en/		

Course title	**Acoustics - Lighting and Space (Lesson in BSc)**		
Provision of diploma / degree	No	**Degree level (EQF 4 – 8)**	-
Open to lifelong learning	No	**Duration**	4 hours
Accreditation	Yes	**ECTS / ECVET points associated**	Yes (4 ECTS)
Institution	University of West Attica, School of Applied Arts & Culture, Department of	**Type of institution**	Academic

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	Interior Architecture		
Webpage	https://ia.uniwa.gr/course/akoystiki-fotismos-kai-choros/		

Course title	**Topics of lighting (Lesson in Master)**		
Provision of diploma / degree	No	**Degree level (EQF 4 – 8)**	-
Open to lifelong learning	No	**Duration**	13 weeks (4 hours / week)
Accreditation	Yes	**ECTS / ECVET points associated**	Yes (6 ECTS)
Institution	University of West Attica, School of Applied Arts & Culture, Department of Interior Architecture	**Type of institution**	Academic
Webpage	https://msiassd.uniwa.gr/		

Course title	**Lighting Laboratory (Lesson in BSc)**		
Provision of diploma / degree	No	**Degree level (EQF 4 – 8)**	-
Open to lifelong learning	No	**Duration**	-
Accreditation	Yes	**ECTS / ECVET points associated**	-
Institution	School of Pedagogical and technological Education, Department of Electrical and Electronic Engineering Educators	**Type of institution**	Academic
Webpage	http://elecengedu.aspete.gr/index.php/el/%CE%B5%CF%81%CE%B3%CE%B1%CF%83%CF%84%CE%B7%CF%81%CE%B9%CE%B1/%CE%B5%CF%81%CE%B3%CE%B1%CF%83%CF%84%CE%AE%CF%81%CE%B9%CE%BF-%CF%86%CF%89%CF%84%CE%BF%CF%84%CE%B5%CF%87%CE%BD%CE%AF%CE%B1%CF%82.html		

Course title	**Special Lighting Topics – Digital Building lighting simulation (Lesson in BSc)**		
Provision of diploma / degree	No	**Degree level (EQF 4 – 8)**	-
Open to lifelong learning	No	**Duration**	4 hours
Accreditation	Yes	**ECTS / ECVET points associated**	Yes (4 ECTS)
Institution	Technical University of Crete, School of Architecture	**Type of institution**	Academic
Webpage	https://www.arch.tuc.gr/fileadmin/users_data/arch_tmpl/documents/Odigos-Spoudwn-PK.pdf		

Course title	**Lighting Technology (Lesson in BSc)**		
Provision of diploma / degree	No	**Degree level (EQF 4 – 8)**	-
Open to lifelong learning	No	**Duration**	4 hours
Accreditation	Yes	**ECTS / ECVET points associated**	Yes (5 ECTS)

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Institution	University of the Peloponnese, School of Electrical and Computer Engineering	**Type of institution**	Academic
Webpage	https://www.ece.uop.gr/wp-content/uploads/2019/10/%CE%95%CE%9D%CE%95-850-%CE%A4%CE%B5%CF%87%CE%BD%CE%BF%CE%BB%CE%BF%CE%B3%CE%AF%CE%B1-%CE%A6%CF%89%CF%84%CE%B9%CF%83%CE%BC%CE%BF%CF%8D.pdf		

Course title	**Implementation problems of the hydraulics and mechanical structures at monuments and historical buildings**		
Provision of diploma / degree	No	**Degree level (EQF 4 – 8)**	-
Open to lifelong learning	No	**Duration**	12 hours
Accreditation	Yes	**ECTS / ECVET points associated**	Yes (2 ECTS)
Institution	Aristotle University of Thessaloniki, Faculty of Engineering, Interdepartmental Program of Postgraduate Studies «Protection conservation and Restoration of Cultural Monuments»	**Type of institution**	Academic
Webpage	http://prosynapo.web.auth.gr/files/BRIEF%20PRESENTATION%20PP.pdf		

Course title	**Historical Techniques of Natural Lighting in Interior Spaces of Monuments (Lesson in Master)**		
Provision of diploma / degree	No	**Degree level (EQF 4 – 8)**	-
Open to lifelong learning	No	**Duration**	12 hours
Accreditation	Yes	**ECTS / ECVET points associated**	Yes (2 ECTS)
Institution	Aristotle University of Thessaloniki, Faculty of Engineering, Interdepartmental Program of Postgraduate Studies «Protection conservation and Restoration of Cultural Monuments»	**Type of institution**	Academic
Webpage	http://prosynapo.web.auth.gr/files/BRIEF%20PRESENTATION%20PP.pdf		

Course title	**Lighting and Space I (Lesson in BSc)**		
Provision of diploma / degree	No	**Degree level (EQF 4 – 8)**	-
Open to lifelong learning	Yes	**Duration**	4 hours
Accreditation	Yes	**ECTS / ECVET points associated**	Yes (4 ECTS)
Institution	International Hellenic University, Department of Interior Architecture	**Type of institution**	Academic
Webpage	https://www.ihu.gr/tmimata/esoterikis-architektonikis#tab-8a21d908536cd408699		

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Course title	Lighting and Space II (Lesson in BSc)		
Provision of diploma / degree	No	Degree level (EQF 4 – 8)	-
Open to lifelong learning	Yes	Duration	3 hours
Accreditation	Yes	ECTS / ECVET points associated	Yes (3 ECTS)
Institution	International Hellenic University, Department of Interior Architecture	Type of institution	Academic
Webpage	https://www.ihu.gr/tmimata/esoterikis-architektonikis#tab-8a21d908536cd408699		

Course title	Seminars in Lighting (Lighting Design Basics, Relux Access, Relux Interior, Relux Road & Exterior, Lighting Design I)		
Provision of diploma / degree	No	Degree level (EQF 4 – 8)	-
Open to lifelong learning	Yes	Duration	(8 hours, 7 hours, 7 hours, 7 hours, 20 hours)
Accreditation	No	ECTS / ECVET points associated	No
Institution	Kafkas Institute Training and Development	Type of institution	Industry / Institute
Webpage	https://www.kafkasinstitute.gr/content/9/meletesefarmoges-/		

Course title	Seminar in Architectural lighting		
Provision of diploma / degree	No	Degree level (EQF 4 – 8)	-
Open to lifelong learning	Yes	Duration	-
Accreditation	No	ECTS / ECVET points associated	No
Institution	Infotech, Life-Long Training Institute	Type of institution	Institute
Webpage	https://www.infotech.edu.gr/course/architectural-lighting/		

Course title	Seminar in Dialux		
Provision of diploma / degree	No	Degree level (EQF 4 – 8)	-
Open to lifelong learning	Yes	Duration	20 hours
Accreditation	No	ECTS / ECVET points associated	No
Institution	DIDAKTIKA, Life-Long Training Institute	Type of institution	Institute
Webpage	https://www.didaktika.gr/index.php/%CF%83%CE%B5%CE%BC%CE%B9%CE%BD%CE%AC%CF%81%CE%B9%CE%B1-%CE%BA%CE%B1%CE%BB%CE%B1%CE%BC%CE%AC%CF%84%CE%B1 / seminario / dialux-%CE%BC%CE%B5%CE%BB%CE%AD%CF%84%CE%B5%CF%82-%CF%86%CF%89%CF%84%CE%B9%CF%83%CE%BC%CE%BF%CF%8D.html#%CF%80%CF%81%CE%BF%CF%8B%CF%80%CE%BF%CE%B8%CE%AD%CF%83%CE%B5%CE%B9%CF%82-%CF%83%CF%85%CE%BC%CE%BC%CE%B5%CF%84%CE%BF%CF%87%CE%AE%CF%82		

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Course title	Seminar in Architectural Lighting Design and Technology		
Provision of diploma / degree	No	Degree level (EQF 4 – 8)	-
Open to lifelong learning	Yes	Duration	120 hours
Accreditation	Yes	ECTS / ECVET points associated	No
Institution	Computer Start, Life-Long Training Institute	Type of institution	Institute
Webpage	https://computer-start.gr/tomeis-spoudon/perivalon-energeia-ktiria/arxitektonikos-fotismos/		

Course title	Seminar in Dialux and Relux		
Provision of diploma / degree	No	Degree level (EQF 4 – 8)	-
Open to lifelong learning	Yes	Duration	24 hours and 24 hours
Accreditation	Yes	ECTS / ECVET points associated	No
Institution	FACE to FACE, Life-Long Training Institute	Type of institution	Institute
Webpage	https://www.f2f.gr/relux.html		

Course title	Seminar in Outdoor lighting installations - design and safety requirements		
Provision of diploma / degree	No	Degree level (EQF 4 – 8)	-
Open to lifelong learning	Yes	Duration	6 hours
Accreditation	No	ECTS / ECVET points associated	No
Institution	Technical Institute of Heraklion Chamber of Commerce and Industry	Type of institution	Institute
Webpage	https://www.katartisi.gr/seminars/seminars/377-egkatastaseis-ekswterikou-fwtismou		

In Greece, there are not many complete programs on lighting. There are lighting-related courses in various academic programs (mostly bachelors), plus some seminars delivered from VET providers.

5.3 Italy

In Italy, totally 19 training programs on Lighting were identified, in various levels, both as academic programs and professional trainings (not aligned with EQF in some cases). No training programs at the level that ECOSLIGHT intends to deliver (EQF 5) were identified.

Course title	Lighting design		
Provision of diploma / degree	-	Degree level (EQF 4 – 8)	EQF 7
Open to lifelong learning	No	Duration	1 year
Accreditation	Yes	ECTS / ECVET points associated	Yes
Institution	Sapienza Università di Roma	Type of institution	Academic
Webpage	http://www.masterlighting.it/		

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Course title	Lighting Design & Technology		
Provision of diploma / degree	-	Degree level (EQF 4 – 8)	EQF 7
Open to lifelong learning	No	Duration	1 year
Accreditation	Yes	ECTS / ECVET points associated	Yes
Institution	Politecnico di Milano	Type of institution	Academic
Webpage	https://www.polidesign.net/it/lighting		

Course title	Lighting Design - Progettare la Luce		
Provision of diploma / degree	-	Degree level (EQF 4 – 8)	EQF 7
Open to lifelong learning	No	Duration	5 months
Accreditation	Yes	ECTS / ECVET points associated	Yes
Institution	IED Firenze	Type of institution	Academic
Webpage	https://www.ied.it/firenze/scuola-design/corsi-specializzazione/lighting-design-progettare-la-luce/DCH2627I		

Course title	Lighting Design Experience		
Provision of diploma / degree	-	Degree level (EQF 4 – 8)	EQF 7
Open to lifelong learning	No	Duration	6 months
Accreditation	Yes	ECTS / ECVET points associated	Yes
Institution	IED Milano	Type of institution	Academic
Webpage	https://www.ied.it/milano/scuola-design/corsi-specializzazione/lighting-design/CCA1518I		

Course title	Lighting design		
Provision of diploma / degree	-	Degree level (EQF 4 – 8)	EQF 8
Open to lifelong learning	No	Duration	4 months
Accreditation	Yes	ECTS / ECVET points associated	Yes
Institution	IED Roma	Type of institution	Academic
Webpage	https://www.ied.it/roma/scuola-design/corso-formazione-avanzata/lighting-design/CRCDBCI001_01		

Course title	Formazione in Luce		
Provision of diploma / degree	No	Degree level (EQF 4 – 8)	
Open to lifelong learning	No	Duration	9 days

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Accreditation	No	**ECTS / ECVET points associated**	No
Institution	AIDI Associazione Italiana di Illuminazione e ASSIL Associazione Nazionale Produttori Illuminazione federata ANIE Confindustria, Milano	**Type of institution**	Association
Webpage	https://www.assil.it/Formazione-in-Luce-AIDI-ASSIL_579		

Course title	**Lumi expo Academy**		
Provision of diploma / degree	No	**Degree level (EQF 4 – 8)**	
Open to lifelong learning	No	**Duration**	2 days
Accreditation	Yes	**ECTS / ECVET points associated**	No
Institution	Lumi expo, Rimini	**Type of institution**	Other
Webpage	https://lumiexpo.com/		

Course title	**Lighting Design & Technology**		
Provision of diploma / degree	Yes	**Degree level (EQF 4 – 8)**	EQF 7
Open to lifelong learning	No	**Duration**	1 year
Accreditation	Yes	**ECTS / ECVET points associated**	Yes
Institution	Politecnico di Milano	**Type of institution**	Academic
Webpage	https://www.polidesign.net/it/lighting		

Course title	**Lighting & LED Technology**		
Provision of diploma / degree	No	**Degree level (EQF 4 – 8)**	
Open to lifelong learning	No	**Duration**	9 days
Accreditation	Yes	**ECTS / ECVET points associated**	Yes
Institution	Poli.design, Università Politecnico di Milano	**Type of institution**	Academic, Industry
Webpage	https://polidesign.net/it/light-led-technology		

Course title	**Master Executive Light Design**		
Provision of diploma / degree	Yes	**Degree level (EQF 4 – 8)**	EQF 6
Open to lifelong learning	No	**Duration**	1 year (300 hours)
Accreditation	Yes	**ECTS / ECVET points associated**	No
Institution	NAD Nuova Accademia del Design, Verona	**Type of institution**	Academic / Industry
Webpage	https://www.accademiadeldesign.com/master-executive-in-light-design/		

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Course title	Lighting Design and Led Technologies		
Provision of diploma / degree	Yes	Degree level (EQF 4 – 8)	EQF 6
Open to lifelong learning	No	Duration	4 months
Accreditation	Yes	ECTS / ECVET points associated	No
Institution	ATE Accademia Telematica Europea, Torino	Type of institution	Academic
Webpage	http://www.accademiatelematica.it/art/Home/Corsi		

Course title	Corso di Specializzazione in Lighting Design		
Provision of diploma / degree	No	Degree level (EQF 4 – 8)	-
Open to lifelong learning	No	Duration	40 hours
Accreditation	Yes	ECTS / ECVET points associated	No
Institution	IDI Italian Design Institute, Milan	Type of institution	Academic
Webpage	https://www.italiandesigninstitute.com/corso-di-specializzazione-in-lighting-design-idi		

Course title	Light engineering and photometry		
Provision of diploma / degree	No	Degree level (EQF 4 – 8)	EQF 7
Open to lifelong learning	No	Duration	48 hours
Accreditation	Yes	ECTS / ECVET points associated	Yes
Institution	Università degli studi di Padova	Type of institution	Academic
Webpage	https://didattica.unipd.it/off/2016/LM/IN/IN1979/000ZZ/IN02122565/N0		

