National Occupational Safety and Health Systems: exploring the underlying networks for future sustainable development

Abstract

Any intervention, initiative, or programme – whether implemented at the local or national level – builds upon existing infrastructure, which, if properly managed, enables sustainable development. Within this perspective, this study examines national Occupational Safety and Health (OSH) systems, specifically a set of European countries, by studying their dynamics through cross-national analyses and investigating their similarities and differences, fostering OSH improvement through new national strategies and possible collaboration between national entities. A secondary data analysis is conducted based on the OSHwiki database of the European Agency for Safety and Health at Work (EU-OSHA), which has a dedicated section on European national OSH systems. This database makes different countries easily comparable – under one single language and the same degree of granularity – which is not trivial if considering the other available primary sources. For a consistent sample, with a controlled heterogeneity, this study includes eleven European countries. An iterative inductive process of data comparison on national OSH systems is used to establish a suitable framework for data analysis. As a result, a range of fundamental functions and recurring bodies, covering – to different extents – the previously identified functions, constitute the framework, which are the most transversal functions for the selected countries. These findings provide valuable insights into how these functions are carried out differently across countries, detecting potential shareable best practices and improvement directions for the future sustainability of national OSH systems.

Keywords: occupational safety; occupational health; national systems; sustainable practices; research framework; functions

1. Introduction

Occupational Safety and Health (OSH) management means developing interventions and programmes for OSH improvement that aim to ensure and improve workers' well-being and safety as well as the health conditions at work. The roles and behaviours of individuals become critical to understanding the internal singularity of any organisation and to analysing the influence of individual actions on its performance and heterogeneity [1–3], without ignoring either interactions between individuals or the context of the organisations themselves [4]. The meaning of 'organisation' can be generalised to any type of group or network of people performing various activities that share common goals or duties, such as the national OSH systems considered here.

The International Labor Organization (ILO) after the ILO general conference in 2006 provided a definition of national OSH systems, which encloses the main aim of any system, highlighting the need for cooperation between different entities by stating 'in pursuit of a safe and healthy working environment for all workers, each country has to develop an effective national OSH system as a collaborative effort of the government and social partners' [5]. The ILO, in the Promotional Framework for Occupational Safety and Health Convention (no. 187) and Recommendation (no. 197), defined such systems as the integration of various elements, 'including legislation and compliance assurance mechanisms as well as a training and information network', which should be continuously improved through the formulation and implementation of national OSH programmes [5]. According to that, national OSH systems should include, among others, functions such as discussion of laws and regulations, compliance with national laws and regulations, insurance, information, advisory, and training, research, and statistics on occupational injuries and diseases [5].

Hence, a national OSH system can be seen as an infrastructure composed of individuals managing activities in different phases, which, if properly managed, represent a lever for improving the entire system and lead in the end to effective interventions at the workplace. As highlighted by Dyreborg et al. [6], advancing research in OSH towards more theoretical and strategic perspectives and investigating how to constantly improve its management at a system level would foster a positive impact on OSH interventions at an operational level. The recently issued International Organization for Standardization (ISO) 45001:2018 [7] aligns with this perspective, shifting its focus from individual system components to a comprehensive understanding of the socio-technical system, including multidirectional interactions and information flow throughout the system, actor networks and their interconnections, and the effects of internal and external factors and constraints [8].

Furthermore, as highlighted in the literature, enhanced coordination among OSH actors improves the effectiveness of OSH interventions [9–11]. The European Survey of Enterprises on New and Emerging Risks (ESENER) report [12] from the European Agency for Safety and Health at Work (EU-OSHA) emphasizes this aspect, stating that the 'presence (and involvement) of employee representation is a factor in ensuring that such OSH policies and action plans are put into practice'. Several authors [13–22] have recently investigated the roles of different OSH actors and their effects on the performance of national OSH systems by investigating the effects of their activities at the workplace and discussing their roles. A well-informed network of actors is indeed essential for sustainable and long-lasting OSH interventions [9,23]. Moreover, the broader landscape, influenced by various contextual elements, significantly shapes national OSH systems and differences in stakeholder involvement and functions [10]. Hence, organizations across nations must adapt to these requirements differently, thus necessitating customized strategies. However, a few literature studies, later detailed, have analysed national OSH systems, considering them as not questionable and unchangeable structures, since usually deemed country-dependent and closely related to national laws and regulations.

In this context, an effective strategy for analysing national OSH systems would be studying the developed activities as well as the individuals involved. It would be, therefore, crucial to understand the key functions and actors and improving

their interactions would become essential to creating an effective network. Consequently, the focus of this work is on the functions and the network of actors within national OSH systems, which are critical for their correct deployment at different levels (national, territorial, and enterprise) across countries. Therefore, this works wonders: *How do countries manage the OSH network through their national systems?*

The remainder of this paper is organised as follows. *Section 2* provides the state of the art of national OSH systems and ends with the research objective. *Section 3* proposes the methodology of the study. *Section 4* presents and discusses the built framework and major implications. *Section 5* draws conclusions by discussing the main contributions and limitations of this work.

2. Literature review

Discussions about national OSH systems are always tough, and scientific publications have been declaring the need for further investigation and improvement, but without taking up the challenge [10,24–26]. Slight evidence of national OSH systems, paving the way for further research, is presented in the following two subsections (*2.1* and *2.2*) and the last subsection (*2.3*) articulates the research objective of the study.

2.1 National OSH systems: key features

National strategies to prevent occupational injuries and diseases at the workplace are the most common reasons in the literature to discuss national OSH systems. Multi-year and continuous programmes to improve the OSH conditions in companies have been described and often compared with others, finding similarities, differences, and added value. Their characteristics are often assessed by considering two major components: accident statistical classification models and methods for work accident analysis to determine causes and, sometimes, specific actions for prevention (e.g. [27–31]). In this regard, Salguero-Caparros et al. [30] conducted an extensive review of the scientific literature to classify existing approaches for analysing occupational accidents, which identified that, although there is a broad range of approaches, most are industry-specific, making their applicability in cross-sectoral contexts more challenging.

According to De Merich [9], developing national health and safety plans to extract, analyse, and share accident-related causes is a promising option to create proactive national systems which are becoming urgent, especially for supporting effective preventative activities at Small and Medium-sized Enterprises (SMEs) and micro-companies, which activities are considered crucial for promoting sustainable economic growth on both local and global scales [32]. A misalignment of legislation, policies, organisational processes, interventions, and service practices with the characteristics, health, and safety issues of small workplaces is highly perceivable [33,34]. These companies have few human and economic resources to allocate for OSH prevention, and the low frequency of accidents contributes to underestimating the danger [35–41].

In addition to the discussion of national OSH strategies and programmes, a few other research streams have been identified covering national OSH systems from different perspectives. A brief overview is provided below.

A few documents have discussed the effectiveness of national systems, mainly for injury surveillance and enforcement of legislation [17,19,42–45], thereby revising mandatory activities in chief of any national OSH system. OSH inspections are an essential component of implementing health and safety legislation; hence, the impact of inspection activities should be assessed by introducing methods of evaluating national inspection systems [44]. The effectiveness of OSH enforcement lies in the ability of regulators to apply systematic OSH management approaches by considering the context in which organisations operate and how they respond to enforcement measures [44]. Therefore, OSH inspectors are expected to provide more advice to workplaces by supporting OSH managers and workers' OSH representatives [17]. Niskanen et al. [17] have suggested that professional competence is crucial for quality inspections; however, according to MacLean and Dror [19], 'expertise is not an effective safeguard from the systematic errors' that can be induced by different natural cognitive mechanisms of individuals [46].

Other works, from the same perspective, have focused on single entities of national systems (in selected countries) by reviewing their actions, such as unions and health and safety committees [16], territorial health departments [47], health and safety specialists [18], and OSH professionals [15,20]. OSH specialists should possess both technical and interpersonal skills [18]. Therefore, individual qualities are not sufficient; they should also build trust-based relationships with different actors, such as public authorities and field practitioners [18]. This is also a highly context-dependent profession in which the context (e.g. the nation, sector, or size) determines the actual practices carried out by OSH

specialists [18]. Considering OSH professionals, Sánchez-Herrera and Donate [20] stated that they often do not have enough authority over employees and firm managers on OSH matters and should receive further responsibilities, from acting as simple advisers to having an active role in the design and implementation of OSH activities at the workplace.

2.2 National OSH systems: cross-national analyses

A small cluster of detected documents compared the specific characteristics of national OSH systems with cross-national analyses. They aimed to study the national OSH systems of European Union (EU) countries by comparison with others, thereby providing suggestions for policymakers on ways to improve them [24–26]. This part of the literature was considered highly relevant for the scope of this study, as it provided suggestions on methods to investigate functions and the network of actors within national OSH systems, as stated in *Section 1*. In particular, Spreeuwers et al. [24] proposed an evaluation of occupational disease surveillance in six EU countries to assess their ability to provide appropriate information for preventive policies [13]. Data on occupational diseases were not comparable between countries and were sometimes unreliable, even within a single country. Therefore, Spreeuwers et al. [24]. suggested using standardised notification forms and guidelines for diagnosing and reporting diseases, advancing one of the main obstacles encountered in this study. The literature is moving in this direction, providing methods for the assessment of health and safety risks beyond the national framework. The recent work of Micheli et al. [48] is a good example. Furthermore, Sakowski and Marcinkiewicz [25] reviewed occupational health systems in the European economic area to detect differences in preventative and promotion activities in national OSH systems, hence suggesting how different countries' national OSH systems could have been studied together. The last related noteworthy work is a recent publication by Jakob et al. [26] that provides a brief report on the status of OSH in agriculture in selected European countries [15]. Although the report focuses on the agricultural context, the work's objective is very pertinent because its aim was 'to describe and categorize different national OSH systems in Europe' [26]. Countries were compared concerning different characteristics such as legislation and authorities, education and training, and specific health and safety programmes to share the best practices of a few countries to help others strengthen their preventive efforts and reduce the burden of occupational injuries and diseases on agriculture.

2.3 Research needs and objective

The above review of the literature stresses the importance of investigating national OSH systems – and current gaps in the discussion as well – by exploring their dynamics and the underlying network of actors working for their correct deployment. National OSH systems are indeed made up of bodies (or individuals) running activities at different stages, who, if properly managed, become a lever for the improvement of the whole system and lead in the end to effective interventions at the workplace for better health and safety of the workers. Hence, interpreting the key functions and bodies and improving their interactions are crucial for establishing an effective interaction network that lasts over time and is sustainable in the long term. Moreover, providing an overview of the underlying network of actors in the national OSH system will be another prior objective since, to the authors' knowledge, this is a perspective missing from the literature and important for the reasons explained above.

At a national level, the knowledge and consequential improvement of each national OSH system may begin by comparing with other systems and investigating their similarities and differences through cross-national analyses, as described in the above literature section [12]–[15]. The sharing of knowledge is the clue to pursuing positive changes. The best practices of a few countries can be helpful to others in fostering OSH improvement through new national strategies and possible collaboration between national entities.

3. Methods

3.1 Context and sample selection

Given the main research objective, the focus of this work lies on national OSH systems and the methods for their investigation are presented below and summarised in Fig. 1.

National OSH systems are governed largely by internal laws which implicitly or explicitly determine their structures and main bodies. Academic literature, as has often been stressed, usually abstains from studying such systems as they are considered an immutable condition in the development of general interventions; hence, even if they might be perceived as a constraint, no effort is put into their investigation and even more in their progressive improvement. The search process in the literature identified a few potentially eligible documents. There are a few examples of effective national practices for OSH improvement. They are more often described, but less concern is given to their evaluation and actual assessment of the real effectiveness of their implementation. The network of actors in national OSH systems has rarely been discussed or taken for granted.

Information about national OSH systems is available on countries' governmental (e.g. ministries', …) websites, which, however, would generate shortcomings for the analysis in the sample validity. First, the amount of potential data to be retrieved would be huge, with a few documents written in English and without common ground in the thematic areas covered. Consequently, to select a proper unit of the analysis, the authors first needed to solve the above issues, that is, as a condictio sine qua non gathering information comparable and reliable at the same time. Looking at primary data on OSH systems was deemed ineffective; hence, the search process went for secondary data that were reliable enough. Primary data were used as a complementary source to check the trustworthiness of secondary data and to add missing information. Several types of data sources can be included, but the more diverse they are, the more complex their analysis and comparison. Therefore, the aim was to build a sufficiently heterogeneous sample (but not too much).

National OSH systems for the analysis should be carefully selected, and the choice should be closely related to the availability of information. Moreover, the analysis of many national OSH systems would not be effective because of their high heterogeneity, which strengthens the need to have a selected, not large, sample of OSH systems. In light of these considerations, the OSHwiki website [49] came to our aid owing to it an entire section called 'OSH System at National Level' dedicated to European national OSH systems described following a default structure; specifically, 31 countries are listed. This makes different countries easily comparable (i.e. one single language – English – and the same degree of granularity), which is not trivial if we consider, as said before, the other available sources. The OSHwiki website, based on the wiki concept, is a collaborative online encyclopaedia in which accredited users produce and share knowledge on OSH topics. It has been managed by EU-OSHA [50] since 2014 and enables the sharing of OSH knowledge to support government, industry, and employee organisations in ensuring health and safety at the workplace. It has the latest information since it is periodically updated by the OSH community, which is built upon recognised OSH professionals or scientific organisations and fosters a participatory culture within the community.

For a consistent sample, with a controlled heterogeneity, 11 European countries, as a purpose sample, were selected from the 31 potential options listed on the OSHwiki website. The selected countries were Belgium, Cyprus, Denmark, France, Germany, Italy, Norway, Poland, Portugal, Switzerland, and the United Kingdom.

3.2 Data collection and analysis

The collection of raw data from the OSHwiki website and related primary sources comprised over 67,000 words. The creation of such an extensive database through the research framework explained in the next section is the first major result of this study. The framework made data visual and comparable among countries, thus becoming a true value-added

for practitioners and policymakers who are interested in interpreting national OSH systems and comparing data from different EU countries.

Data were coded in Microsoft Excel by creating a matrix; rows were used for the selected countries, and columns were used for the most important functions, hence making comparable information of the selected EU countries. Other specific characteristics were highlighted between countries by further classifying the data using different colours. The structure and interpretation of the developed framework and database are discussed in the next section.

Data were checked and integrated when unavailable on the OSHwiki website by looking for primary data on the respective national websites and, whenever possible, by talking with national and international practitioners.

For clarity, the purpose of the data collection was to gather information that could enable analysis between different countries, and it did not claim to be exhaustive, including all countries' specificities. The analysis of different countries (without any intention of making direct comparisons between countries) detected trends in their modus operandi and potential shareable best practices as well as improvement directions for their sustainability in the long run.

3.3 Validity and reliability

The validity and reliability of the research should be assessed [51,52]. When different sources are included their construct validity must be tested. Convergent and discriminant validity should also be considered. Multiple sources should converge for the same considered issue (convergent validity), and when convergence is not reached, an explanation should be provided. Discriminant validity, instead, ensures that evidence is obtained from different perspectives. In the selected case, the triangulation of data strengthened the construct validity by looking for convergence in evidence and, at the same time, enriching from discriminant perspectives the data basis. External validity, which enables the generalizability of the results, was achieved by selecting a representative sample within the scope of the research. The seamless process of data collection and the definition of a research framework, detailed in *Section 4*, enable the replication of the study and collection of similar data, thus making the process reliable.