Course title	Architectural Lighting e Illuminazione Naturale		
Provision of diploma / degree	No	Degree level (EQF 4 – 8)	EQF 7
Open to lifelong learning	Yes	Duration	40 hours
Accreditation	No	ECTS / ECVET points associated	No
Institution	Assform	Type of institution	Training organization
Webpage	https://www.assform.it/corso-architectural-lighting-firenze_674.php		

Course title	Light design		
Provision of diploma / degree	No	Degree level (EQF 4 – 8)	EQF 7
Open to lifelong learning	Yes	Duration	40 hours

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Accreditation	No	**ECTS / ECVET points associated**	No
Institution	Home design	**Type of institution**	Architectural atelier
Webpage	http://www.homedesignitalia.com/#corsi		

Course title	**Lighting Design for Hospitality**		
Provision of diploma / degree	No	**Degree level (EQF 4 – 8)**	EQF 7
Open to lifelong learning	Yes	**Duration**	40 hours
Accreditation	No	**ECTS / ECVET points associated**	No
Institution	Poli.design	**Type of institution**	Training organization
Webpage	https://www.polidesign.net/en/lighting-design-for-Hospitality-course		

Course title	**Lighting Design for the Show**		
Provision of diploma / degree	No	**Degree level (EQF 4 – 8)**	EQF 7
Open to lifelong learning	Yes	**Duration**	40 hours
Accreditation	No	**ECTS / ECVET points associated**	No
Institution	Poli.design	**Type of institution**	Training organization
Webpage	https://polidesign.net/it/lighting-design-lo-show-workshop		

Course title	**Lighting Design - Fondamenti e CAD**		
Provision of diploma / degree	No	**Degree level (EQF 4 – 8)**	EQF 7
Open to lifelong learning	Yes	**Duration**	82 hours
Accreditation	No	**ECTS / ECVET points associated**	No
Institution	Poli.design	**Type of institution**	Training organization
Webpage	https://polidesign.net/it/content/lighting-design-fondamenti-e-cad		

Course title	**Corso Lighting Designer UPLOAD basic**		
Provision of diploma / degree	No	**Degree level (EQF 4 – 8)**	EQF 7
Open to lifelong learning	Yes	**Duration**	100 hours
Accreditation	No	**ECTS / ECVET points associated**	No
Institution	Aild	**Type of institution**	Training organization
Webpage	http://www.aild.it/corso-upload-basic-teatro-delle-voci-tv/		

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As we can see, in Italy, the mostly EQF 6+ level trainign programs are oriented to lighting design and technologies. No additional programs in specifically the EQF 5 level were identified, opening the route towards the ECOSLIGHT training provision.

5.4 Other programs / countries

Apart from the aforementioned programs, additional were identified delivered in other EU countries but mainly accessible to residents / professionals of the four project countries. Additonal programs outside the EU were also identified. Totally 38 training programs were identified.

Course title	**Interior design and lighting**		
Provision of diploma / degree	-	**Degree level (EQF 4 – 8)**	EQF 6
Open to lifelong learning	No	**Duration**	3 years
Accreditation	Yes	**ECTS / ECVET points associated**	-
Institution (/Country)	Istituto Marangoni (Italy / UK)	**Type of institution**	Academic
Webpage	https://www.istitutomarangoni.com/it/corsi-di-design/undergraduate/programmi-triennali/interior-design-lighting/		

Course title	**Lighting design and management**		
Provision of diploma / degree	-	**Degree level (EQF 4 – 8)**	EQF 7
Open to lifelong learning	No	**Duration**	5 semesters
Accreditation	Yes	**ECTS / ECVET points associated**	-
Institution (/Country)	WINGS - Wismar University (Germany)	**Type of institution**	Academic
Webpage	https://www.contact.institute/wings/ma-lighting-design/?utm_source=Studyportals		

Course title	**Architectural Lighting Design**		
Provision of diploma / degree	-	**Degree level (EQF 4 – 8)**	EQF 7
Open to lifelong learning	No	**Duration**	1 year
Accreditation	Yes	**ECTS / ECVET points associated**	Yes
Institution (/Country)	KTH Royal Institute of Technology (Sweden)	**Type of institution**	Academic
Webpage	https://www.kth.se/en/studies/master/architectural-lighting-design		

Course title	**Post-Master Embedded Lighting Systems**		
Provision of diploma / degree	-	**Degree level (EQF 4 – 8)**	EQF 7
Open to lifelong learning	No	**Duration**	400 hours
Accreditation	Yes	**ECTS / ECVET points associated**	-
Institution (/Country)	ESTACA (France)	**Type of institution**	Academic

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Webpage	https://embedded-lighting.com/

Course title	**Lighting Design BA**		
Provision of diploma / degree	-	**Degree level (EQF 4 – 8)**	EQF 6
Open to lifelong learning	No	**Duration**	3 years
Accreditation	Yes	**ECTS / ECVET points associated**	-
Institution (/Country)	Rose Bruford College (UK)	**Type of institution**	Academic
Webpage	https://www.bruford.ac.uk/courses/lighting-design-ba-hons/?utm_source=Keystone&utm_medium=Keystone%20Profile&utm_campaign=Keystone		

Course title	**Audiovisual design**		
Provision of diploma / degree	-	**Degree level (EQF 4 – 8)**	EQF 6
Open to lifelong learning	No	**Duration**	4 years
Accreditation	Yes	**ECTS / ECVET points associated**	Yes
Institution (/Country)	ESDi - Design School (Spain)	**Type of institution**	Academic
Webpage	https://esdi.es/en/studies/design-degree/audiovisual-design/		

Course title	**Bachelor of Arts (Hons) in Lighting Design for Architecture**		
Provision of diploma / degree	-	**Degree level (EQF 4 – 8)**	EQF 6
Open to lifelong learning	No	**Duration**	3 years
Accreditation	Yes	**ECTS / ECVET points associated**	-
Institution (/Country)	Rose Bruford College of Theatre and Performance (UK)	**Type of institution**	Academic
Webpage	https://www.bruford.ac.uk/courses/lighting-design-for-architecture-ba-hons/?utm_source=Keystone&utm_medium=Keystone%20Profile&utm_campaign=Keystone		

Course title	**The Erasmus Mundus - Master of Science in Imaging and Light in Extended Reality**		
Provision of diploma / degree	Yes	**Degree level (EQF 4 – 8)**	EQF 7
Open to lifelong learning	No	**Duration**	2 years
Accreditation	Yes	**ECTS / ECVET points associated**	Yes
Institution (/Country)	Joint: University of Eastern Finland (UEF), Université Jean Monnet (UJM, France), KU Leuven (Belgium), and Toyohashi University of Technology (TUT, Japan) (Finland, France, Belgium and Japan)	**Type of institution**	Academic
Webpage	https://iiw.kuleuven.be/english/programmes/imlex		

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Course title	MSc Light and Lighting		
Provision of diploma / degree	Yes	Degree level (EQF 4 – 8)	EQF 7
Open to lifelong learning	No	Duration	1 year
Accreditation	Yes	ECTS / ECVET points associated	Yes
Institution (/Country)	University College London (UK)	Type of institution	Academic
Webpage	https://www.ucl.ac.uk/prospective-students/graduate/taught-degrees/light-lighting-msc		

Course title	MA in Architectural Lighting Design		
Provision of diploma / degree	Yes	Degree level (EQF 4 – 8)	EQF 7
Open to lifelong learning	No	Duration	2 years
Accreditation	Yes	ECTS / ECVET points associated	Yes
Institution (/Country)	The Royal Danish Academy of Fine Arts Schools of Architecture, Design and Conservation (Denmark)	Type of institution	Academic
Webpage	https://kglakademi.dk/		

Course title	Master in Lighting Design		
Provision of diploma / degree	Yes	Degree level (EQF 4 – 8)	EQF 7
Open to lifelong learning	No	Duration	2 years
Accreditation	Yes	ECTS / ECVET points associated	Yes
Institution (/Country)	Aalborg University (Denmark)	Type of institution	Academic
Webpage	https://www.en.aau.dk/education/master/lighting-design		

Course title	MSc Lighting Design		
Provision of diploma / degree	Yes	Degree level (EQF 4 – 8)	EQF 7
Open to lifelong learning	No	Duration	2 years
Accreditation	Yes	ECTS / ECVET points associated	Yes
Institution (/Country)	ITMO University in Saint Petersbourg (Russia)	Type of institution	Academic
Webpage	https://en.itmo.ru/en/viewjep/2/64/Lighting_Design.htm		

Course title	Master in Lighting Design		
Provision of diploma / degree	Yes	Degree level (EQF 4 – 8)	EQF 7
Open to lifelong learning	No	Duration	9 months

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Accreditation	Yes	**ECTS / ECVET points associated**	Yes
Institution (/Country)	Istituto Europeo di Design – Madrid (Spain)	**Type of institution**	Academic / Industry
Webpage	https://www.ied.edu/madrid/design-school/master-courses/lighting-design/DME961S		

Course title	**Continuing Study Programs - Smart Lighting**		
Provision of diploma / degree	Yes	**Degree level (EQF 4 – 8)**	EQF 7
Open to lifelong learning	No	**Duration**	3 months
Accreditation	Yes	**ECTS / ECVET points associated**	Yes
Institution (/Country)	Istituto Europeo di Design – Barcelona (Spain)	**Type of institution**	Academic / Industry
Webpage	https://www.ied.edu/barcelona/design-school/continuing-study-programs/smart-lighting/CBCDBNE003_01		

Course title	**MA in Lighting Design**		
Provision of diploma / degree	Yes	**Degree level (EQF 4 – 8)**	EQF 7
Open to lifelong learning	No	**Duration**	1 year
Accreditation	Yes	**ECTS / ECVET points associated**	Yes
Institution (/Country)	Edimburgh Napier University (Scotland)	**Type of institution**	Academic / Industry
Webpage	https://www.napier.ac.uk/courses/ma-lighting-design-postgraduate-fulltime		

Course title	**MFA in Lighting Design**		
Provision of diploma / degree	Yes	**Degree level (EQF 4 – 8)**	EQF 7
Open to lifelong learning	No	**Duration**	2 years
Accreditation	Yes	**ECTS / ECVET points associated**	Yes
Institution (/Country)	Edimburgh Napier University (Scotland)	**Type of institution**	Academic / Industry
Webpage	https://www.napier.ac.uk/courses/mfa-lighting-design-postgraduate-fulltime		

Course title	**MA Architectural Lighting and Design Management**		
Provision of diploma / degree	Yes	**Degree level (EQF 4 – 8)**	EQF 7
Open to lifelong learning	No	**Duration**	2,5 years
Accreditation	Yes	**ECTS / ECVET points associated**	Yes
Institution (/Country)	Hochschule Wismar - University of Applied Sciences: Technology, Business and Design (Germany)	**Type of institution**	Academic

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Webpage	https://www.iald.org/IALD-Education-Trust/STUDENTS/learn-2-light/Lighting-Design-Schools/Hochschule-Wismar-Professional-Part-Time-Masters

Course title	**Engineering Intelligent Lighting Certification Programme**		
Provision of diploma / degree	Yes	**Degree level (EQF 4 – 8)**	EQF 6
Open to lifelong learning	No	**Duration**	-
Accreditation	Yes	**ECTS / ECVET points associated**	Yes
Institution (/Country)	Eindhoven University of Technology (the Netherlands)	**Type of institution**	Academic
Webpage	https://www.tue.nl/en/research/research-institutes/top-research-groups/intelligent-lighting-institute/education/certificate-program/#top		

Course title	**MFA Lighting Design Program**		
Provision of diploma / degree	Yes	**Degree level (EQF 4 – 8)**	-
Open to lifelong learning	No	**Duration**	2 years
Accreditation	Yes	**ECTS / ECVET points associated**	No
Institution (/Country)	The New School Parsons (USA)	**Type of institution**	Academic
Webpage	https://www.newschool.edu/parsons/mfa-lighting-design/		

Course title	**MA Illumination Design Program**		
Provision of diploma / degree	Yes	**Degree level (EQF 4 – 8)**	-
Open to lifelong learning	No	**Duration**	1,5 years
Accreditation	Yes	**ECTS / ECVET points associated**	No
Institution (/Country)	The University of Sydney (Australia)	**Type of institution**	Academic
Webpage	https://www.sydney.edu.au/courses/courses/pc/master-of-architectural-science-illumination-design.html		

Course title	**Graduate Diploma in Illumination Design Program**		
Provision of diploma / degree	Yes	**Degree level (EQF 4 – 8)**	-
Open to lifelong learning	No	**Duration**	6 month/1 year, depending on the credit points already held by the student
Accreditation	Yes	**ECTS / ECVET points associated**	No
Institution (/Country)	The University of Sydney (Australia)	**Type of institution**	Academic
Webpage	https://www.sydney.edu.au/courses/courses/pc/graduate-diploma-in-architectural-science-		

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	illumination-design.html

Course title	**PhD program**		
Provision of diploma / degree	Yes	**Degree level (EQF 4 – 8)**	-
Open to lifelong learning	No	**Duration**	3 years
Accreditation	Yes	**ECTS / ECVET points associated**	No
Institution (/Country)	The University of Sydney (Australia)	**Type of institution**	Academic
Webpage	https://www.iald.org/IALD-Education-Trust/STUDENTS/learn-2-light/Lighting-Design-Schools/The-University-Of-Sydney		

Course title	**Lighting General Coverage Programme (leading to Lighting Certification for Products)**		
Provision of diploma / degree	-	**Degree level (EQF 4 – 8)**	-
Open to lifelong learning	Yes	**Duration**	-
Accreditation	Yes	**ECTS / ECVET points associated**	-
Institution (/Country)	Intertek. Total Quality. Assured (Worldwide)	**Type of institution**	Quality Assurance Provider
Webpage	https://www.intertek.com/lighting/product-certification/		

Course title	**Horticultural Lighting Certification Program**		
Provision of diploma / degree	-	**Degree level (EQF 4 – 8)**	-
Open to lifelong learning	Yes	**Duration**	-
Accreditation	Yes	**ECTS / ECVET points associated**	-
Institution (/Country)	Intertek. Total Quality Assured (Mexico)	**Type of institution**	Quality Assurance Provider
Webpage	https://smart-lighting.es/intertek-lanza-programa-certificacion-iluminacion-horticola/		

Course title	**Illumination Design Certification Program**		
Provision of diploma / degree	-	**Degree level (EQF 4 – 8)**	-
Open to lifelong learning	Yes	**Duration**	-
Accreditation	-	**ECTS / ECVET points associated**	-
Institution (/Country)	International Association of Lighting Designers (Mexico)	**Type of institution**	International (professional) association
Webpage	https://www.iluminet.com/iald-cld-iluminacion-certificacion/		