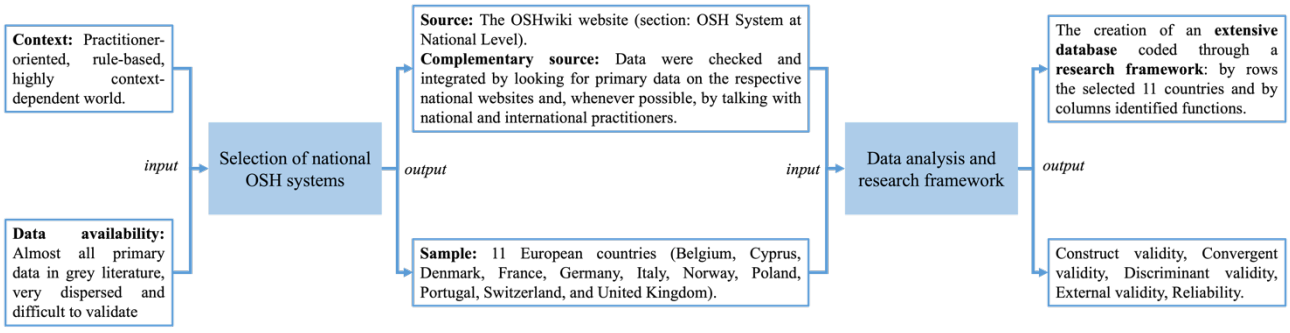

Fig. 1. Research methods: sample selection and data analysis.

4. Results and implications

The analysis of various European national OSH systems led to the definition of a research framework, which identifies a range of fundamental functions and recurring bodies for the countries included in the study. First, the framework is described, and the level of analysis is explained by including some descriptive statistics (*4.1*). It follows a thorough discussion of the findings gathered through the population of the framework, which provides details on the functions and bodies involved at different – national, territorial, and enterprise – levels by the selected countries (*4.2*).

4.1 The framework for national OSH systems

The available data on the OSHwiki website for our sample were gathered, but the information provided by EU-OSHA in the original dataset was difficult to compare. Although the data almost followed a default index (Table 1), each section was not homogenous because the country's experts who added information to the website might have interpreted the meaning of the sections differently. Moreover, the structure of the OSHwiki website induced repeated information between paragraphs. Therefore, this introduced bias in the raw data collected for the analysis, making it difficult to compare countries. Hence, a reclassification function for the rest of the analysis was needed.

Table 1. OSHwiki website: table of contents.

INDEX
1. Occupational safety and health legislative framework
2. National strategy and programmes
3. Social dialogue
3.1. Social dialogue at the national level
3.2. Social dialogue at the sectoral level
3.3. Social dialogue at the enterprise level
4. OSH infrastructure
4.1. OSH infrastructure scheme
4.2. National competent bodies
4.2.1. OSH authorities and inspection services
4.2.2. OSH services
4.2.3. Compensation and insurance bodies
4.2.4. Other OSH bodies
4.2.4.1. Prevention institutes
4.2.4.2. Professional associations
4.3. Education, training, and awareness raising
4.3.1. Legally required training for OSH specialists
4.3.2. Other vocational training
4.3.3. Awareness-raising networks
4.4. Specialized technical, medical, and scientific institutions
4.4.1. Research institutes
4.4.2. Standardization bodies
5. Institutions and organisations
6. References

An iterative inductive process of data comparison on national OSH systems was used to determine an adequate framework. The process was not straightforward, and the raw data were iteratively analysed many times before reaching a satisfactory solution. At that time, there were two possibilities for a new classification. A reclassification by bodies, actors or functions was advisable. Legislative bodies were strictly contingent upon the reference country, and their names and roles significantly changed from country to country. Therefore, these functions were selected as more homogenous elements for classification. The functions included in the framework were the most transversal functions for most of the selected countries.

The identification of transversal (mostly essential) functions that enable the interpretation and proper management of national OSH systems was the first important result of this study. The framework, detailed in Table 4, includes all the functions by columns and the eleven countries of the sample by row. In every block (one country-one function), bodies and actors covering the selected function are detailed for the considered country. The entire framework, with the information included, is available upon request. The functions are detailed one by one in Table 2.

Table 2. The functions of national OSH systems.

Functions		
1	Education (non-recursive)	is a process of conceptualisation, which means an 'organised and sustained instruction designed to communicate a combination of knowledge, skills, and understanding valuable' [53].
2	Training (periodical)	complementary to education focuses on periodically mastering workers in performing specific tasks or roles by avoiding improper actions and thus reducing accidents [54].
3	Guidelines	provide practical guidance and best practices to companies in optics of OSH's continuous improvement, which means either the deployment of international standards into national settings or their application into the practice of national regulations.
4	Awareness	is the ability to raise awareness of OSH concerns among the main players in daily OSH management at work.
5	Support (operational)	as part of awareness offers companies the possibility of receiving help from external providers in the daily activities of OSH management.
6	Insurance	is coverage protecting individuals who are injured or become ill because of their work.
7	Financial incentives	are policy instruments of national bodies that provide monetary benefits to encourage behaviour or actions which otherwise would not take place or develop to a minimal extent.
8-9	Health surveillance and Safety surveillance	are intended as active surveillance practices applied to prevent injuries and diseases at work through the delegation of OSH responsibility inside companies. These functions are highly recommended by the ILO guidelines [55] and European Council Directive 89/391/EEC [56].
10	Monitoring health and safety/statistics	is the process of assessing industrial risks by conducting statistics on accidents and illnesses and periodically publishing monitoring reports.
11	Enforcement of regulations/inspections	is the act of identifying hazards in the workplace by an official visit to the site and formalising the outcomes in an enforcement document.
12	Accreditation standards	are procedures leading to national standards that provide shared norms and best practices used by individuals, industry, and government to complete specific tasks.
13	Research (academic-practical)	explores theoretical and operational solutions for OSH improvement over a long-time horizon.

These can be considered essential functions necessary to first interpret and then effectively manage national OSH systems. Furthermore, other elements have been categorised, which are not strictly functions of national systems but are useful information for analysing and comparing national OSH systems They are detailed below in Table 3.

Table 3. Additional components of national OSH systems.

Additional components		
14	Focal point	is an EU-OSHA's official representative for safety and health at work and is the primary contributor to the implementation of EU-OSHA's work programmes. There is a focal point in each member state as well as in the European Free Trade Association (EFTA) states and potential candidate countries [57].
15	Committees	include the major working groups of OSH bodies and representatives established to discuss and make decisions about current OSH topics.
16	Legislation	refers to national and international (European) directives about safety and health at work.
17	National bodies	show a list of major national bodies with a prominent role in running national OSH systems.
18	National strategies and programmes	represent nationwide interventions for OSH improvement, applied in different contexts and issued by national authorities that ended in the past or are currently under development.

Table 4 outlines an explanatory version of the entire framework. As previously mentioned, the built database does not seek to be exhaustive in terms of information provided for each country, considering the OSHwiki website [49] as the main source of reference, but aims to analyse different countries (not making a comparison between them) to detect trends in their modus operandi and potential shareable best practices.

The countries' data, once classified by function, were further categorised. First, functions and related bodies and actors were divided into three groups to differentiate between national, territorial, and enterprise levels. As will be explained in depth later, it was expected that every function would prevail at one level, because the specificity of each function often implies a different degree of granularity. Indeed, it is uncommon to see functions implemented by countries across all levels. Of course, countries' differences in the application of the functions were very likely, and discrepancies among the types of actors and bodies depended as well on that. The functions are not independent, and bodies that play a function might also cover other functions. This is country-dependent; some countries split functions among different bodies, thus more independent bodies, whereas others assign several functions to one body. Second, each body or actor identified across functions was classified as public or privately controlled. This provides an overview of the modus operandi of countries because some are more state-controlled, and others assign more activities to private bodies. Some functions are keener to apply private bodies and others vice versa; hence, the type of function affects who is involved.

Table 4. The research framework for national OSH systems: main bodies across countries.