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Course title	Lighting Design Certificate Program		
Provision of diploma / degree	-	Degree level (EQF 4 – 8)	-
Open to lifelong learning	Yes	Duration	-
Accreditation	-	ECTS / ECVET points associated	No
Institution (/Country)	The G. Raymond Chang School of Continuing Education, Ryerson University (Canada)	Type of institution	VET institution
Webpage	https://continuing.ryerson.ca/public/category/courseCategoryCertificateProfile.do?method=load&certificateId=198265		

Course title	Lighting Specialist Certificate Program		
Provision of diploma / degree	-	Degree level (EQF 4 – 8)	-
Open to lifelong learning	Yes	Duration	-
Accreditation	-	ECTS / ECVET points associated	-
Institution (/Country)	National Association of Innovative Lighting Distributors (USA)	Type of institution	National (professional) association
Webpage	https://naild.org/training/		

Course title	Automotive Lighting Certificate Program		
Provision of diploma / degree	-	Degree level (EQF 4 – 8)	-
Open to lifelong learning	Yes	Duration	12 weeks , 72 hours
Accreditation	-	ECTS / ECVET points associated	-
Institution (/Country)	Oakland University School of Engineering and Computer Science and Professional and Continuing Education (USA)	Type of institution	VET and academic institution
Webpage	https://www.oakland.edu/pace/engineering/automotive-lighting/		

Course title	Lighting Essentials Certificate Program		
Provision of diploma / degree	-	Degree level (EQF 4 – 8)	-
Open to lifelong learning	Yes	Duration	-
Accreditation	-	ECTS / ECVET points associated	-
Institution (/Country)	Signify (Wolrdwide - with EU head office in the Netherlands)	Type of institution	Company
Webpage	https://www.signify.com/global/lighting-academy/browser/course/lighting-essentials		

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Course title	Lighting Calculations Training		
Provision of diploma / degree	No	Degree level (EQF 4 – 8)	-
Open to lifelong learning	Yes	Duration	-
Accreditation	-	ECTS / ECVET points associated	-
Institution (/Country)	Signify (Wolrdwide - with EU head office in the Netherlands)	Type of institution	Company
Webpage	https://www.signify.com/global/lighting-academy/browser/course/lighting-calculations		

Course title	Lighting Designers Certification and Recertification		
Provision of diploma / degree	-	Degree level (EQF 4 – 8)	-
Open to lifelong learning	Yes	Duration	at least 3 years of experience as a lead architectural lighting designer to be eligible
Accreditation	-	ECTS / ECVET points associated	-
Institution (/Country)	CLI (Certifing Lighting Designers) (USA)	Type of institution	Certification Body
Webpage	https://www.cld.global/		

Course title	California Advanced Lighting Controls Training Program		
Provision of diploma / degree	No	Degree level (EQF 4 – 8)	-
Open to lifelong learning	Yes	Duration	-
Accreditation	-	ECTS / ECVET points associated	-
Institution (/Country)	CALCTP (USA)	Type of institution	Certification Body
Webpage	https://www.calctp.org/		

Course title	Community Lighting Training and Certification		
Provision of diploma / degree	No	Degree level (EQF 4 – 8)	-
Open to lifelong learning	Yes	Duration	-
Accreditation	-	ECTS / ECVET points associated	-
Institution (/Country)	SOLA (Smart Outdoor Lighting Alliance) (USA)	Type of institution	Non-for-profit consulting body
Webpage	http://volt.org/training/		

Course title	Lighting Associate Certification Program		
Provision of diploma / degree	No	Degree level (EQF 4 – 8)	-

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Open to lifelong learning	Yes	**Duration**	-
Accreditation	-	**ECTS / ECVET points associated**	-
Institution (/Country)	ALA (American Lighting Association) (USA)	**Type of institution**	National Association
Webpage	https://alamembers.com/Professional-Education/LA		

Course title	**Ligthing Specialist Certification Program**		
Provision of diploma / degree	-	**Degree level (EQF 4 – 8)**	-
Open to lifelong learning	Yes	**Duration**	-
Accreditation	-	**ECTS / ECVET points associated**	-
Institution (/Country)	ALA (American Lighting Association) (USA)	**Type of institution**	National Association
Webpage	https://alamembers.com/Professional-Education/LS		

Course title	**Lighting Consultant Certification Program**		
Provision of diploma / degree	-	**Degree level (EQF 4 – 8)**	-
Open to lifelong learning	Yes	**Duration**	-
Accreditation	-	**ECTS / ECVET points associated**	-
Institution (/Country)	ALA (American Lighting Association) (USA)	**Type of institution**	National Association
Webpage	https://alamembers.com/Professional-Education/CLC		

Course title	**Lighting Manufacturers Certification Program**		
Provision of diploma / degree	-	**Degree level (EQF 4 – 8)**	-
Open to lifelong learning	Yes	**Duration**	-
Accreditation	-	**ECTS / ECVET points associated**	-
Institution (/Country)	ALA (American Lighting Association) (USA)	**Type of institution**	National Association
Webpage	https://alamembers.com/Professional-Education/CLMR		

Course title	**Lighting Controls Professionals Certification Program**		
Provision of diploma / degree	-	**Degree level (EQF 4 – 8)**	-
Open to lifelong learning	Yes	**Duration**	-
Accreditation	-	**ECTS / ECVET points associated**	-
Institution (/Country)	NALMCO (interNational Association of Lighting Management Companies)	**Type of institution**	Certification Body

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Webpage	https://www.nalmco.org/NALMCO/Certification/CLCP /NALMCO/Certification/CLCP.aspx?hkey=8bbdd874-a402-45e1-98a7

5.5 Overall training provision findings

Totally 125 training programs related to lighting were identified and analyzed. The main numbers related to them are presented in Table 45. Overall we see that the vast majority of them are below EQF 6 or not aligned with the European Qualifications Framework.

	Totally	France	Germany[12]	Greece	Italy	Other
Training programs identified	125	50	2	18	19	36
EQF 6 and above training programs	52	18	2	1	15	16
Below EQF 6 training programs or not aligned with the EQF	73	32	0	17	4	20

Table 45: Training programs related to lighting identified

Figure 62: Tag cloud of training programs titles

In order to visualize better their orientation, a tag cloud was created based on titles of the programs (Figure 62). We see that most programs have the terms “lighting” or “lighting design” in their title, followed by the term “architecture”. Interestingly, and contrary to the findings of the competences needs identified in the

[12] The reader should have in mind that the complete list of lighting-related training programs in Germany is not included in this version of the deliverable.

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previous chapters, there are not many training programs covering terms like “technology”, “green”, “entrepreneurship” and other. Therefore, training programs covering all this different agenda would be ideal for the market. A market that, as proven already, finds the currently available programs outdated or not aligned with the actual needs.

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6 Qualitative survey

Further to the quantitative survey, the ECOSLIGHT Partners conducted Interviews with representatives of the key stakeholders, i.e. Municipalities, Local collectivities, City Councils, Policy making bodies, Government organizations, Social partners, NGOs, International organizations, Associations, and Companies, or even with individual professionals on the sector of lighting design, aiming to identify (a) the key characteristics of lighting professionals, (b) the demand for job role profiles in the sector, and (c) the skills, training and qualifications required for those professionals.

Totally, the ECOSLIGHT project partners conducted 40 interviews with key stakeholders in France (8), Germany (10), Greece (10) and Italy (12), during the spring of 2021. Most of the interviews were conducted online due to the pandemic.

6.1 The lighting professional

First, the respondents were asked to describe a lighting professional. The key characteristics identified are the following (per country).

FRANCE Key characteristics of lighting professionals

- No longer a simple lighting designer: the professional will move towards data, and use his network to allow “doing something else”. He will quietly move towards data and how networks will make it possible to "do something else".
- You could think of a lighting professional as a lighting designer, but that's not all. Lighting has so many facets. There is the lighting design part which is often put forward, but there is the whole chain upstream: product design, sizing of installations. And the downstream part: sustainability and maintenance. A lighting professional has knowledge of basic lighting, but also project design, maintenance ...
- The nightlife of a community has always been, until now, forgotten in the development of public space. City planners are not trained to think about the city at night. There is a problem with the design and vision of a planner in a community. We need professionals because, in recent years, we have seen real revolutions in this field. We have been using gas-discharge sources for a very long time, we have switched to LED luminaires, and we are very solicited by environmental associations concerning light pollution. In the 90s, we were in a policy of "who could do the most, could do less" and not in a policy of just enlightening. Lighting has become more and more complicated, which is why we need lighting professionals.
- Someone who already knows the different units, what lighting design is. He is also familiar with all the regulations and standardization around “good lighting”. It's not just about enlightening, but just enlightening. There is a growing interest from professionals in lighting studies, due to regulation and standardization, so that for each project and each installation, a level of illumination must be confirmed in order to illuminate well. It is also necessary to show potential energy savings compared to old installations.
- A lighting professional is someone trained in lighting, with permanent upgrading, respecting standards and decrees. But also a spokesperson for users and users.
- A lighting professional is very customer-oriented. You have to be very attentive to the customer, know what their problems are and what their needs are, and then advise them well. There are two main areas of activity in lighting which are installation and maintenance. The role of project manager and design office is very important in the choice of equipment and implementation, in compliance with standards and in its commitment to the preservation of the planet. Maintenance is a bit of the poor cousin of the installation that is often overlooked, although very important in keeping the equipment alive.
- He is someone who masters the technical, aesthetic and environmental aspects of light, who has a very broad knowledge of the field of light. A bad professional is someone who is too technical, too biased, and an overly quantitative / prescriptive approach that takes precedence over the qualitative. The good professional is a professional who takes the "why am I doing this?" Approach. »: For whom, what uses? The good lighting professional isn't too keen on standards, books, diagrams, manuals, and who feels like a human being, and who has empathy. In the other direction, a bad lighting professional is one who creates his work for himself.
- We feel it at the level of solicitations on the subject: upsurge on different themes. Today's lighting professional needs to master other subjects. He must both be very professional in his field: mastering the basic technical and technological aspects of lighting and innovations. But also to master everything that appeals to photometry, to be able to respond to the challenges of the people who request them, and in particular the communities. Having a vision that goes beyond the field of lighting: implications

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on the subjects of black frames and light pollution, impacts on the energy issue, innovation, smart city. More and more project integrator profiles: we must no longer only take into account the principle of street lighting.

Key messages from France:

- Lighting professionals exploit the potential of digital technologies.
- Lighting designers are changing incorporating more tasks in their duties.
- Lighting has become more complicated and demanding.
- Knowledge of regulation and standardization.
- Customer-oriented.
- Mastery of the technical, aesthetic and environmental aspects of lighting. Not only technical.

GERMANY: Key characteristics of lighting professionals

- Qualified training/studies in electrical engineering
- Lighting design, Designer-oriented
- Good Autocad, Dialux etc. Knowledge
- Interest in lighting technology
- Knowledge of the current technical lighting standards
- Knowledge of the benefits and effects of light in the environment
- Technical application (lighting flat and street)
- Light architecture
- Application of finished products
- Economic suitability test
- Basis: Solid technical lighting training to understand causal relationships, luminosity, spectrum, reflection laws and technology. THEN subject-specific application. Understand product portfolio.
- Lighting and electrical engineering knowledge (basics)
- Product Manager (Commercial)
- Market analysis / price calculation
- Focus on people (impact, need)
- Enjoyment of the activity
- Environmental aspect
- Basic electrical engineering training
- Feeling for lighting (lighting design)
- Architecture (e.g. church lighting)
- Lighting technician (design-heavy)
- Application, Specific Basic Training
- Street lighting Light sources Broad
- Subject-specific For area of application
- Good Autocad, Dialux etc. Knowledge
- Knowledge of thermal management
- Shaping and design
- Basic electronic knowledge (lighting technology 90% LED technology)
- Optional market knowledge
- The lighting professional should be very familiar with the generally applicable standards and guidelines.
- Furthermore, he should be able to handle one of the leading light calculation programs with confidence.
- He must also be fit in the area of control and smart home.
- Light Is always holistic through visual perception
- Subject limited
- Mastering Human and Technical Basics
- Art and the human
- Qualified training/studies in the field of electrical engineering
- Solid knowledge of lighting and control technology
- Digital sensitivity and existing IoT affinity
- Knowledge of the benefits and effects of light in the environment

Key messages from Germany:

- Knowledge of lighting design, light architecture, electrical engineering, and technical application
- Knowledge of software tools (e.g. Dialux, Autocad, etc)
- Knowledge of technical lighting standards and technologies (e.g. LED, smart, IoT, etc.)
- Knowledge and application of products, market knowledge
- Environmental aspect of light
- Human aspect of light

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GREECE: Key characteristics of lighting professionals

- Insights into the technical lighting requirements (luminous efficiency, luminous effects, etc.)
- Understanding of the correlation between supply and demand
- Creation of unique and innovative lighting solutions that respond to each client's aesthetic and budgetary needs.
- Adopt and promote environmentally conscious lighting solutions.
- Apply enhanced aesthetic criteria.
- Show flexibility and agility.

Key messages from Greece:

- Understanding of the market
- Technical lighting requirements and solutions
- Aesthetics
- Environment

ITALY: Key characteristics of lighting professionals

- A lighting professional is an individual expert or a company that operates in developing the lighting design of an ambient from a technical and decorative point of view.
- Lighting advisor that knows how to respond to the market demand thanks to his/her (or its, in case of a company) technical, artistic, normative competences and know-how, as well as the ability to listen to the needs of customers, offering assistance with willingness, dedication and sensitivity.
- A lighting professional is a technical figure specialised in proving innovative lighting solutions.
- A lighting professional is a specialist in lighting design able to tackle different kind of contexts, from internal solutions (houses, farms, gym) to public spaces (squares, streets...).
- A Lighting professional knows the effects of light in various environments.
- He has clear ideas about the colour temperature and colour rendering of light sources. He knows the luminous efficiency and the luminous flux of the various sources. He masters the lighting effects on coloured surfaces.
- A lighting professional is an individual professional or a company that operates in conceive the lighting design of an ambient from a technical and decorative point of view.
- Practitioner in the architectural and interior lighting design, with confirmed skills in developing the lighting project for the customer and the related lighting design concept in line with the needs and vision of the client and the characteristics of the building / apartment /outdoor area.
- A lighting engineer working to improve the beauty and efficiency of inner and outer spaces.
- Managers in the field of lighting design able to deal with projects in sustainable development field.
- Lighting Technicians and Installers able also to maintain and repair lighting systems.
- Commercial professionals, who also have a technical preparation which allows them to sell products.
- A lighting professional know the dynamics of the light and uses them to the different needs of the users.
- A lighting professional should be acquainted with all aspects of lighting and should cover different areas of expertise.
- A lighting designer must be passionate, live light as a life experience, because light is all that surrounds us, light is safety, light is life, so (s)he must live this experience with maximum enthusiasm, emotion.