[cell colours: yellow – enterprise level; green – territorial level; blue – national level] [text colours representing bodies: red privately controlled; light blue – public controlled]

[Bodies: committee *(public or privately controlled)*; cooperative association *(public or privately controlled)*; education and training association (non-profit) *(privately controlled)*; employee labour inspector *(privately controlled)*; government body *(public controlled)*; institute for standardisation *(public or privately controlled)*; insurance institute *(public controlled)*; internal and external service, single actors *(privately controlled)*; labour inspection authority *(public controlled)*; membership association *(privately controlled)*; prevention and welfare agency *(public controlled)*; research centre *(public or privately controlled)*; service company *(privately controlled)*; statistical institute *(public controlled)*; and university *(public or privately controlled)*].

			Functions												
			1	2	3	4	5	6	7	8	9	10	11	12	13
			Education	**Training**	**Guidelines**	**Awareness**	**Support**	**Insurance**	**Financial incentives**	**Health surveillance**	**Safety surveillance**	**Monitoring health and safety/statistics**	**Enforcement of regulations/ inspections**	**Accreditation standards**	**Research**
Nations	**1.Belgium**	**Enterprise**								Internal & external service, single actors	Internal & external service, single actors				
		Territorial				Service company Membership association	Membership association								
		National	University	Government body		Prevention & welfare agency Government body Membership association	Membership association	Insurance institute Service company	Government body	Membership association	Membership association	Government body Insurance institute	Labour inspection authority	Institute for standardisation	University Government body
	2.Cyprus	**Enterprise**								Internal & external service, single actors	Internal & external service, single actors				
		Territorial		Membership association											
		National	University	Labour inspection authority Education & training association		Labour inspection authority Education & training association	Labour inspection authority	Government body				Labour inspection authority Government body	Labour inspection authority	Institute for standardisation	University
	3.Denmark	**Enterprise**								Internal & external service, single actors Committee	Internal & external service, single actors Committee				
		Territorial		Membership association		Service company Membership association Cooperative association	Service company Membership association Cooperative association								
		National	Research centre	Cooperative association	Labour inspection	Research centre Cooperative		Insurance institute	Labour Inspection authority			Research centre Labour	Labour inspection	Institute for standardisation	Research centre

				Membership association	authority Committee	association Membership association			Government body			inspection authority	authority Committee		
	4.France	Enterprise		Committee	Committee					Internal & external service, single actors Committee	Internal & external service, single actors Committee				
		Territorial				Labour inspection authority	Labour inspection authority								
		National	University University	Research centre Prevention & welfare agency	Insurance Institute Committee	Prevention & welfare agency Insurance institute Research centre Committee	Prevention & welfare agency Insurance institute	Insurance institute Committee	Insurance institute Research centre			Prevention & welfare agency	Labour inspection authority	Institute for standardisation	Prevention & welfare agency Research centre
	5.Germany	Enterprise								Internal & external service, single actors	Internal & external service, single actors				
		Territorial		Prevention & welfare agency Membership association		Membership association	Membership association						Labour inspection authority		
		National	University University	Insurance institute	Government body Insurance institute	Cooperative association Membership association Insurance institute	Cooperative association Insurance institute	Insurance institute				Government body Statistical institute	Labour inspection authority	Institute for standardisation	Insurance institute Government body
	6.Italy	Enterprise								Internal & external service, single actors	Internal & external service, single actors				
		Territorial		Membership association		Labour inspection authority Membership association	Labour inspection authority Membership association		Labour Inspection authority				Labour inspection authority		
		National	University University	Committee Insurance institute	Committee	Insurance institute Membership association		Insurance institute	Labour Inspection authority Insurance institute			Government body Insurance institute	Labour inspection authority Government body	Institute for standardisation	Insurance institute Research centre University University
	7.Norway	Enterprise								Internal & external service, single actors	Internal & external service, single actors				
		Territorial		Membership association		Membership association			Cooperative association				Labour inspection authority		
		National	Education & training association University Research centre	Prevention & welfare agency Research centre	Labour inspection authority	Government body Membership association		Insurance institute				Government body Statistical institute	Labour inspection authority	Institute for standardisation	University Research centre Research centre

	8.Poland	Enterprise								Internal & external service, single actors	Internal & external service, single actors		Employee labour inspector		
		Territorial		Cooperative association		Membership association	Membership association						Labour inspection authority		
		National	University University	Research centre	Research centre	Cooperative association Cooperative association Research centre Membership association	Cooperative association	Insurance institute				Research centre Statistical institute	Labour inspection authority	Institute for standardisation	Research centre
	9.Portugal	Enterprise								Internal & external service, single actors	Internal & external service, single actors				
		Territorial				Membership association Service company	Service company						Labour inspection authority		
		National	University University	Research centre Labour Inspection authority		Government body Labour inspection authority Cooperative association	Government body	Insurance institute				Research centre Statistical institute	Labour inspection authority	Institute for standardisation	University University Research centre Cooperative association Service company
	10.Switzerland	Enterprise								Internal & external service, single actors	Internal & external service, single actors				
		Territorial				Membership association	Membership association		Labour Inspection authority				Labour Inspection authority		
		National	University University	Insurance institute University University	Committee	Government body Education & training association Committee Membership association	Education & training association Committee	Insurance institute				Government body Statistical institute	Committee Government body Labour Inspection authority	Institute for standardisation	Government body Insurance institute University Research centre Membership association
	11.UK	Enterprise								Internal & external service, single actors	Internal & external service, single actors				
		Territorial		Membership association		Research centre Membership association Education & training association							Labour inspection authority Committee		
		National	Membership association Education &	Education & training association Membership	Education & training association Labour	Labour Inspection authority Education &	Labour Inspection authority Education &	Insurance institute Service company	Labour Inspection authority			Labour inspection authority	Labour inspection authority	Institute for standardisation	Labour inspection authority Membership

			training association	association Labour Inspection authority	Inspection authority	training association Membership association	training association								association Education & training association University university Research centre

4.1.1 Descriptive statistics

The built research framework (Table 4) and classification of data enabled simple statistics between the national OSH systems included in the study, which are presented in Table 5. Almost all functions are covered by the 11 countries selected, which were ensured by iteratively reviewing information. Depending on the considered function, activities, as expected, can be executed at the national, territorial, or enterprise levels. In some cases, a function takes place at different levels (e.g. national and territorial), but one option almost prevails. Hence, countries not only agree on the key functions of the national OSH system but are mostly aligned on the run level of each function. This implies higher consistency in the tasks accomplished between countries.

National functions are prevalent; nine out of 13 functions, namely education (non-recursive), training (periodical), guidelines, awareness, support (operational), insurance, monitoring health and safety/statistics, enforcement of regulations/inspections, accreditation standards, and research (academic-practical), are represented at the national level. Analysing national OSH systems, it was foreseeable that the majority of functions would be applied at the national level.

Two functions, awareness and support (operational), have wide coverage at the territorial level, meaning that there are bodies/actors external to enterprises (e.g. employer associations) that provide assistance with various activities throughout the territory. A shared consensus among countries revealed how these context-dependent activities are almost developed across territories close to enterprises and workers. National bodies are also important for such functions, as they coordinate and control activities at the territorial level. In fact, there are countries (10 for awareness and 8 for support) that have competent bodies employed at both territorial and national levels.

Training (periodical) and enforcement of regulations/inspections functions, although all the selected countries identified them as national functions, had good coverage at the territorial level (6–7 out of 11, respectively).

Two other functions, health surveillance and safety surveillance, are applicable in all selected countries at the enterprise level. They share similar statistics because they have many actors entrusted with both health and safety surveillance, as declared by EU Directive 89/391/EEC [56].

Some national-based functions, such as education (non-recursive), guidelines, insurance, monitoring health and safety/statistics, accreditation standards, and research (academic-practical), are more homogenous because almost all countries consider these as national functions not applicable to other contexts.

National functions tend to be deployed at one level without involving actors and bodies at other levels, whereas territorial and enterprise-level functions have more blurred boundaries, which means a higher diversity of countries' practices.

A remaining function, financial incentives, is not included in any category since it has been identified in seven out of 11 countries, with only five of them at a national level, three at a territorial level, and one at both levels.