Key messages from Italy:

- Development of lighting design according to the ambient from technical and decorative points of view
- Knowledge of market and customers' needs
- Development of innovative solutions, adapted to different contexts / environments (inner, outer spaces, etc)
- Various roles operating in the field, including managers, lighting professionals, lighting advisors, lighting engineers, practitioners, lighting technicians, installers, commercial professionals, etc. having different areas of expertise

Overall, **the contemporary lighting professionals must have extensive knowledge and understanding of the market and the customers' needs. They must also have knowledge of software tools, the technical requirements of lighting, the environmental aspects, and the aesthetics. Over and above, the lighting professionals' tasks agenda is expanding to multiple domains creating particular demands from them.**

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Next, the interviews tried to identify the missions and tasks that a lighting professional should be able to accomplish.

FRANCE: Missions and tasks a lighting professional should be able to accomplish

- You have to combine HTL, data, security, safety, etc. Lighting is made for seeing: ecological ideologies make one think mostly of either "bugs" or of the sky, but we must not forget that humans are also part of biodiversity. The right lighting professional needs to find the right slider for good lighting.
- It all depends on what level it intervenes, and what its field of activity is. It can also intervene in the design, sizing, electronics, installation, project management assistance, sustainability, etc. There is a whole chain of trades.
- Process design / research: help in defining needs, which products can correspond to needs, etc.
- Installation: how to implement them technically, have them carried out, etc.
- Sustainability: how to maintain them over time
- First of all, to define the lighting strategy in his community, to share it with thematic elected representatives, who can be from different public policies: safety, tourism, environment, economic development, etc. Design is very important: how to design a lighting installation according to the defined policy. Preserve and manage the facilities with a "good father": you must neither under-invest nor over-invest, but invest just. You don't have to invest everything all at once and end up 15 years later with an aging installation. Take care of your heritage with technical and regulatory skills.
- The professional's mission is to find the best location, the best choice of lighting in terms of equipment, visual comfort, while taking into account the energy savings in the context of renovations, for the best user comfort.
- Study a lighting project after listening and defining the need, optimizing it or proposing alternatives. Training mission in the basics of lighting.
- A professional can be:
    - Assistant to the Contracting Authority: helps the client who does not have a lot of skills in the field of construction, in the construction of markets, in the choice of professionals to implement or operate an installation.
    - Project manager: technically oriented, well aware of standards and regulations, and technically constructs the project, in terms of installation and maintenance
    - Installer: install the equipment in accordance with the rules of the art
    - Material supplier: supplies compliant material
    - Maintainer: public lighting equipment is expected to have a lifespan of 30 years. If left unattended, it can last less than 10 years.
    - Operator: energy consumption ...

or group several tasks

- The lighting professional should arrive early in the lighting project, upon diagnosis. Architects and other trades call lighting professionals too late after plans are made. We are no longer in an anticipatory and preventive approach, but in an approach where we fix the problems, we compensate. He must understand the uses, intelligently interpret the standards, have a civic commitment.
- Advice: need for advice in communities
- Effective technical support: sometimes not as optimal as one might hope
- Promotion of good practices: identify and help people move towards good lighting practices
- Normative and regulatory
- Anticipation of changes: today, we too often give a purely lighting response when we know that we must anticipate the city of tomorrow, the smart city. The city must be questioned about its future needs when proposing lighting: connections, sensors, pooling of light points. But the municipalities are not always ready to hear this discourse.
- Integrated diagnostic concepts: integrate energy, environmental and smart lighting issues into all of the issues.
- Take into account the evolution of uses: we can go further in the reflections
- Notion of advice and openness to communities.

Key messages from France:

- There are many different roles of lighting professionals, depending on the area they provide their services, e.g. strategy, management, design, installation, compliance with regulations, etc.
- There role is crucial early in the project, starting with the needs identification.
- They have to provide advice to the communities and the customers / stakeholders.
- Smart lighting is an emerging issue among their tasks.

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GERMANY: Missions and tasks a lighting professional should be able to accomplish

- Mission: to make the best possible use of light in terms of safety, ambience, environmental impact and energy saving according to the latest lighting technology findings.
- Task: Create lighting solutions to meet requirements, taking into account the relevant standards and environmental aspects.
- Too technical, e.g. thermal, environmental, outdoor- indoor lighting.
- Viewing light as a whole (from development to the end of the project)
- Bringing optimal light to the right place
- Comply with legal requirements
- Note Estetik
- Environmental aspect
- Specialist, lighting designer
- Application right
- Simulations
- Sales / Marketing (also career changers)
- The lighting professional should always work independently of the luminaire manufacturers and always use the appropriate luminaires for the respective project without losing sight of the costs.
- For the lighting professional, the focus should always be on the optimal lighting solution.
- Objective / Holistic view
- Current / Regulations / Light nuisance / Emission
- Ongoing research
- To maximise aspects such as safety, well-being and environmental impact for the benefit of people with suitable lighting solutions.

Key messages from Germany

- Legal standards, safety and requirements
- Address the environmental aspect
- Provide optimal lighting solutions

GREECE: Missions and tasks a lighting professional should be able to accomplish

- Serve each project's technical requirements effectively.
- Deeply comprehend human-centric and energy efficiency needs.
- Accomplish an efficient combination of technical capacity and cost-efficiency.
- Incorporate energy efficiency principals and "green" ideas.
- Apply techniques and methods of high aesthetic criteria.
- Pursue on-going learning and keeping up with emerging trends and practices.
- Prompt and timely delivery of consistently high-quality products and services.

Key messages from Greece

- Implement solutions effectively and efficiently
- Implement solutions according to cost and energy efficiency

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ITALY: Missions and tasks a lighting professional should be able to accomplish

- Everything starts from an idea, namely the lighting project. First the intuition of the lighting "request" must be captured from the client and transformed in the light design project itself. From these idea and intuition of the lighting professional, supported by an in-depth analysis and feasibility study, a specific concept of the light project is elaborated that must then be brought to completion - realized and installed.
- Lighting designer, shall combine technical skills in lighting, electronics and architecture / design with a strong artistic component.
- Lighting professional shall accompany a client from the idea through design and effective realization of the lighting solution.
- Lighting designer has to cooperate with the architect in charge from the very beginning of the project because the quality of spaces must be considered in the design phase.
- Impartial professionals offering quality solutions.
- The lighting professionals must be able to integrate its competences in the team of professionals involved (engineers, electricians, plumbers…) under the coordination of the architect. They need to offer the clients clear project complete and integrated in all its parts.
- Mission: provide a professional lighting design solution.
- Make a lighting project that gives visual comfort.
- Take into account the consumption and the lifecycle of the lighting fixtures.
- Elaborate the lighting design of an ambient and give customers support in the selection.
- Identify lighting requirements (esthetical).
- Identify lighting requirements (technical).
- Elaborate one or more lighting solutions to the customer.
- Give support to tuning of the lighting fixtures.
- Understand and transform the client's needs and the building features into the lighting design solution with respect to the current legal and technical regulations, and functional to the target space.
- Consider the people well-being and positive impacts that the lighting solution may provide.
- Provide advice throughout the light design and implementation process.
- Developing the complete design project and the related documentation along with the final commissioning.
- Improve the beauty and efficiency of inner and outer spaces.
- Creating lighting solutions with a low environmental footprint
- Realising lighting solutions taking into account the needs and characteristics of people.
- Realising lighting solutions having as their objective the safety and health of people.
- Realising solutions which adapt themselves to the general conditions of the environment in which they are present.
- A lighting professional should improve the people life through the "good light", an expression which includes aesthetics, economics and functionalities.
- A lighting professional has to study a tailor-made dress for the person in front of him/her. Have to understand the customer or the organisation who commissions the work and understand him/her, maybe advise him/her, be a guide, make tests, and then study the solutions with shades of light. The important thing is to establish a connection with the person commissioning the work, to understand where you want to go. The economic aspect should be taken into account, clients should develop awareness about that.
- A lighting professional should be able to innovate, improving designing in the field.

Key messages from Italy

- Accompany the client from inception of the idea, including the identificaton of lighting requirements, to the implementation of the lighting solution, collaborating with the engaged professionals (e.g. architects)
- Lighting designers must combine technical, electronics, architectural and artistic skills, so as to provide optimal professional lighting solutions
- Take into account the needs and the characteristics of the people, the environment, and the ambience (place)

In general, **there are many emerging roles of the lighting professionals, depending on the area / level they provide their services. Among the most crucial is their role in the identification of the needs of the customer, taking into account the lighting regulations, the environment, the needs and the characteristics of the people and the ambience. Overall, lighting professionals should be able to provide /**

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support the provision of optimal and professional lighting solutions, effectively and efficiently, respecting regulations, budgeting and the maximizing energy efficiency.

Next, the interviewees were asked to describe the market demand for lighting professionals.

FRANCE: Market demand for lighting professionals

- The motto is "We owe you more than light" and we are right in it. Indoor lighting should be managed like outdoor lighting with IOTs, with smartphones at the center of purchasing, guidance etc. We must include other professionals in the reflections of projects: doctor, electrician ... because we can do more things together. Lighting is first and foremost a team game.
- As a community, the support of lighting professionals is necessary to carry out projects. You have to find the right information and implement it so that the installation meets the needs defined by elected officials. Lighting professionals are needed at all levels, right from the design phase. Ditto for the work and maintenance part.
- Due to the revolution of the last 10 years and the arrival of all LEDs, there is a lot of interaction between lighting and other themes: environmental, road safety, development of active modes, etc. Lighting must accompany policy changes. Professionals are absolutely necessary to understand and integrate these different dimensions in the development of projects.
- As manufacturers of luminaires, the company sells directly to installers. Among these installers, we find all levels of knowledge in lighting. Some companies have dedicated design offices, others don't. These companies that do not have dedicated design offices are generally unfamiliar with standards and regulations and, for these people, it makes sense to pass something on to them done by a professional in the trade.
- The company carries out more than 8,000 study projects per year: it can only exist through skills and experiences shared between professionals and customers.
- The customer is not knowing, and does not necessarily have skills in the field of lighting. He must therefore be supported by people who can help him build calls for tenders, choose good companies and good installers. Lighting is a profession with economic, security and environmental issues. On each subject the responsibility of the Customers or our company can be engaged. By relying on professionals, the risks are understood and the good faith of the person responsible is recognized. In addition by participating in professional circles, our knowledge of the trade progresses along with technology and the rules of the art for the greater benefit of everyone.
- The lighting design community needs trained people, and in France there is no lighting design school. There are specialties in some schools, either design, or architect, or engineer, or schools of applied arts. Then the young people are trained on the job in the agencies. This allows teams to be very versatile with profiles that complement each other. On the other hand, it is painful to take someone new to an agency because the apprenticeship is very long. It is considered that a bac + 5 takes 3 to 4 years to be efficient in the field.
- We work on everything relating to public space and city life, and therefore also at night, which raises questions of urban mobility, accessibility, urban strategy, quality of use of the public space, energy, various types of pollution… All of these issues must be integrated into the reflections of the public space. On the customer side, local authorities are looking for technical and methodological support, but not necessarily linked to this or that company / manufacturer. So they are looking for independence.

Key messages from France

- The human capital market of the lighting sector needs to collaborate with professionals from other sectors as well. New products (e.g. LEDs) have created the need for interaction with other areas, e.g. public spaces and cities, environment, road safety, etc.
- Lighting professionals must be engaged to projects even from the design phase. There is a need for designers with knowledge on standards and regulations.
- Lighting relates to economics, security and environmental issues. The lighting professionals must be able to support their clients to select the right products and professionals (e.g. installers), etc. The community needs trained professionals to advice it, provide technical and methodological support.

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GERMANY: Market demand for lighting professionals

- They expect energy-efficient, cost-effective lighting solutions that meet standards and requirements.
- The given room must be illuminated accordingly according to standard specifications
- Filling personal wishes with light
- Operation or planning
- Planning: Must know the requirements in operation and vice versa
- Basic lighting knowledge
- Traffic planning in public space
- Product selection for clean operation (quality, logistics, cost taxes insurance)
- Electrotechnical knowledge
- Mechanical knowledge
- Construction activities
- Business Administration
- Customer management
- Distribution
- Indoor service (product range)
- Target customers (street lighting, quality management)
- Consulting / lighting design (no lighting design, only secondary aspect)
- Experts at the supplier
- Professional articles / lectures
- Lighting Design (TU Ilmenau)
- Experienced lighting designer
- Electrical engineer
- Mix of skills
- Electrical engineering / fun at work
- Knowledge of human nature
- Company: Competence vis-à-vis other companies in the field of light
- Customers: Service and support to be able to cover more difficult projects without own special expertise and to make more competent statements to the end customer.
- Court Opinion
- Flora Fauna
- Current status
- Competent, agile, trustworthy, progressive contacts paired with energy-efficient, intelligent and economical lighting solutions.

Key messages from Germany

- Professionals able to deliver solutions meeting standards and requirements
- Advice and support the customers in product selection
- Knowledge on various related topics (electrotechnical, mechanical, business administration, construction, suppliers, etc)
- Knowledge on indoor and outdoor lighting
- Need for lighting designers and professionals with mix of skills

GREECE: Market demand for lighting professionals

- Solid theoretical background
- High aesthetic criteria
- Assimilation of new technologies
- Environmental awareness

Key messages from Greece

- Solid theoretical background
- High aesthetic criteria
- Assimilation of new technologies
- Environmental awareness

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ITALY: Market demand for lighting professionals

- The current clients are more and more demanding. They are aware of new technologies, innovation or green solutions, and are more confident in expressing their aesthetic preferences and requests. Considering it, today lighting professionals (lighting designers) must act as a tailor that make a suit according to our needs, and define the light project in a tailored-made measure.
- Environmental awareness with customised solution (and reasonable cost).
- Timely delivery.
- Human centric lighting approach, combining natural and artificial lights - strict cooperation with architects.
- Use of new technologies and digital solutions both for light design, application and marketing.
- Respect of technical regulations and national laws.
- Technical skills.
- Green skills.
- Business and economic skills.
- Understanding how to create light through luminous products, mainly from an aesthetic point of view (especially important for interior design).
- Training from an economic point of view is required (especially for lighting in the industrial and sports fields), in order to create structures that make profits with a low investment.
- It is essential also a knowledge of all the existing legislation in terms of lighting.
- Furthermore, it is very important that those who work in this area know how to carry out the lighting checks and commissioning.
- Finally, a good knowledge of how to install the designed and built systems is required.
- The technician should be the one who should raise awareness, make proposals to the customer or the entity that commissions him/her.

Key messages from Italy

- Define and implement tailored made solutions according to the customer needs, which is quite aware of the state of the art.
- Have digital, green, business and economic and human centric lighting skills
- Knowledge of the legislation, the regulation and standards

Overall, **the market needs professionals who are able to collaborate with other professionals (outside from the sector), knowledgeable on standards and regulations, and engaged to the projects early enough so as to advice customers on the available products and solutions. A mix of skills is required. Professionals should have digital and green skills, aesthetics and environmental awareness.**

6.2 The job role profiles

Next, the interviewees were asked to estimate the level of demand for a list of indicative job role profiles (actually a group of tasks) in the next five years. They were asked to provide their estimations in the following table.

	Low demand		Moderate demand		Strong demand
	1	2	3	4	5
Light Pollution & environmental impact of Lighting Specialists	☐	☐	☐	☐	☐
Human-Centric Lighting Specialists	☐	☐	☐	☐	☐
Road Lighting Safety and Lighting Security Specialists	☐	☐	☐	☐	☐
Smart Lighting system Specialists	☐	☐	☐	☐	☐

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Lighting Designers	☐	☐	☐	☐	☐
Other (please specify):	☐	☐	☐	☐	☐

The results per country are as follows:

FRANCE	**Interviews**							**Quantitative survey**
	1: Low demand	**2**	**3: Moderate demand**	**4**	**5: Strong demand**	**AVG**	**4-5**	**4-5**
Light Pollution & environmental impact of Lighting Specialists	0.0 %	0.0 %	12.5 %	12.5 %	75.0 %	4.6	87.5 %	46.5 %
Human-Centric Lighting Specialists	0.0 %	0.0 %	50.0 %	25.0 %	25.0 %	3.8	50.0 %	23.9 %
Road Lighting Safety and Lighting Security Specialists	12.5 %	25.0 %	25.0 %	12.5 %	25.0 %	3.1	37.5 %	33.8 %
Smart Lighting system Specialists	0.0 %	0.0 %	12.5 %	62.5 %	25.0 %	4.1	87.5 %	54.9 %
Lighting Designers	12.5 %	12.5 %	50.0 %	12.5 %	12.5 %	3.0	25.0 %	26.8 %

The interviews confirmed the results (sequence) of the quantitative survey, rating as serious the need for Light Pollution and environmental impact of lighting specialists and Smart lighting system specialists. On the other hand, the need for lighting designers was lower than the need for Human-centric lighting specialists, which is reversed towards the results of the quantitative survey.

GERMANY	**Interviews**							**Quantitative survey**
	1: Low demand	**2**	**3: Moderate demand**	**4**	**5: Strong demand**	**AVG**	**4-5**	**4-5**
Light Pollution & environmental impact of Lighting Specialists	0.0 %	10.0 %	10.0 %	30.0 %	50.0 %	4.2	80.0 %	63.6 %
Human-Centric Lighting Specialists	10.0 %	10.0 %	30.0 %	10.0 %	40.0 %	3.6	50.0 %	63.6 %
Road Lighting Safety and Lighting Security Specialists	0.0 %	20.0 %	20.0 %	10.0 %	50.0 %	3.9	60.0 %	54.5 %
Smart Lighting system Specialists	10.0 %	0.0 %	0.0 %	20.0 %	70.0 %	4.4	90.0 %	72.7 %
Lighting Designers	10.0 %	10.0 %	20.0 %	30.0 %	30.0 %	3.6	60.0 %	63.6 %

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The results are also confirmed in the case of Germany, despite the low participation to the quantitative survey. Minor differences are observed.

GREECE	Interviews							Quantitative survey
	1: Low demand	2	3: Moderate demand	4	5: Strong demand	AVG	4-5	4-5
Light Pollution & environmental impact of Lighting Specialists	0.0 %	20.0 %	20.0 %	30.0 %	30.0 %	3.7	60.0 %	46.2 %
Human-Centric Lighting Specialists	0.0 %	20.0 %	20.0 %	60.0 %	0.0 %	3.4	60.0 %	46.2 %
Road Lighting Safety and Lighting Security Specialists	10.0 %	20.0 %	10.0 %	60.0 %	0.0 %	3.2	60.0 %	52.6 %
Smart Lighting system Specialists	0.0 %	20.0 %	10.0 %	30.0 %	40.0 %	3.9	70.0 %	67.8 %
Lighting Designers	0.0 %	10.0 %	30.0 %	50.0 %	10.0 %	3.6	60.0 %	47.4 %

Overall, in Greece we observe the highest demand to correspond to Smart lighting system specialists, and a lower demand for human-centric lighting specialists and Road lighting safety and lighting security specialists.

ITALY	Interviews							Quantitative survey
	1: Low demand	2	3: Moderate demand	4	5: Strong demand	AVG	4-5	4-5
Light Pollution & environmental impact of Lighting Specialists	9.1 %	9.1 %	45.5 %	27.3 %	9.1 %	3.2	36.4 %	47.7 %
Human-Centric Lighting Specialists	9.1 %	0.0 %	27.3 %	27.3 %	36.4 %	3.8	63.6 %	43.2 %
Road Lighting Safety and Lighting Security Specialists	0.0 %	9.1 %	36.4 %	18.2 %	36.4 %	3.8	54.5 %	56.8 %
Smart Lighting system Specialists	0.0 %	9.1 %	0.0 %	45.5 %	45.5 %	4.3	90.9 %	65.9 %
Lighting Designers	0.0 %	0.0 %	27.3 %	27.3 %	45.5 %	4.2	72.7 %	52.3 %

Despite the differences in the percentages, we see that the interviews in Italy confirm partially the findings of the quantitative survey in Italy, retaining the Smart Lighting System Specialists as the most demanded one, with minor differences in the rest of the role profiles. Overall, in Italy we observe a very high (4,3/5 and 4,2/5) demand respectively for Smart Lighting Systems Specialists and Lighting Designers, and a

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moderately important demand (3,2, 3,8 and 3,8) correspondingly for Light Pollution specialists, Human-Centric Lighting Specialists and Road Lighting Safety and Lighting Security specialists.

Overall, the findings of the qualitative survey on the job role profiles confirm in generally the findings of the quantitative survey.

6.3 Education and training for lighting professionals

In this section of the interviews, the interviewees were asked on the education and training levels and needs of the emerging lighting professionals.

FRANCE: Education level of the emerging lighting professionals

- The basic level is an IT electrical engineer. But for chiseled lighting, you need artistic and emotional qualities. The professional must perceive the lighting, the environment and the desires.
- Today, at least a bac +2 in electrical engineering. Ideally, bac +5 in electrical engineering, with knowledge in general electricity and power electronics.
- Specialist in lighting for maintenance: Bac pro electrotechnics
- Maintenance supervisor: a little more management, BTS / DUT
- Lighting operator, who monitors the operation of lighting on a perimeter: BTS / DUT
- Installation designer: engineer (ex ENSIP engineer)
- You need at least a higher education (bac + 2 / + 3), because of course the whole lighting environment is important, but a lighting designer is also a bit of an electrician, industrial designer and must have a fairly wide range of skills.
- It would take someone who knows about electricity, and has a background in mechanics and photometry. All of this can be learned, particularly through AFE training, but in addition to basic training.
- Bac +5, engineer, applied arts, designer, architect ... Below, there are problems in the design of projects, and have not acquired enough methods to manage multi criteria: town planning, optics, consumption balance, biodiversity, uses, etc.
- The approaches are too basic and not innovative enough when you have a profile of less than 5 years of study.
- Engineer level, "multi-profile" which is both technical but also knows optics, photometry, other issues (energy, environment, social, etc.) A little less commercial, and more in the advice. It is more necessary to be an accompanist of the client.

Key messages from France

- Lighting professionals typically are electrical engineers or similar with some years of experience (min 2 years, ideally 5 years). They also have knowledge on specific topics.

Lighting professionals in France typically are electrical engineers or similar with some years of experience and knowledge on specific topics.

GERMANY: Education level of the emerging lighting professionals

- Requirements and diversity in the field of lighting technology are continuously increasing. A completed degree is therefore desirable. All current standards must be known. Sensitisation to the issues of safety and environmental impact of light is important. Under all these aspects, the requirements and wishes of the customer must be taken into account, in terms of budget.
- University studies
- Lighting design studies at a university of applied sciences
- Further training opportunities
- Large technician and master craftsman (via electrical engineering track)
- Special topics through external support
- Depending on the task explicitness
- Electrician for simple tasks
- For lighting design / more complex tasks University degree (non-university)
- Study architecture or lighting engineering / electrical engineering
- Many years of experience journeyman / luminaire construction

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- From my experience, a completed technical education in the electrical sector is useful, as we have to deal with controls and complex circuits, line lengths, inrush and outrush currents, etc.
- A degree in lighting technology is an advantage, but not essential.
- Training (experience through practice)
- Dual study
- Qualified training/studies in the field of electrical engineering
- Solid knowledge of lighting and control technology

Key messages from Germany

- Lighting professionals typically have a university degree, especially architecture or electrical engineering, and specific training. They also have experience, mainly through the Dual system.

Lighting professionals in Germany typically have a university degree, especially architecture or electrical engineering, and specific training. They also have experience, mainly through the Dual system. In general, the education requirements for lighting professionals in Germany are more open.

GREECE: Education level of the emerging lighting professionals

- University degree in a relevant field with a focus on physics, optics, electricity
- Basic and advanced principles of lighting -interior and exterior environment
- Practical training and design on lighting projects

Key messages from Greece

- Lighting professionals have a university degree in neighbouring sectors plus specific knowledge through practice.

Lighting professionals in Greece have a university degree in neighbouring sectors plus specific knowledge through practice.

ITALY: Education level of the emerging lighting professionals

- University degree in architecture and/or design with a specific master/specialisation course on light design
- In general, all lighting professionals, not only lighting designers, shall take care of their specific professional training (and upskilling), which must include:
  - The design of light (theory and technology)
  - Types of lighting and lighting solutions
  - New technologies and innovative materials
- A lighting professional should be electrical engineers or an architect with a short (6 months) training course of specialisation
- They should be architects with a post graduate specialization course. He/she has to know how to project lighting solutions but based on a solid understanding of architectural knowledge and sensitivity.
- The education must be medium / high but does not require the possession of a Master degree. A specialization course in the lighting design remains essential.
- Architect/engineer degree and a specialisation in lighting design (master of other private courses). The required degree should be high to have a good knowledge of technical skills but with a specific curriculum on lighting design.
- University degree in architecture, engineering or directly in lighting design (if exists)
- A senior role: he should be able to consider social and technological issues, public welfare, and organizational wellness
- Human and social background
- Engineering qualification level, also in the environmental field (Bachelor and Master degree)
- Design qualification level (Bachelor and Master degree)
- Technical background (secondary school diploma)
- It depends on the role of the specific professional. For the Lighting Designers or Specialists, Master's Degree (for example in Architecture, Cultural heritage, etc.); for the professionals who concretely realize these systems, Diploma of Higher Education. Many of the people I interact with for work have acquired their knowledge "in the field", because the university does not offer training on some of the topics of lighting.

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- Definitely a diploma and then a further course of specialization, such as an ITS (an EQF 5 specialisation course in Italy), 3 years, or a bachelor's degree, but a course specifically focused for all the 3 years on lighting.
- S/he must know the photometric quantities and what one expects from a specific lamp.
- A lighting professional may have strong theoretical knowledge, and collaborate with a team of engineers that put an Idea Into practice
- A lighting professional should have a diploma and a specialisation course, focused on practical matters.
- A lighting specialist should take courses in companies that produce lighting materials. These are the people really well trained and skilled in this field.

Key messages from Italy

- Lighting professionals typically have an EQF 5 or EQF 6 (university) degree (e.g. in architecture, design, engineering) and specialization (or additinal training) on lighting design or other lighting-related topics. Usually, they do not need a Masters but only to have attended a specialization course.

Lighting professionals in Italy typically have an EQF 5 or EQF 6 (university) degree (e.g. in architecture, design, engineering) and specialization (or additinal training) on lighting design or other lighting-related topics. Usually, they do not need a Masters but only to have attended a specialization course. In Italy, recognizing the lack of adequate education programs in the higher and professional education levels, as well as the only recent proliferation of lighting professionals in the construction and neighboring sectors, interviewees were asked to identify the type of training expected for lighting professionals.

Overall, the lighting professionals in the four countries typically have a university degree in a relevant field (e.g. engineering, architecture), plus some specialization through training or practical experience.

Next, the interviewees were asked to identify the training expected for lighting professionals.

FRANCE: Training expected for the lighting professionals

- There isn't one diploma that combines everything you need to be a good lighting designer: town planning, electrical engineering, data ... Only training that complements the skills. There is a lack of training modules at the service of schools to transmit knowledge.
- On the market, unfortunately, we meet too general profiles: engineering schools, urban planning. But lighting is not a science that can be learned in the classroom, but through professional experience. Basic knowledge of electricity and power electronics is required. With these same bases, we can work equally well in industry, in the service sector or in lighting. Specialization in relation to the chosen profession is very important.
- Electrical training base to understand each other, understand the problems of installations, networks, operations. Lighting design training, then AFE training. There is a lack of lighting specialists among the prime contractors. Often they are only road and sanitation specialists. Lighting is still the last thing too often. It is also necessary to master intelligent lighting, sensors… knowing how to install, manage and maintain them.
- There are school training focused on lighting, but also environment and electricity. What we are looking for are training provided by AFE, or IFEP, which are the specialist entities in lighting. If a candidate has this kind of training, it is always a guarantee of security.
- For commercial profiles, the level of mastery in lighting, similar to the training courses in the AFE catalog, is the minimum level to have to correctly understand a lighting project: you cannot go to a project owner without a minimum of skills. For technical support, in factories or in the field, it is necessary to go one step further. For example, we are very consumers of young graduates from ENSI Poitiers.
- Electrical skills for safety issues and energy savings
- Lighting skills for better service to the public
- You have to light up just enough: neither too much nor too little. We must bring the light where it is needed.
- Little is taught in the related fields of light. Lighting designers benefit from being both very good technicians and having an aesthetic vision. There are too many professionals who think that the quantitative approach prevails. They don't like the quantitative approach. Some lighting projects that can be very expensive and look great on paper but are ugly in the middle and don't feel good. While it is essential to feel good in a light. But light is not quantifiable, it is subjective, so less taken into account.