Table 5. The research framework for national OSH systems: descriptive statistics.

		Functions												
		1	2	3	4	5	6	7	8	9	10	11	12	13
		Education	Training	Guidelines	Awareness	Support	Insurance	Financial incentives	Health surveillance	Safety surveillance	Monitoring health and safety/ statistics	Enforcement of regulations/ inspections	Accreditation standards	Research
Nation' s Statistics	Tot.	11 0 EMPTY	11 0 EMPTY	8 3 EMPTY	11 0 EMPTY	10 1 EMPTY	11 0 EMPTY	7 4 EMPTY	11 0 EMPTY	11 0 EMPTY	11 0 EMPTY	11 0 EMPTY	11 0 EMPTY	11 0 EMPTY
	Tot. Enterprise	0	1	1	0	0	0	0	11	11	0	1	0	0
	Tot. Territorial	0	6	1	10	8	0	3	1	0	0	7	0	0
	Tot. National	11	11	8	11	8	11	5	1	1	11	11	11	11
	Tot. National/ Territorial	0	6	1	10	6	0	1	0	0	0	7	0	0
	Tot. National/ Enterprise	0	1	1	0	0	0	0	1	1	0	1	0	0
	Tot. Territorial/ Enterprise	0	0	0	0	0	0	0	1	0	0	1	0	0

4.2 Implications

The functions before presented can be deemed the most common options among at least European countries considering the selected sample. Then, the classification for each function by its scope – national, territorial, enterprise – clarified the field of action of functions, whether more national, territorial, or enterprise-based. The identified bodies and actors accomplishing these functions helped in the assessment of the run levels of each function. Therefore, the selected countries agree on the key functions of national OSH systems as well as on the run level of each of them.

For highly regulated functions, especially those following EU Directive 89/391/EEC, it was expected to find many similarities across countries, such as in safety and health surveillance. However, this was not obvious for other functions that might be very context dependent, thus expected not to be generalisable in terms of findings. Such controlled heterogeneity within the sample also enabled the identification of a preliminary list of public and private bodies and actors shared among countries and having an active role in the operation of OSH systems (as reported in Table 4).

Furthermore, by populating the framework, it became evident that **the functions are mostly not independent and largely interconnected**, with many actors managing multiple functions and various relationships within them. This is on one side beneficial from a system perspective, but on the other hand, it also increases the complexity of the system under consideration, thus requiring effective management of these OSH systems at different levels, both within and between functions. Consequently, it would have been expected to have a wider spread of certain functions across the three levels, especially those with less regulation, such as training, awareness, and support if compared to others, like safety and health surveillance at the workplace. If the aim is to achieve more effective OSH management with better workplaces and improved working conditions, **coordination and collaboration among entities with different tasks and responsibilities at various levels are essential**. This is something countries still need to work on, and policymakers should be proactive in building robust networks that facilitate the sharing of knowledge across territories. Having, for example, membership associations or prevention agencies, which actively do the training in specific areas, could be a way to promote collaboration among nearby companies facing similar challenges and make them work together for one common goal, the workers' well-being.

The following subsections discuss the results obtained from the cross-national analysis of the national OSH systems, by interpreting the findings arising from each function individually and identifying potential improvement directions. Table 6 summarises these findings by function, highlighting key implications, the relevant bodies involved, and the interrelations between functions. Further details on national bodies for each function and the related additional components – focal points, committees, legislation, national bodies, national strategies, and programmes – are provided in Appendix A.

Table 6. Functions and main bodies in national OSH systems: main findings.

Functions	Key implications	Main bodies	Interconnected functions
4.2.1 Education	Education significantly influences the OSH culture of individuals, promoting safer and healthier behaviour in the workplace. Starting OSH education early in life, during schooling, enhances knowledge and enriches cultural experiences. OSH education needs to evolve with changing work tasks and risks.	Private and public **national research centres** and **universities** are the most common bodies.	• Training • Research
4.2.2 Training	Training, typically regulated by national laws, follows the education phase in individuals' lives and targets individuals already in the workforce.	Public and private bodies are often under the supervision of the **Ministry of Labour**. **Insurance institutes and research centres** commonly	• Education • Awareness and Support • Insurance

	Enhanced coordination across different levels – national, territorial, and enterprise – would contextualize training more effectively. However, only half of the countries identify training bodies at both territorial and national levels.	oversee training at the national level. Territorial training is often provided by **trade unions, employer associations, and independent associations**, like chartered institutions.	• Enforcement of regulations/inspections • Research
4.2.3 Guidelines	EU countries follow ILO and EU-OSHA guidelines.	National bodies with cross-visibility at the field level across countries, such as **insurance institutions**, and **labour inspection authorities**, develop and provide practical guidance. **Joint committees** can assist in guideline development, bringing together multiple bodies.	• Insurance • Enforcement of regulations/inspections
4.2.4 Awareness and Support	Awareness and Support functions are interconnected, with fewer bodies having the operational capacity to physically support companies in OSH prevention. Empowering membership associations can enhance daily OSH management for companies, highlighting a promising avenue for improved support.	National bodies, predominantly public, play a significant role in awareness, with **labour inspection authorities** having national reach and regional branches. Territorial bodies, such as **membership associations** (e.g. trade unions, and employers' associations), also have a supporting role due to their close relationships with companies.	• Training • Health surveillance and Safety surveillance • Enforcement of regulations/inspections • Research
4.2.5 Insurance	The function related to insurance institutes is consistent across selected countries. Differences exist in the nature of insurance institutes: some countries allow multiple national insurance institutes; others have single, independent but publicly controlled bodies ensuring insurance for all workers. Centralized insurance organizations offer easier management, standardized data, and consistent statistical analyses. Offering a choice among providers might be preferable but requires stringent control over authorized insurers.	Most countries naturally designate **insurance institutes** as the primary body for this function.	• Training • Guidelines • Financial incentives • Monitoring health and safety/statistics
4.2.6 Financial incentives	National bodies allocate periodic funds to encourage OSH improvement within companies. Designing effective incentives necessitates collaboration between competent bodies and policymakers.	Three primary bodies provide financial incentives: directly from **government bodies**, **labour inspection authorities**, and **insurance institutes**.	• Insurance • Enforcement of regulations/inspections
4.2.7 Health surveillance and Safety surveillance	Health and safety surveillance at the enterprise level ensures OSH standards within companies. Effective surveillance and monitoring promote higher-level performance and reduce the risk of sanctions by inspector authorities. Establishing active dialogues between territories and companies is a priority for policymakers and national institutions.	EU Directive 89/391/EEC guides the selection and roles of bodies involved in OSH at the enterprise level, like **representatives**, **inspectors**, and **committees**.	• Awareness and Support
4.2.8 Monitoring health and safety/statistics	National-level analyses are conducted in countries, gathering data on workplace accidents and diseases.	Some countries designate **statistical institutes** for managing statistics, monitoring	• Insurance • Enforcement of regulations/inspections

	The monitoring function is centralized at the national level to ensure comprehensive, consistent, and unbiased data. Multiple bodies, like research centres, handling the function may lack full data access, potentially leading to incomplete analyses.	trends, and disseminating results. **Insurance institutes**, **labour inspection authorities**, and **research centres** are often identified as competent bodies.	• Research
4.2.9 Enforcement of regulations/inspections	The importance of this function is emphasized in existing literature, particularly regarding the effectiveness of national systems for injury surveillance and enforcement of legislation. Inspectors are advised to offer guidance and support directly to employers and managers within companies. The function is highly regulated, suggesting stability in its operations, though there is always the potential for improvement and designed bodies should work for that.	The **labour inspection authority** is unanimously identified as the primary body for this function. Most national labour inspectorates operate through a network of **local authorities** across their territories. **Committees** associated with this function primarily support and occasionally oversee labour inspection authorities but do not possess enforcement powers.	• Training • Guidelines • Awareness and Support • Financial incentives • Monitoring health and safety/statistics
4.2.10 Accreditation standards	Institutes for accreditation are responsible for transposing international (ISO) and European (EN) standards into national standards according to the country's regulations. There is potential value in enhancing the collaboration of the accreditation institute with other bodies. A more integrated approach involving multiple bodies could lead to the development of more effective standards and guidelines.	Countries identify public or private **institutes for standardization**, which typically operate independently with minimal direct interactions with other functions.	
4.2.11 Research	The research represents a starting point for the proper development of other functions and is foundational for advancing OSH conditions; however, its long-term significance may not always be immediately recognized by those in operational roles. Engaging multiple bodies in research activities fosters advancements in knowledge across various facets of national OSH systems.	A mix of public and private bodies often delegated to **national research institutes**, are engaged in research. **Universities** play a significant role in having specialized research groups dedicated to OSH. Numerous other bodies, such as **membership associations**, **prevention and welfare agencies**, and **insurance institutes** collaborate with public bodies to actively research OSH improvements.	• Education • Training • Awareness and Support • Monitoring health and safety/statistics

4.2.1 Education

Representing the early formation for any individual who then will become a worker, education was expected to have most of the bodies concentrated at the national level. From the analysis of the selected 11 countries, it emerged that all bodies are at a national level. Most entities are represented by national research centres and universities, which can be private or public. **Universities** can have a more territorial outreach since their educational programmes might differ according to where they are set. However, they have been considered national-level-based because the formation provided is set on national guidelines and university programmes are mostly aligned.

Education is defined as not recursive, or long-term, to distinguish it from training. Education is the initial point of contact for individuals in their lives, as it is typically part of their early formation during their youth. **Education can thence make a significant difference in the OSH culture of individuals, fostering safer and healthier behaviour once they are at work**. To maximise its effects, it should begin soon in individuals' lives, while they are still attending school so that this

can broaden their knowledge and enrich their cultural experiences. OSH education must adapt to the current times, where work tasks and associated risks are continuously evolving. Therefore, **policymakers and institutions should stay abreast with those changes and ensure that education is regularly updated**.

4.2.2 Training

Training naturally comes after the education phase in individuals' lives. It provides operational formation to companies that need skilled workers. Compared to education, **it is supposed to be periodical** since it applies to individuals already working and has the aim of consolidating background knowledge and training them for specific activities they will perform while working [58]. The training function is usually regulated by national laws and includes both public and privately controlled bodies. At the national level, the most common body in this role is the **insurance institute**. This function is sometimes under the supervision of the Ministry of Labour, which demands activities from **labour inspection authorities**. In other cases, **national research centres** deliver training courses for specialised figures. A few countries describe the process of training in the territory, which is mainly provided by **trade unions and employer associations** (e.g. mentioned by Denmark, Germany, and the United Kingdom). **Independent associations** also deliver training courses, such as chartered institutions, which provide support to professionals of many kinds.

The diffusion of this function was expected across all the levels (national, territorial, and enterprise); however, only half of the countries identify bodies at the territorial and national levels, and only France goes further at the enterprise level. However, to the best of the authors' knowledge, training activities across territories exist, but not being highly regulated, they are still not considered as requirements of national OSH systems. Therefore, there is no clear definition of how different levels – national, territorial, enterprise – of training might be related. **Higher coordination of bodies at different levels would determine activities properly contextualised in the environment and consequently be more effective**. This is the main difference with education which, instead, can be still effective at a national level. Therefore, **transversal training turns out to be one crucial point that national OSH systems should focus on**.

4.2.3 Guidelines

Having selected EU countries for the analysis, all should adhere to the ILO and EU-OSHA guidelines. These international standards are explicitly mentioned in most of the selected countries as reference points for developing national guidelines. Bodies across countries make them actionable in the field by providing practical guidance to companies. In any of the selected countries, there is a specific body responsible for developing guidelines, but transversal bodies with high competencies are usually in charge of them. Three main types of bodies are identified: **insurance institutions, labour inspection authorities, and various kinds of national OSH committees**. More rarely, sector-specific boards and committees have been mentioned. More than one body can help in the development of guidelines, which is also the reason for the presence of joint committees. **Labour inspection authorities** and **insurance institutions** are often designated as referent bodies as they are involved in two important functions for national systems: enforcement of regulations/inspections and insurance. They are aware of OSH conditions and companies' needs; therefore, they can propose and set guidelines for OSH improvement. **Committees** are common among countries, often supporting other kinds of bodies. **Developing guidelines with the possibility to gather public and private bodies together represents strong added value** because what they finally produce would consider diverse perspectives. Therefore, setting up committees would be a good starting point to develop **guidelines that can be effectively applied in different contexts across a wide range of territories**.

4.2.4 Awareness and support

Awareness and Support (operational) functions are presented together because they have several common points. **Bodies doing supporting activities are a subset of those providing awareness.** Several public or privately controlled bodies

conduct awareness activities promoting OSH improvement; however, only a few have operational power to physically support companies in OSH prevention activities.

These are by nature the most diversified functions closely related to other functions. Functions such as training and research have many bodies in common since they enhance awareness among OSH stakeholders and, in some cases, **provide support as well**. These functions are developed at the territorial level with bodies, like membership associations (e.g. trade unions, employers' associations, and professional associations), that have close relationships with companies and can effectively apply campaigns or simple initiatives for raising awareness and support. These functions are also present at the national level because activities are nationally and territorially based, and the same bodies often apply at both levels. **Public bodies prevail at the national level except for labour inspection authorities** that are nationally based and have several operating local and regional branches. Territorial bodies conducting awareness activities are often conducting operational support as well, which is less common for national-based bodies. **Membership associations**, especially employers' associations and service companies seem to be the most suitable for assisting companies in OSH activities. **By empowering these associations, companies,** often lacking technical and human resources, **would receive greater operational support in their daily OSH management**, which is exactly what they need. Therefore, this shows to be **a promising direction for further improvement of the operational support provided to companies**.

4.2.5 Insurance

This function is almost the same for all the selected countries; **most identify insurance institutes as the only body eligible for this function**. However, differences lie in the characteristics of insurance institutes. They are all public, but some countries allow more than one national insurance institute (e.g. Germany and Switzerland), while others have single bodies, often independent but publicly controlled (e.g. Denmark and Italy) that guarantee insurance to all the workers. **Centralised organisations are easier to manage and control**; data coming from policyholders are almost standardised and statistical analyses are consistent. However, this might be perceived by employers as a duty; hence, the **possibility of choosing between different providers could be a better solution, which requires however a higher control on authorized insurers**. In Switzerland, there is a federal act (the Insurance Supervision Act, ISA) for the supervision of insurance companies. This act governs the supervision of insurance companies and insurance intermediaries by protecting insured persons against the insolvency risks of insurance companies and abuses. There are pros and cons in any case and the choice almost derives from historical reasons. Therefore, **this function does not expect to undergo great changes** in the coming years, besides the fact that it is a subject highly regulated.

4.2.6 Financial incentives

Financial incentives are allocated by national bodies in favour of companies through periodic funds which support the improvement of OSH conditions inside companies. Bodies that assist companies through financial incentives are almost public entities that use public funds to support assistance activities. Three main bodies are involved: directly from **government bodies**, **labour inspection authorities**, and **insurance institutes**.

Financial incentives are effective instruments for encouraging companies to spend time and resources on OSH improvement. **They might, however, be a double-edged sword as they can favour the opportunistic behaviours of companies receiving them**. This might generate short-term benefits for those companies implementing activities only to obtain money from the incentive and then interrupt any activity once the requirements are satisfied. Of course, much depends on how the incentive is structured; hence, proposing effective incentives requires careful design for the future sustainability of the activities [59]. Therefore, **competent bodies should study better potential solutions and collaborate closely with policymakers to develop and implement more effective incentives for companies**.