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- "Multi-profile" vision with transversal skills.
- Notions of the human sciences, and the social aspect of lighting which is often neglected and yet which is coming back to the fore.
- Questions related to the provision of natural lighting
- Environmental issues
- Renewable energies
- Road safety
- Energy impact

Key messages from France

- Basic knowledge of electricity (electrical training) and power electronics is required
- Specialization in relation to the profession is demanded
- Skills on lighting and lighting design, intelligent lighting, electrical skills for environmental / energy saving and safety issues, transversal skills, human sciences, social aspects of lighting
- Level of skills: mastery versus technical support

In France, a set of different type of skills is demanded for the emerging lighting professionals, varying from lighting and green skills, to digital, transversal, human sciences and social aspects of lighting related. But, a basic knowledge of electricity is required. Morever, the professionals are categorized in two levels: masters (e.g. managers) and technicians.

GERMANY: Training expected for the lighting professionals

- At least good training in technical field or completed studies.
- Question how far does the training go or where does it come from?
- Product-oriented further education, more in the direction of master craftsman
- Practical training
- Studies & Further Education: Light, Electronics, Biology
- Craftsman / electrical engineer good basic requirement
- Businessman in the lighting technology track
- Study Lighting Technology
- Additional training
- Lighting designer
- Light pollution UNI
- Completed technical training in the electrical field
- Advanced training and recognised certification
- LITG - Training to become a lighting professional

Key messages from Germany

- Two levels of professionals: Businessmen vs. Technicians (craftsmen)
- Training in the technical field
- Practical training
- Certification

In Germany, as in France, two levels of professionals are recognized and guide the training: businessmen and technicians (craftsmen). Training in the technical (electrical) field is demanded, accompanied with practical training. Last, certification is demanded.

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GREECE: Training expected for the lighting professionals
• The training should incorporate and ensure “green and responsible” lighting design practices. • The training should offer advanced levels of lighting design training and instil professionalism to designers. • The training should help individuals gain industry recognition and market exposure. • The training should help individuals understand and communicate the “emotional” impact of a lighting design. • The training should address growing regulatory concerns and trade-related issues.
Key messages from Greece • Green and responsible lighting design practices • Emotional impact of lighting design • Standards and regulation • Market knowledge

In Greece, the significance of green skills, lighting design skills, emotional impact, standards and regulation and market knowledge are recognized.

ITALY: Training expected for the lighting professionals
• Constant professional training and periodical updates regarding new technologies (smart technologies, digital solutions - home automation connected systems), technical regulations and market trends. • The training course should cover at least the following aspects: technical solutions (lighting sources), smart solutions, home automations, digitalisation, administrative/certifications aspects • Training to increase the knowledge of administrative regulations, especially if he/she collaborates with public bodies, and techniques: certifications, new technological solutions (LED, smart solutions, IOT…) • Deep knowledge of the architecture of lighting fixtures • Specific training on: photometry; lighting design; lighting fixtures architecture; human physiology • New technical regulations (like eco-design, architectural normative etc.), new technologies and market requests (what clients expects and what are the new trends) • Technical problem solving • Human-centred approach to lighting design • Engineering design of outdoor solutions • Engineering design of efficient and sustainable lighting systems • Policy, certifications and regulation • Economic lighting models • What are the dynamics of the light and how to use the characteristics of the light for our scope; the aesthetics elements of the light; the economic aspects in the lighting sector
Key messages from Italy • Training on digital (e.g. smart, home automation) technologies • Technical regulations, market trends and demands • Lighting technical solutions, lighting skills, lighting design skills, architecture, economic models • Human-centered approach to lighting design, aesthetics • Certification

In Italy, the training expected relies mostly on digital technologies (e.g. smart), technical regulations, market knowledge, development of specific types of skills (lighting / lighting design skills, technical solutions, architecture, economic models, human aspects of lighting design, aesthetics, etc). Certification is required.

Overall, the professionals, and the respective training, orients higher level professionals (e.g. managers) and technicians. Skills related to digital and green technologies, lighting skills, human aspects of lighting

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and on standards and regulations is required. Eventually, all these trainings must be accompanied with certification.

Next, the study proceeded to the required qualifications for lighting professionals.

FRANCE: Qualifications for lighting professionals
• Nomadic qualifications, because the lighting is everywhere and nowhere at the same time. A lighting professional must have a certain sensitivity, but also be technical, and have an ecological approach. • There is a lack of professional qualifications today to be able to respond to consultation papers. Anyone can improvise as a lighting masterpiece without necessarily having very advanced knowledge of lighting design. • If there are AFE or IFEP levels, that's interesting. • Use of a common and common language in lighting: popularization of the vocabulary for a customer with little experience to explain the technique. • Double profile not easy to find: the professional must be very comfortable both in writing and orally. There is a very important literary and artistic part, the professional must be good at drawing, for all that he must also be good at calculation and technique. • Often, the professional is either very comfortable with optics and calculation, who know how to model very well, make impeccable technical sheets and power balances, but very uncomfortable with drawing a lighting plan. Conversely, some people are very good at drawing and writing beautiful texts that win contests, but struggle with the technical side. In addition, a good lighting professional has knowledge of group project management and with other trades: dialogue, patience, etc. • We must be able to give a technical and technological response to the owners, and at the same time be able to provide other visions, more methodological and strategic responses.
Key messages from France • Lack of professional qualifications • Lack of hybrid professionals, able to operate in written and orally, disposing also lighting and artistic skills (e.g. drawing)

In France, the responses were not clearly related to qualifications; the lack of professional qualifications on the sector was recognized, and identified the need for professionals that have a mix of skills (lighting, artistic, speak and write using the proper terminology.

GERMANY: Qualifications for lighting professionals	
• Spatial imagination • Technical understanding • Interdisciplinary, planning thinking • Solution-oriented working method • Communication skills, sense of responsibility, ability to work independently • Spatial thinking • Drawing skills • Aesthetics & Spatial Imagination • Design Perception Effect & Architecture • Technical understanding / efficiency • Social competences / communication skills (solution finding) • Interest in technology / physics • Open and solution-oriented • Estetics & Spatial Imagination • Technical understanding • Feeling for light • Application-specific • Estetics & Spatial Imagination • Technical understanding / efficiency	• Basic mathematical understanding • English language • Aesthetic sensibility • Spatial idea • Cultural interest (lighting design) • In addition to the above-mentioned education, a flaible for architecture and sensible or advantageous. • Several years of professional experience in the commercial area of a luminaire, lamp or component manufacturer can also serve as a basis for becoming a luminaire professional. • Spatial imagination • Social competence (perceptiveness, understanding of ideas / needs) • Technical affinity, energy efficiency and sustainability • Interdisciplinary, planning thinking • Organisational talent with an independent and solution-oriented way of working • Sense of responsibility and good communication skills

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Key messages from Germany

- Instead of qualifications, skills and competences identified
- Spatial imagination / thinking
- Technical understanding / efficiency
- Aesthetics
- Solution oriented
- Social competences / communication skills
- Sense of responsibility

In Germany, instead of qualifications, particular skills and attitudes were identified. The most popular ones were Spatial imagination / thinking, Technical understanding / efficiency, Aesthetics, Solution oriented, Social competences / communication skills and the Sense of responsibility.

GREECE: Qualifications for lighting professionals

- Design skills
- Digital skills
- I am not aware of the specific qualifications that lighting professionals shoud acquire but I can mention the sections that in my opinion should be covered. These sections are: Electrical practices/principles, Light Pollution, Energy-Saving Lighting Solutions and Exterior & Interior Lighting principles
- A lighting professional should be appropriately educated in specific fields of lighting with evidence -based assessments. Additionally, it is neccessary to regularly attend educational seminars from accredited institutions and participate in one or more lighting programs and associations.
- In addition to the basic education in lighting-specific fields, it is necessary to acquire postgraduate specialization oriented in the emerging trends in the field of lighting and to attend seminar training
- I am not aware of the specific qualifications that are required but I can share my opinion that a lighting professional should have some basic knowledge around specific lighting subjects like Energy Efficiency and Residential and Urban lighting industry, including industry trends, technology and technical developments.
- People that are in charge as lighting professionals should be participating in one or more lighting programmas and associations on country and European levels.

Key messages from Greece

- Training in fields of lighting (e.g. Energy efficiency, lighting principles, technologies, etc)
- Postgraduate oriented to lighting
- Seminar training

In Greece, again the qualifications required were also not clearly defined; but, the need for training (mostly seminar training from dedicated stakeholders (e.g. associations) was underlined. These trainings should orient to specific topics related to lighting (e.g. energy efficiency).

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ITALY: Qualifications for lighting professionals

- Master course after the university graduation
- Secondary school diploma could be enough if correlated to a specific training on lighting design
- Master Degree in Industrial Design, Architecture or Engineer. A specialization training is required
- Master degree + professional certifications issued by renowned sector organisations
- Bachelor and Master degree
- Sectoral qualifications are more and more required, in particular in the electronic field
- EQF5 specialisation course, plus on-site experience

Key messages from Italy

- Master Degrees (EQF 7) accompanied with specialization training and certification
- EQF 5 specialization courses accompanied with practical experience
- Secondary school diploma (EQF 4) plus specific training

The results of the Italian interviews were much more clear in respect to the required qualifications for lighting professionals; EQF 4 was set as a minimum, while EQF7 as a maximum. All of them should be accompanied with specialization trainings.

Overall, the required qualifications for lighting professionals typically vary from EQF 4 to EQF 7, in various domains related to lighting. Further (specialization) training is also required. In all cases, practical experience is essential.

Next, the interviewees were asked the identify the requires digital skills for lighting professionals.

FRANCE: Digital skills for lighting professionals

- A good lighting professional must be able to install lighting with data: detect failures, flows, set up a network ... He must also be proficient in IOT software.
- The use of office tools: spreadsheets, word processing. Mastery of professional photometric and electrical sizing software… these are the minimum skills to have. In terms of advanced skills, this is the programming of lighting devices, the use of specific devices (luxmeters, push devices, network analyzers, etc.).
- Someone who knows low voltage, telecommunication networks, communication protocols (DALI, DMX…, other protocols, and GIS for lighting mapping and CMMS operation.
- Today, IT has become central to the business. You have to master basic IT tools: the office pack, internet research. In terms of advanced skills, 3D modeling plan tools that allow you to go further in project design are interesting to master.
- Mastery of lighting software (Dialux, Relux ...)
- A good professional must know the standards and regulations in force. He must know how to read these standards and interpret them correctly.
- He must know how to install and maintain equipment. He must know the material with the advantages and disadvantages.
- He must also have a good knowledge of computer music.
- All drawing and CAD software, 3D. Someone who knows Dialux is a big plus.
- Tomorrow, a lighting designer will need to know what LoRa is, Bluetooth, that the lighting network must be able to communicate with Bluetooth. It requires at least mastering the language and how it works. An essential communication aspect. Proficiency in all applications and software, Lifi, etc.

Key messages from France

- Basic digital skills (e.g. word processings, spreadsheets, etc)
- Basic digital skills for lighting (e.g. photometrics)
- Advanced digital skills (IoT, programming of lighting devices, luxmeters, networks, protocols, 3D modeling, standards, etc)
- Knowledge of lighting software and techniques (e.g. Dialux, Relux, etc)
- Technical knowledge (e.g. installations)

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France respondents identified the need for basic and advanced digital skills for lighting professionals, as well as the knowledge for particular lighting software.

GERMANY: Digital skills for lighting professionals
• Dealing with all digital media and platforms. • Software to apply light according to standards • Mobile devices • Digital processes • Simplifying the work • Digitise a shitty process and you've got a shitty process. • Basic knowledge of software programming • Must be mass compatible and simple. One System. • Cloud data Cloud-based topics • IT Security • Luxmeter / illuminance and light measurement (connection with Excel) • Sometimes own software • Smart CRM System • Citavi (technical article) • Dialux / Relux • App for lighting control Casambi • Commercial • Internet skills • Excel (Commercial Digital Skills) • Basic digital understanding • Systems are becoming increasingly digital and lighter • Industry question • No software programming • Niche Technical Programmes Dali, DMX, Casambi • Very good knowledge of common lighting calculation programs, proficient in Office programs and user programs of individual luminaire manufacturers. • Dealing with digital platforms • Data networks / IoT
Key messages from Germany • Basic digital skills (e.g. word, excel, etc) • Advanced digital skills (IoT, data networks, cloud, digital platforms, software programming, IT security, luxmeters, standards, etc) • Knowledge of lighting software and techniques (e.g. Kassambi, Dialux, etc)

In Germany, lighting professionals have to have basic and advanced digital skills, and knowledge of lighting software.

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GREECE: Digital skills for lighting professionals
• Lighting simulation software • CAD software • Graphic design and Presentation tools
Key messages from Greece • Lighting software • CAD software, presentation tools, graphic design

In Greece, special emphasis was given to the knowledge of lighting and design software.

ITALY: Digital skills for lighting professionals
• Skills in graphic representation of lighting design, so use of CAD and Revit programs • Specific programs, then, that allow the creation of three-dimensional representations (3D, BIM), animations and very detailed models of the light project • For commercial use also all the AR and/or VR solutions (virtual showrooms, etc.) • Lighting simulation software • Radiosity software in case of advanced simulation • Calculations for eco-design labels/certifications • Creating digital contents • Problem solving (e.g., needs identification and technological responses, creativity through digital technologies, etc.) • User-centred design tools and methods (user research) • Identification of user requirements • Support to the user during the interaction with a system • Sensors and type of signals (how to communicate the button, application, sensor, etc. to create specific effects for specific situations) • (S)he should be able to use rendering software • About basic digital competences, (s)he should be able to use the internet so to carry out research on good practices and existing structures. • Lighting professionals should have basic digital skills, as well as being able to use simulation softwares, so that they can get acquainted with the job related processes and procedures before going out In the field.
Key messages from Italy • Knowledge of design software • Advanced digital technologies (e.g. AR, VR) • Lighting specific software • Problem solving digital skills • User-centered design • Sensors, signals • Basic digital skills

In Italy, the need for basic digital skills for lighting professionals was underlined, together with the need for lighting specific software and technologies.

Overall, the need for basic and advanced digital skills, as well as the knowledge of lighting related software were underlined in all project countries.

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Next the study examined the need for horizontal skills for lighting professionals.

FRANCE: Horizontal skills for lighting professionals

- He needs situational intelligence to adapt to audiences and projects. Commercial ability to guide and define needs and problems.
- Lighting is a transversal profession, it is one use among others. It takes a commercial element, a lot of discernment, adaptability and flexibility vis-à-vis the audience.
- In a community, have a sense of public service, the general interest before the particular interest, openness, know the functioning of communities, public contracts, the legal aspect. Understand the impacts of artificial lighting on biodiversity (fauna, flora, humans). Be a teacher to transmit the skills necessary for understanding lighting.
- As said above, the lighting designer is also a bit of an electrician, architect and industrial designer. All of these skills, or knowledge in those skills, are good for moving forward in a faster or more focused way, the projects that one has.
- Control of the standards in force on a daily basis, the standards in force must be perfectly known. Mastery of lighting software (Dialux, Relux ...)
- Know the expectations of the public as well as the issues related to the actors of the profession.
- You have to know the legislative framework: what is a tender, a CCTP, how does a contract work today. A good level of written and oral expression to present projects, and the humility and modesty of being at the service of an architect or a landscape designer.
- Concept of being able to combine their main lighting competence with subjects other than communities or other project owners on environmental, energy, social issues, etc.

Key messages from Italy

- Skills related to communities
- Commercial skills
- Audience related skills
- Standards and regulations
- Public services

In France, the need for skills related to communities, the market, the audience, the standards and the provision of public services were identified.

GERMANY: Horizontal skills for lighting professionals

- Engineering knowledge
- Interior lighting, exterior lighting
- Specialised knowledge in technical fields
- Architecture / Lighting effect
- Summer / Winter Concept via City
- Basic training
- Understanding the visual process
- Effects
- Basic electrical engineering knowledge
- Basic thermal knowledge
- Mechanics
- Physics of light Lux, lumen, candela
- Good commercial understanding, mobility, confident and cultivated appearance, confident dealing with customers and suppliers, willingness to undergo further training.
- Gift to describe the light
- Design skills
- Lifelong learning

Key messages from Germany

- Lighting specific knowledge and skills
- Engineering knowledge

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- Design skills
- Commercial understanding

In Germany, the horizontal skills identified cannot be classified as soft skills, but mostly technical skills oriented to the lighting, accompanied with market knowledge.

GREECE: Horizontal skills for lighting professionals
• Deep knowledge of lighting technical requirements • Good communication skills • Economic perspective to achieve cost-efficiency. • Teamwork • Agility in assimilation of new technologies and trends
Key messages from Greece • Lighting technical skills • Communication, teamworking • Economics

In Greece, the horizontal skills identified include lighting (technical) skills and soft skills (e.g. communication, teamworking).

ITALY: Horizontal skills for lighting professionals
• Ability to listen to client's "idea" • Capacity to study and deepen the argument • To share and discuss internally with the company lighting team • Ability to dialogue and work with the whole value chain - architects, designers, installators, contractors, etc. • Skills in the photographic field • Artistic sensibility • Capabilities of synthesis between technical requirements and economic requirements of the lighting projects • Capacity to combine elements a way that the lighting solution works in harmony with other features of the space, so that the effect of lighting is seamless with the presentation of the architecture or the environment • Ability to select the most appropriate technical elements like the source of light, optical control and distribution of light, the luminaires, management of natural light, electrical monitoring and control, architectural detailing, etc. to ensure the requested lighting result and further enhance or valorise the visual beauty of the building / apartment / outdoor area and make it appealing • Empathy, communication and collaboration • Critical thinking • Design thinking approach • Communication and promotion, know how to communicate the light to the customer and the Institution • A professional must know the photometric quantities, the main rules of engineering, mathematics, calculation, history, a pinch of architecture would not hurt, because you find yourself working with historical monuments of different periods, which could be illuminated differently. • Team working skills are essential. • Spirit of initiative is essential.
Key messages from Italy • Communication and collaboration • Idea development and justification • Analysis and synthesis • Critical thinking • Sense of initiative

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In Italy, horizontal skills identified are classified more as soft skills, including communication and collaboration, analysis and synthesis of ideas and solutions, critical thinking and sense of initiative.

Overall, the horizontal skills for lighting professionals identified in all project countries include mainly lighting related (technical) skills, commercial skills, audience and community analysis and development, communication and collaboration.

6.4 Additional findings and conclusions

Last, the interviewees were asked to provide any additional comments that considered them as valuable, and denote their willingness (a) to participate in ECOSLIGHT training interventions, (b) recommend colleagues / employees to participate to ECOSLIGHT training interventions, and (c) host trainees for the ECOSLIGHT work-based learning.

FRANCE: Additional findings

1. Participate in ECOSLIGHT training interventions: Yes (5), Maybe (3)
2. Recommend colleagues / employees to participate to ECOSLIGHT training interventions: Yes (5), Maybe (3)
3. Host trainees for the ECOSLIGHT work-based learning: Yes (2), Maybe (4)

- There are too few educational and initial training related to lighting. Newly hired people have the technical background of an electrician and electrical engineer, but rarely the background of lighting. AFE remains the only source of dedicated lighting training, along with IFEP and a few schools.
- Difficulty of considering how the Ecoslight trainings will not overshadow the already complete AFE trainings. But curious to see the progress of the project.
- Note: Today, there are big investments being made in France in the renovation of lighting. We do not think about the potential of this new technology, in relation to questions of communication, remote management, intelligence in lighting and more that we can put in the street. Many cities have saved energy, but could have optimized investments in this perspective. Much remains to be done to convince communities to provide "communication" mechanisms. We must anticipate the future without costing a fortune. Behind this, we need a professional subsidiary that optimizes the advice, which is efficient in terms of technological and methodological support ... everyone must walk in the same direction, hence the importance of training.

Key messages from France

- Most interviewees would like to participate and invite others to join as well the ECOSLIGHT training interventions
- The majority of them is willing or sceptical to host trainees for the ECOSLIGHT work-based learning
- Few trainings related to lighting
- Increase collaboration and convince communities for the renovation of lighting.

In France, most respondents would like to participate and invite others to join as well to the ECOSLIGHT training interventions, and the 75% may or for sure host people for the ECOSLIGHT work based learning. Interestingly, not many trainings are available for lighting. There is a concern about how to engage and convince communities to join and accept to implement lighting projects.

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GERMANY: Additional findings

1. Participate in ECOSLIGHT training interventions: Yes (4), No (3), Maybe (3)
2. Recommend colleagues / employees to participate to ECOSLIGHT training interventions: Yes (4), No (3), Maybe (3)
3. Host trainees for the ECOSLIGHT work-based learning: Yes (2), No (5), Maybe (3)

- Lighting technology greatly changed by the introduction of LEDs
- Formerly spread in education
- Today only LED
- Smart Lighting only made possible by LED
- Approach directions: (a) Architecture, Development / Production, Operation, (b) Develop thematic fields for this, (c) Master or university note, (d) Design / Bridge construction / Statics
- Consult Chamber of Crafts
- Question architecture
- Consult VDE (lighting for municipalities)
- Legislation / environmental aspects
- Before LED lighting technology: (a) Classic lighting technician, (b) Artist – Technique,
- Data sheets - Light as an emotional
- Seminars free of charge from wholesale companies

Key messages from Germany

- Most interviewees would like to participate and invite others to join as well the ECOSLIGHT training interventions
- The half of them are willing or sceptical to host trainees for the ECOSLIGHT work-based learning
- The introduction of LEDs improved seriously the lighting sector and enabled the use of smart technologies
- Support and advice policy makers and regional stakeholders

In Germany, most respondents would like to participate and invite others to join as well to the ECOSLIGHT training interventions, and the 50% may or for sure host people for the ECOSLIGHT work based learning. LED technologies changed the landscape of lighting creating particular demands and opportunities for the sector and its human capital. Lighting professionals should engage actively to consultations with policy and regional stakeholders.

GREECE: Additional findings

Lighting professionals are expected to be well-educated individuals that acquire a concrete knowledge of the technical requirements related to the lighting field while using the latest technology products and software that facilitates and enhances the lighting design. Furthermore, it is necessary to have upscale communication and teamwork skills as they constitute an integral part of a team consisting of different specialists, from architects to interior designers and engineers. Lastly, professional lighting designers bring solid technical acumen and sensitive design technique to architectural and landscape projects by applying energy - efficiency trends and sustainability ideas.

A few important fields of interest considered to be crucial for lighting professionals are the following:

- Environmental footprint (ecosystem, recycling, life cycle estimation,
- Energy Efficiency & Lighting Efficiency,
- Lighting for outdoor installations (Cities, Stadiums, Airports, Tunnels, etc.) including street lighting, street lighting,
- Artificial Lighting / Daylight Implementation
- Understanding and promoting sustainable lighting (techniques, systems, practices)
- Understanding the evaluation of the viability of lighting systems and solutions: objectives, methodologies, standards

Last, 20 % of the interviewees declared that they are interested in participating in ECOSLIGHT training interventions, the 100 % stated clearly that they would recommend to their colleagues or employees to participate to ECOSLIGHT training interventions, and the 10% that their organization is capable and would like to host trainees for work-based learning!

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Key messages from Greece

- 20 % of the interviewees declared that they are interested in participating in ECOSLIGHT training interventions, the 100 % stated clearly that they would recommend to their colleagues or employees to participate to ECOSLIGHT training interventions, and the 10% that their organization is capable and would like to host trainees for work-based learning!
- Modern lighting professionals have to have good knowledge of technologies and requirements, communication and teamworking skills, and design skills.
- Lighting professionals have to dispose green skills, skills related to outdoor lighting, and sustainability of lighting.

In Greece, not many interviewees declared that will participate to the ECOSLIGHT trainings, but will recommend it to colleagues and a minority of them will be able to host trainees for the work-based learning. In general, lighting professionals in Greece have to have good knowledge of technologies and requirements, communication and teamworking skills, and design skills, as well as green skills and sustainability knowledge.

ITALY: Additional findings

- Specifically, I do not have the idea of "many professional figures", I picture an expert in lighting (science of light) that has general knowledge, plus the opportunity to deepen and specialise in one of the above-mentioned fields.
- 75% of the interviewees declared that they are interested in participating in ECOSLIGHT training interventions, the 100% stated clearly that they would recommend to their colleagues or employees to participate to ECOSLIGHT training interventions, and the 42% that their organization might be interested to host trainees for work-based learning!

Key messages from Italy

- 75% of the interviewees declared that they are interested in participating in ECOSLIGHT training interventions, the 100% stated clearly that they would recommend to their colleagues or employees to participate to ECOSLIGHT training interventions, and the 42% that their organization might be interested to host trainees for work-based learning!

In Italy, most **respondents would like to participate and invite others to join as well to the ECOSLIGHT training interventions, and the 42% may be interested to host people for the ECOSLIGHT work based learning.**

In general, and in all project countries, there was a serious interest in participation and advertising the upcoming ECOSLIGHT trainings, with the commitment to host trainees for work-based learning being a bit decreased; a finding expected as more information on that is required.

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7 Gap analysis and conclusions

7.1 Key findings and gap analysis

One of the objectives of the ESCOLIGHT (Environmentally Conscious Smart Lighting) project was to understand the human capital market of the lighting sector, and subsequently identify the competences required as well as particular job role profiles related to smart, energy efficient and sustainable lighting environments for infrastructure, cities, buildings and industries (including construction sector) in order to respond to the market needs for Environmentally Conscious Smart Lighting professionals.

To achieve this objective, questionnaires have been developed within ECOSLIGHT Project and interviews were conducted with sector stakeholders in France, Germany, Greece and Italy. The purpose here was the collection of additional data for analysing needs regarding lighting-related training in order to create modular VET curricula (EQF 5) based on the learning outcomes approach and the adult learning principles in order to develop lighting design skills that bring together lighting design and smart technologies, as well as skills that take into account ecological and human-centric issues on lighting systems in the connected world. At this point we have to underline again that the quantitative data received from Germany were limited and do not allow for generalization of results for the country; but, the data obtained through the interviews confirm in most cases the limited results received.

The sector in general employs mostly young people, less than 50 years old, who face the challenge of career advancement, and according to their age they will be more open and volunteer to participate to professional development activities. The ¼ of the respondents to the quantitative survey were self-employed, whereas the half of the individual professionals participated are employees. From the companies that participated, the 63% of them were SMEs, while Eurostat data indicate that the construction sector is seriously dominated by SMEs. Interestingly, we understand that the lighting sector in Europe is dominated by quite larger companies (mainly SMEs) than the rest of the (construction) sector. Moreover, the survey found that the professionals will be called to work mainly in Small and medium enterprises with manufacturing facilities.

Concerning the skills of the respondents, the vast majority of them declared moderate to very high in all areas of skills, i.e. lighting related skills, digital skills, life skills, entrepreneurial skills and green skills, with the digital skills lacking a bit behind in respect to the other types of skills. Respondents also assessed as high to very high their own or their company ecological engagement. Interestingly, large companies present higher ecological engagement than SMEs and quite higher than very small companies; therefore, one may claim that policy makers and country policies should focus more on increasing the ecological engagement of smaller companies, identifying in parallel the reasons for this discrepancy. On the country level, companies in France and Italy seem to be characterized by larger ecological engagement than in Greece and Germany, a finding that it is absolutely contrary in the case of the professionals of those countries! Overall, we observe a very increased ecological engagement of companies and professionals active in the lighting sector. Moreover, State representatives in France, Greece and Italy denote moderately to high indications concerning government initiatives setting up environmental policies, as the market requests for environmental protection or energy saving. Similar results, with the exception of Greece that presents moderate results, are declared for the environmental engagement of those organizations.

Apart from that, special analyses were conducted in respect to the human capital of the lighting sector. Both the quantitative and the qualitative survey revealed a lack of training programs related for lighting professionals, with the quantitative survey indicating also that the currently provided trainings are not

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adapted to the scholar level of the professionals or even being outdated. Moreover, all project countries seem to face a limited problem (with the exception of Italy) with the availability of job vacancies in the sector due to the lack of adapted academic curricula. Therefore, it is obvious that new training programs are required for the professionals of the lighting sector, adapted to their scholar level, and oriented to the current and emerging needs of the lighting sector activities.

Continuing in this logic, the study examined also the availability of trained lighting professionals. Near the half of the respondents indicated that it is difficult of very difficult to find the suitable trained staff, a finding that it is also confirmed by the interviews. In line with that, the 56 % of companies, the 46.7 % of individual professionals, the 36.4 % of governmental organizations and the 66.6 % of non-governmental organizations participated to the quantitative survey consider difficult to very difficult to find the suitable trained staff for their lighting related activities. Following the analysis of the received responses in the questionnaire, we observe that it is difficult to find suitable trained staff in the lighting sector that fulfils the sector's requirements and this is true for any country. Looking further on the reasons of shortage of lighting professionals, the responders clearly pointed-out the lack of required skills followed by fact that "naturally" only few professionals are available in the job market. Salary level offered to lighting professionals is also somehow foreseen as an additional jam. Interestingly, it seems that Southern Europe suffers from lack of skills whereas northern Europe suffers from lack of staff! **Therefore, there is a proven need to develop / train professionals for the lighting sector**.