4.2.7 Health surveillance and Safety surveillance

Surveillance at the enterprise level is the basis to ensure a good OSH level inside companies by monitoring the status and proposing improvement measures. Health and safety surveillance functions are discussed together because they have many common bodies. Health and safety surveillance ensures higher-level performance and better enforcement of regulations by inspector authorities. Indeed, **constantly surveilling workplaces simplifies the activities of authorities when carrying out inspections**. Compliance with regulations starts from daily management inside companies with figures that can range **from representatives, inspectors, and ad-hoc committees that report directly to employers**, especially in small realities.

The functions of health and safety surveillance and enforcement of regulation can be considered as two sides of the same coin; one applies at the enterprise level while the other at the territorial and national levels. Having effective bodies carrying out improvement actions and monitoring changes enables more transparency in activities ensures compliance, not risking sanctions. **Dialogue between bodies at different levels** should be always pursued as it enables a harmonious alignment between the needs of one side (the enterprise) and the requirements of the other side (authorities). Today, **establishing an active dialogue with territories and the companies with them is one of the top priorities for policymakers and national institutions**, which is also considered the right way forward. Furthermore, the bodies and figures selected for these functions are almost aligned following EU Directive 89/391/EEC [56]; however, by reading how the activities were implemented, **it was possible to perceive different approaches to OSH management**. A **reactive approach** usually begins with a description of how figures comply with regulations by identifying only those required by law. On the other hand, a more **proactive approach** describes how OSH management can be improved inside companies through daily operations. For instance, Denmark describes a typical process inside companies with more than 34 employees where safety groups and committees are established for day-to-day tasks.

4.2.8 Monitoring health and safety/statistics

This function shows that every analysed country has a system of monitoring health and safety conditions at the workplace. Every selected country performs high-level analyses at the national level by gathering data on accidents and diseases at work and providing periodic reports and statistics on the current conditions and prevention activities to be implemented. This function is set at the national level in every selected country, and **it must ensure comprehensive as well as consistent and mostly unbiased data**. The more the availability of data the more consistent will be the statistical sample for the analysis. Therefore, **it is common to see only one major designated body for this function, which already gathers data on accidents and illnesses for other reasons**, such as **labour inspector authorities** or **insurance institutes**. Public bodies ensure a less biased sample of data as they gather information from the entire workers' population. Having more than one body would enable more analyses, but if the samples are not well integrated, results might be biased and even contradictory owing to differences in the data sources.

Several countries identify a (or more than one) **statistical institute**(s) for handling statistics (e.g. Germany and Norway), monitoring trends, and disseminating results. **Research centres** are sometimes indicted as competent bodies. They might have powerful means for carrying out research, but often do not have full access to the data, which makes their analysis incomplete.

4.2.9 Enforcement of regulations/inspections

The relevance of this function has already been stressed in the literature, where the discussion has focused on the effectiveness of national systems for injury surveillance and enforcement of legislation [17,19,42–45]. Inspections were, indeed, already identified as an essential component of implementing health and safety legislation. It was suggested and confirmed by such analysis (see section 4.2.4 related to *Awareness* and *Support* functions) that inspectors should also

provide advice and support to employers and managers directly in the companies [17]. The **labour inspection authority** is pointed out by all the selected countries as the most suitable body for this function. In addition, most national labour inspectorates have a network of **local authorities spread over the territory**. **Committees**, when mentioned for this function, are not intended to have enforcement power, but to support (and sometimes control) labour inspection authorities in their work.

Therefore, being a highly regulated function**, it is not expected it will undergo great changes in the upcoming years, but there is always the potential for its improvement and designed bodies should work for that**. In Denmark, for example, a good practice is established by the Danish Working Environment Authority (DWEA) which, before sanctioning a company because of non-compliance with regulations, issues a consultancy notice, ordering the company to seek advice from an authorised health and safety consultant, who must help solve the problem and reinforce preventive OSH activities. Another good practice emerges again from Denmark, where a monitoring, stand-alone, body of inspection authorities is designated. The Working Environment Appeal Board deals with complaints against decisions made by the DWEA.

4.2.10 Accreditation standards

Every considered country identifies an **institute for standardization**, responsible for transposing international (ISO) and European (EN) standards into national standards according to the country's regulation. **It is almost a stand-alone function which has low direct relationships with the other functions and can be either public or privately controlled**. As evidence of this, the institutes for accreditation do not cover other functions of the framework for the selected countries, nor provide guidelines which seemed to be the closest function. It can be argued that **higher inclusiveness of this institute for accreditation with other bodies and actors would be the starting point to get more effective standards and guidelines, which would better address the needs arising from the field**, thereby reducing the gap frequently highlighted in the literature between policy-level objectives and on-field issues [10,60].

4.2.11 Research

In all the selected countries, there is a blend of public and private entities conducting research with some public bodies that, besides their main functions, have a budget for research. Most of the selected countries delegate this function to **national research institutes** which are public or private based. Several institutions/associations/centres support **public bodies in the active research for OSH improvement**. Among public bodies, there are **universities with specific research groups.** Having a such mixture of bodies enables the inclusion of different perspectives. **Membership associations** (like the British Psychological Society in the United Kingdom) and **prevention and welfare agencies** usually have a sectoral view focusing, by the way, on specific research topics; while **insurance institutes** cover a broader audience researching multi-faced topics, like the Italian National Institute for Insurance against Accidents at Work (INAIL) and the German Social Accident Insurance (DGUV).

Research is crucial to strive for continuous improvement of OSH conditions. However, its long-term value is often not fully perceived by individuals operatively involved in the workplace. **It represents a starting point for the proper development of other functions**, which effectiveness of programmes and courses mostly depends on previous research carried out in these areas. Therefore, **having more bodies performing research activities is always beneficial**, as doing research produces advancement in knowledge in many fields and across various functions within the national OSH systems. Hence, the more bodies are involved in research activities the better is, as it presupposes a higher level of interconnectivity among functions, such as education, training, awareness, and support, and ultimately, this should be the path to be pursued.

5. Conclusions

This work aimed at providing insights into the sustainable development of national OSH systems as the sharing of knowledge is pivotal in driving positive changes, and insights gained from best practices of a few countries can be helpful to others in fostering OSH improvement, i.e. through new national strategies and possible collaboration between national entities. Therefore, this work examines national OSH systems in several European countries by proposing a framework to interpret the data gathered from the selected countries and identifying a set of essential functions and recurrent bodies through cross-national analyses. It provides insights into how the different functions, by difference, are performed across countries by detecting potential shareable best practices and improvement directions for policymakers towards the future sustainability of national OSH systems. This has been possible thanks to the development of the research framework for national OSH systems, which relies on 'cross-functions' that ensure greater validity than bodies which might be too contingent even among European countries. The selected functions are not completely unknown as the literature has already mentioned them over the years, but to the best of the authors' knowledge, there are no studies in OSH management analysing these functions and looking at them all together from a system perspective. As proof of the relevance of this work, EU-OSHA is currently researching in the same direction. Indeed, it has recently released a website, called the OSH barometer [61], which makes accessible secondary data on OSH by gathering, and then, comparing different EU countries. The website is currently under development and will represent a powerful data visualisation tool for the most important OSH facts and indicators at the EU and national levels.

Practitioners, besides policymakers and national authorities, can benefit from this work. Individuals working for OSH management at different levels can better position themselves in the whole 'value chain' of OSH national systems by being more aware of their role in society. Hence, the identified framework and the classification of functions and actors provide, even to single actors, a comprehensive – (eco)system – view of national OSH management, which combines highly regulated functions (e.g. safety and health surveillance inside companies) with others much less (e.g. awareness and support). Therefore, practitioners as employees of – organisations, associations, public bodies, etc. – become aware of their main stakeholders and can establish collaborations and partnerships for more effective activities across the territories. Likewise, practitioners knowing their 'position' in their country's OSH system, could also start collaborating with actors in other countries playing similar roles and exchanging best practices across national boundaries that might be helpful in more countries.