In respect to the type of professionals currently employed to the sector, we saw that it employs them mainly in the roles of managers, R&D engineers (i.e. scientists with MSc level and above), Lighting professionals (with engineering background), Lighting designers (with artistic background), Technicians (Lighting technicians, installers and associate professionals), technical-commercial staff, and other specialties. In the next five years, the sector will need mostly Lighting Professionals with engineering background followed by Lighting technicians, installers and associate professionals, Lighting Designers with artistic background and R&D engineers / scientists. Apart from the Lighting designers with artistic background and the technicians (which typically correspond to the EQF level 5), the rest fold in EQF 6 and above. The qualitative survey indicated that the education level of the current professionals folds mainly EQF 6 (university degree in a relevant field) and above, plus some specialization through training or practical experience. The interviews also underlined that the required qualifications for lighting professionals typically vary from EQF 4 to EQF 7, in various domains related to lighting. Further (specialization) training is also required, with practical experience being essential. **In this regard, and given the serious automation of the sector, ECOSLIGHT will try to support the demand for lighting professionals providing training in the EQF 5 level, accompanied with specialization and work-based learning. This approach totally fits to the demands of the sector, as it is identified through the quantitative and the qualitative survey**.

The skills shortages were identified as one of the prevailing reasons for the lack of lighting professionals; the quantitative survey surfaced that (a) Managers face a shortage mostly in eco-responsibility consciousness and green skills, in engineering or technical skills and lighting related skills; (b) R&D engineers / scientists (MSc-level) and Lighting professionals with engineering background face a shortage firstly in artistic skills, and secondarily in entrepreneurial skills and insufficient workplace experience; (c) Lighting designers with an artistic background face a shortage of insufficient workplace experience and entrepreneurial skills; (d) Lighting Technicians, Installers and Associate Professionals face a shortage mainly in artistic skills, followed by eco-responsibility consciousness and green skills and digital skills; (e) Technical-commercial staff face a shortage of lighting related skills, followed by the insufficient artistic skills and eco-

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responsibility consciousness and green skills. The review of the currently available training programs in the four project countries revealed that (Table 45), there are currently 125 training programs available in the four countries, with the 52 of them orienting to the EQF 6 and above, and the 73 below EQF 6. A review of the curricula of these programs found the lack of training subjects in those training outlines (Figure 62) related to "technology", "green", "entrepreneurship" and the other types of skills mentioned above. **Thus, there is a need to develop training curricula for lighting professionals covering additional wider subjects apart from lighting. These will include lighting, digital, entrepreneurial, green skills, and human qualities. And in order to facilitate the mobilization and recognition, at least of these categories of skills will be based on well known and accepted skills and competences frameworks** (e.g. DigComp, e-CF, EntreComp, LifeComp, etc).

Next, the research conducted under the ECOSLIGHT project, examined the demand for particular job role profiles. These profiles are not established officially, and correspond more to roles (groups of tasks) operated in the sector. Of course, one person may implement more than one of these roles in a company. These roles (groups of tasks) introduced include the following:

1. Light Pollution & Environmental Impact of Lighting Specialists
2. Human-Centric Lighting Specialists
3. Road Lighting Safety and Lighting Security Specialists
4. Smart Lighting System Specialists
5. Lighting Designers

Results indicate that, in the next five years, there will be a high demand for Smart Lighting System Specialists, followed by Road Lighting Safety and Lighting Security Specialists, Light Pollution and Environmental Impact of Lighting Specialists, and Lighting Designers. The Human Centric Lighting Specialists are rated last among the pre-selected profiles, and one could think of merging it with another role profile, e.g. the Smart Lighting System Specialist. We remind the reader that, although these are defined as job role profiles, they consist in practice a group of tasks.

ECOSLIGHT Job Role Profile	Moderate to high demand (3-5) (excluding the N/A option)
Light pollution and environmental impact of lighting specialists	83.8 %
Human-centric lighting specialists	76.5 %
Road lighting safety and lighting security specialists	86.5 %
Smart lighting system specialists	92.7 %
Lighting designers	86.9 %

Figure 63: Demand for job role profiles in the next five years (excluding the N/A option)

Globally the interviews confirm the findings from the quantitative survey. However, the need also of having well trained professionals mastering the light pollution and environmental impacts of lighting seems to be an additional priority. On the country level, and taking into account also the interviews, is seems that Smart Lighting Systems Specialists will be of the most demand in all four project countries. In France, they are followed by Light Pollution and Environmental Impact of Lighting Specialists. In Germany, they are followed by Light Pollution and Environmental Impact of Lighting Specialists, Human-Centric Lighting Specialists, and

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Lighting Designers. In Greece and Italy, Smart Lighting System Specialists are followed by Road lighting safety and lighting security specialists.

Additionally, the research tried to identify the sub-sectors of the lighting market that will face a great demand for trained staff (on each one of the aforementioned job role profiles (i.e. groups of tasks) in the mid-term (next five years). Results indicate that Light Pollution and Environmental Impact Lighting Specialists will be needed more in the sub-sector of policy regulatory framework design, in consultancy, lighting studies, and lighting system manufacturing. Human-Centric Lighting Specialists will be demanded most in consultancy, policy regulatory framework design and lighting system manufacturing. Road Lighting Safety and Lighting Security Specialists will be needed mostly in lighting operation and maintenance, and lighting installations, while Smart Lighting System Specialists will be needed mostly in consultancy, lighting studies, etc.

Next, the study focused to the particular skills needs. The respondents of the quantitative survey were asked to identify the different skills needs in the level of (a) lighting skills, (b) basic and advanced digital skills (DigComp and e-CF compliant), (c) entrepreneurship skills (EntreComp), (d) life skills / human qualities (LifeComp), and (e) green skills. In the interviews, the exploration was more "open" and the respondents could declare specific titles of skills, providing more emphasis on lighting, digital, horizontal and green skills.

Concerning the lighting skills, the survey identified the following:

a) Lighting system and components technologies including smart lighting (indoor and outdoor): Light source, drives, fixtures, sensors, controls and metering
b) Light influence on human health, well-being and working performance (lighting ergonomics)
c) Indoor lighting for buildings and artificial lighting / Daylight integration
d) Environmental impact of lighting (ecosystem, recycling, life cycle assessment)
e) Energy efficiency and lighting performance
f) Lighting design and solving technical problems

Results indicate (and confirmed by the interviews) that there is a slight preference for skills on Lighting System technology (including smart lighting), skills on lighting ergonomics, indoor lighting / Daylight integration and environmental-related skills. It should be noted here that Economic models related lighting, Lighting policy, regulation, energy labeling, procurement, incentives and planning and End-user's behavior studies occupy the last positions; This may be surprising at a first glance, but there is a rational explanation on that: the lighting sub-sector of the Construction Industry employs massively Architects and in a large majority Architects either have good skills in these domains or are irrelevant with that leaving the implementation of relevant tasks to other engineers.

Concerning digital competences, the results of the quantitative survey indicate an increased need for the skills' areas 4: Safety and 5: Problem solving of the DigComp. Taking into account the detailed responses of the individual professionals, we observe increased need for the following competences:

- In the first area (Information and data literacy), *1.2 Evaluating data, information and digital content* is the most demanded competence.
- In the second area (Communication and collaboration), *2.4 Collaborating through digital technologies* and *2.1 Interacting through digital technologies* are the most demanded competences.

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- In the third area of basic digital competences (Digital content creation), *3.2 Integrating and re-elaborating digital content* is the most demanded competence.
- In the fourth area (Safety), *4.2 Protecting personal data and privacy* is the most demanded competence.
- In the fifth area (Problem solving), *5.1 Solving technical problems* and *5.2 Identifying needs and technological responses* are the most demanded competences.

Proceeding to the advanced digital competences (e-CF compliant), we observe that the highest demand occurs for the areas B. Build ICT, E. Manage ICT and A. Plan ICT. Delving into the details, through the separate assessments of the individual professionals, we see that,

- In the first area (A. Plan ICT), *A.9 Innovating* is the most demanded competence, followed by *A.4 Product/service planning* and *A.6 Application design*.
- In the second area (B. Build ICT), *B.1 Application development* is the most demanded competence, followed by *B.4 Solution deployment* and *B.6 Systems engineering*.
- In the third area (C. Run ICT), *C.1 User support* is the most demanded competence, followed by *C.4 Problem management*.
- In the fourth area (D. Enable ICT), *D.3 Education and training provision* is the most demanded competence, followed by D.10 Information and knowledge management.
- In the fifth area (E. Manage ICT), *E.3 Risk management* is the most demanded competence followed by *E.5 Process improvement*, *E.6 ICT quality management and E.8 Information security management*.

These results are more or less confirmed by the findings of the interviews. Especially for the advanced digital competences, the interviews revealed the need for digital skills related to the use of particular lighting-related software (e.g. Dialux), and the use of smart technologies, communication networks, sensors, etc. Of course these fold, even partially, under the aforementioned enlisted advanced competences.

In respect to the human qualities, see that most respondents selected the *Learning to learn* type of competences, which include *Growth mindset*, *Critical thinking*, and *Managing learning*. Concerning the entrepreneurship competences, into-action skills (e.g. Taking the initiative, Planning and management, coping with uncertainty, ambiguity and risk, Working with others, Learning through experience) dominate, followed by Ideas and Opportunities (e.g. Spotting opportunities, Creativity, Vision, Valuing ideas, Ethical and sustainable thinking).

Last, concerning green competences needs, the quantitative survey revealed that the most demanded in the lighting sector are the following:

- Understand and promote the value of sustainable lighting
- Understand the new sustainable lighting techniques applied to sustainable lighting
- Understand the sustainable assessment of lighting systems and solutions: purposes, methodologies, standards

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- Understand the circular economy approach to lighting sector: maintenance – reuse / redistribute – refurbish / remanufacture – recycle processes
- Understand the new sustainable / green trends in lighting and how to integrate the environmental / sustainability criteria in the lighting design process

Therefore, lighting professionals who wish to obtain a job in the Construction Industry sector should understand and promote the value of sustainable lighting and techniques, as well as to be able to understand the sustainable assessment of lighting systems and solutions. Understanding the circular economy concept is also expected, together with the new green trends in lighting. These results are confirmed also by the interviews, where the respondents stressed the importance of green skills and sustainability.

7.2 Conclusions

As literature search shown the Construction Sector is growing at international level, further new needs for trained professionals raise in the domain of smart systems in order to achieve energy savings and fulfil expectations of customers who are looking for a better quality of life and less environmental footprint. Lighting is part of this type of systems and well-trained professionals in this sector are urgently needed.

Taking into account all findings from ECOSLIGHT questionnaire and interviews as summarized in this document we can draw the following conclusions:

- Today, it is difficult finding suitable trained staff in the lighting sector that fulfils the sector's requirements and this is true for any country.
- Lighting professionals specialized in Smart lighting seems to be the top priority followed by lighting designers. A good knowledge on impacts of artificial lighting in the environment (light pollution and world resources savings) is also important.
- The needs may vary from country to country: France needs in priority light pollution specialists when Italy and Greece are looking for mainly for intelligent lighting system professionals.

Concerning the education/training of future lighting professionals, our study shown that the current offer is not in adequate within the needs of the Construction Industry, which considers that the training level is not adapted and existing training programs are outdated or just inexistent. Overall, in the four project countries, findings indicate that there is a need for training programs focusing (a) to smart lighting systems and smart-grids, (b) Street / Outdoor lighting, (c) Indoor lighting, (d) Fundamentals of lighting engineering and lighting design, and (e) Specialty lighting.

Concerning the disciplinary training needs for future lighting professionals expected by the sector the study shown that all proposed skills have been ranked at the higher level almost equally. This is logical because, lighting professionals, whatever is their specialization, need solid disciplinary background knowledge.

Lighting professionals who wish finding a job in Construction Industry sector in the next years also should understand and promote the value of sustainable lighting as well as all associated green trends in the domain. Understanding the circular economy concept is also expected. Having god knowledge on Information and data literature is important. Further, running and manage ICTs is plus for their profile. They should display some personal-level skills, like having ideas and being able to spot opportunities. Overall, all training programs and specializations should be accompanied with some form of practical experience.

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8 References

Amerlux Innovation Center. 2018. *LED Energy Market Observer.* Energy Observer: Energy Observer, August.

Bacigalupo M, Kampylis P, Punie Y and Van Den Brande L. 2016. EntreComp: The Entrepreneurship Competence Framework. EUR 27939 EN. Luxembourg (Luxembourg): Publications Office of the European Union; 2016. JRC101581

Carretero Gomez, S., Vuorikari, R. and Punie, Y. 2017. DigComp 2.1: The Digital Competence Framework for Citizens with eight proficiency levels and examples of use, EUR 28558 EN, Publications Office of the European Union, Luxembourg, 2017.

Cedefop. 2019. Skills for green jobs: 2018 update. European synthesis report. Luxembourg: Publications Office. Cedefop reference series; No 109. http://data.europa.eu/doi/10.2801/750438

CEN. European e-competences Framework 3.0 (e-CF). A common European Framework for ICT professionals in all industry sectors. Available at http://www.ecompetences.eu/

European Commission . 2020. *Press release - Renovation Wave: doubling the renovation rate to cut emissions, boost recovery and reduce energy poverty.* Brussels, 14 October.

European Construction Sector Observatory. 2018. Improving energy and resource efficiency. Available at https://ec.europa.eu/docsroom/documents/33121/attachments/1/translations/en/renditions/native

European Construction Sector Observatory (2019). EU construction sector. In transition towards a circular economy. Available at https://ec.europa.eu/docsroom/documents/34904/attachments/1/translations/en/renditions/native

Frost & Sullivan. 2017. «Analysis of the LED Lighting Market in the GCC, forecast to 2020, F&S Energy & Environment Growth Partnership Service program.»

Global Markets Insights. 2019. «Smart Lighting Market Analysis - Global Industry Share Forecast 2025.» online teaser, Report ID: GMI413.

Holoubek, Elisabeth. 2011. *Lighting Solutions for Austrian Building Construction Projects - A Customer Analysis.* Master's Thesis, Wien: WU Executive Academy.

LightingEurope. 2016. Strategic Roadmap 2025 of the European Lighting Industry.

LightingEurope. 2020. LightingEurope position paper on the roadmap on a circular economy action plan.

Mischke, Jan. 2020. *The next normal in construction How disruption is reshaping the world's largest ecosystem.* Zurich: McKinsey Global Institute (MGI).

National Surety Services Inc. 2020. *Predicting the Future: Construction Industry Job Skills to Recruit for Now.* http://nationalsurety.com/predicting-the-future-construction-industry-job-skills-to-recruit-for/.

Sala, A., Punie, Y., Garkov, V. and Cabrera Giraldez, M., LifeComp: The European Framework for Personal, Social and Learning to Learn Key Competence, EUR 30246 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-19417-0, doi:10.2760/922681, JRC120911.

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Statista. 2019. *Digital Market outlook: Comfort and Lighting, online database.* www.statista.com/outlook/392/125/comfort-and-lighting.

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