In terms of limitations, first, the generalisability of the results is the first key issue to be explored in future research and represents a major limitation of this work. The results are certainly valid for European countries and require further analysis to be tested and extended to a larger sample of non-EU countries. Even if we had possessed reliable data on several national OSH systems worldwide, the analysis of that amount of data would not have been feasible. The initial heterogeneity of data was significant; hence, this work looks at establishing a leading thread among countries (i.e. essential functions and actors for national OSH systems) and sets the ground for further research where advanced data analysis techniques might be applied to uncover deeper insights. Therefore, although the generalisability of the results can be seen as a limitation, it is, instead, more a choice than a real limitation, with a right compromise between exhaustiveness and heterogeneity.

In this regard, a potential avenue for further research could focus on validating the initial findings by expanding the sample to include additional countries, which would provide a more comprehensive understanding of OSH systems across different contexts. Conducting in-depth interviews with key stakeholders could further enrich these investigations, offering a closer look into the dynamics of OSH systems within the academic community. Additionally, improving the framework (e.g. by including contextual factors to better investigate differences among countries) would enable the

assessment of countries (included or not in the sample), facilitating their comparison based on shared parameters. This, in turn, could provide valuable support to policymakers in their efforts to sustain national OSH systems' improvement, making this a promising area for future exploration. By leveraging the framework, policymakers can assess and compare their national systems, gaining valuable insights into potential improvements by benchmarking against best practices from other countries. Finally, researchers affiliated with national institutions, such as EU-OSHA, could derive valuable insights for refining European guidelines. This cross-national analysis can drive policy adjustments and enhancements for European OSH systems, which would remain robust and effective in promoting workplace safety and health.

Declaration of Interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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A Appendix A: Insights from the research framework by functions and additional components

The thirteen functions and the additional components of the research framework are below detailed.

Functions

A.1 Education

At first glance, education can be considered long-term training (not recursive) for OSH stakeholders recognised by each country's legislative system. Some countries on the OSHwiki website prefer being generic by referring to universities as the main bodies for education. Norway and Switzerland provide details on the differential requirements for OSH bodies (e.g. physicians, hygienists, and engineers). Most entities are represented by national research centres, which can be private or public. There are also government research institutes, such as the National Research Centre for the Working Environment (NRCWE) in Denmark and the National Institute of Occupational Health (STAMI) in Norway, which are under the supervision of specific ministries, that is, the Ministry of Employment in Denmark and the Ministry of Labour and Social Affairs in Norway, respectively.

A.2 Training

The training function is usually regulated by national laws and includes both public and privately controlled bodies. At the national level, the most common body in this role is the insurance institute: the National Institute for Insurance against Accidents at Work (INAIL) in Italy, the Swiss Accident Insurance Agency (SUVA) in Switzerland, and various institutes (e.g. the Institute for Work and Health [IAG], the Institute for Occupational Safety and Health [IFA], and the Institute for Prevention and Occupational Medicine [IPA]) of the German Social Accident Insurance (DGUV) in Germany. This function is sometimes under the supervision of the Ministry of Labour, which demands activities from labour inspection authorities. The Department of Labour Inspection in Cyprus regularly organises conferences and seminars with foreign organisations or institutions. Similarly, the Authority for Working Conditions (ACT) in Portugal regulates all training courses on safety and hygiene, so that trainees may have a professional certification legally assigned by this organ. In other cases, national research centres deliver training courses for specialised figures. Poland has identified research centres, such as the Nofer Institute of Occupational Medicine (NIOM) for medical professionals and TBF training centres for both employees and employers, which apply research activities by organising training. In France and Norway, institutions such as the National Higher Institute of Social Security (EN3S) are in partnership with the French National Research and Safety Institute for the Prevention of Occupational Accidents and Diseases (INRS) and the Norwegian National Institute of Occupational Health (NIOH).

A few countries describe the process of training in the territory, which is mainly provided by trade unions and employer associations (e.g. in Denmark, Germany, and the United Kingdom). Independent associations also deliver training courses, such as chartered institutions, which provide support to professionals of many kinds. The Chartered Institute of Environmental Health (CIEH) in the United Kingdom is a registered charity and a professional voice for environmental health. It provides over 50 certification training programs which include food safety, health and safety, and environmental awareness through a network of over 10,000 registered trainers and 6,000 registered training centres across the United Kingdom.

A.3 Guidelines

Having selected EU countries for the analysis, all should adhere to the ILO and EU-OSHA guidelines. These international standards are explicitly mentioned in most of the selected countries as reference points for developing national guidelines. Bodies across countries make them actionable in the field by providing practical guidance to companies. None of the countries has a specialised body for guidelines, but they are mostly national bodies with other primary functions. Bodies with transversal competencies are indicated because they have cross-visibility of needs at the field level. Three main types

of bodies are identified: insurance institutions, labour inspection authorities, and various kinds of national OSH committees. More rarely, sector-specific boards and committees have been mentioned. More than one body can help in the development of guidelines, which is also the reason for the presence of joint committees. Committees are built to be heterogeneous by including different perspectives: ministerial departments, insurance institutes, representatives of national and regional or federal OSH bodies, and so on. They meet regularly and, among other things, discuss the release of new guidelines for companies. Guidelines are often proposed by one or a few bodies and then revised and approved by all members of the committee. For example, the Working Conditions Advisory Board (COCT) in France developed guidelines as a national strategy. The COCT comprises all stakeholders: social partners, ministerial departments, representatives of OSH bodies, and qualified experts. Each region of France has also established regional Working Conditions Advisory Boards (CROCT in French) with similar functions and compositions. Similarly, in Italy, the Steering and Evaluation Committee for active policies and the national coordination of surveillance activities related to health and safety at work, among other activities, set down the common guidelines of national policies regarding health and safety at work. The actors involved in this committee include representatives from the Ministry of Labour and Social Policies, the Ministry of Health, the Ministry of Domestic Affairs, the Ministry of Infrastructure and Transport, Regions, and the National Institute for Insurance against Accidents at Work (INAIL). In some cases, individual associations provide guidelines. In the United Kingdom, the British Safety Council (BSC) is a registered charity, now one of the largest independent occupational health, safety, and environmental organisations in the world.

A.4 Awareness and Support

Awareness and Support (operational) functions are presented together because they have several common points. Bodies doing supporting activities are a subset of those providing awareness. Several public or privately controlled bodies conduct awareness activities promoting OSH improvement; however, only a few have operational power to physically support companies in OSH prevention activities. These are by nature the most diversified functions closely related to other functions. Functions such as training and research have many bodies in common since they enhance awareness among OSH stakeholders and, in some cases, provide support as well.

National institutions should promote OSH across the whole country, for example, through temporary national programmes or the introduction of councils assisting enterprises. Inclusive Work Life was a Norwegian governmental programme issued by the Ministry of Labour and Social Affairs that has been implemented to stimulate public discussion. In Germany, a confederation of companies, business associations and institutions, trade unions, foundations, social insurance providers, and different federal representatives was introduced through the Initiative New Quality of Work (INQA) to offer practical support for companies in four strategic fields of human resources policy: personnel management, equity opportunities and diversity, health, and knowledge and competencies. The 'Top 100 – Good Business Practice' database is a result of such an initiative as it contains successful best-practice interventions in the four fields mentioned above. In Belgium, the Federal Public Service (FPS) for employment, work, and social dialogue coordinates awareness-raising activities developed by the directorate general for the humanisation of work and the directorate general for the control of well-being at work. Denmark has five sector working environment councils, which assist enterprises in one or several sectors with information and sector guidelines on health and safety.

Then, associations, centres, agencies, research institutes, and similar, are the most common bodies across countries in charge of awareness activities. These rarely provide operational support with practical tools but disseminate knowledge through public reports, awareness campaigns, and so on. Most bodies are privately based, but some countries also refer to public bodies. The Polish Central Institute for Labor Protection is a public national research institute. France has some generic agencies, such as the French National Agency for Improvement of Working Conditions, and others are more

sectoral than the French Professional Agency for Risk Prevention in building and civil engineering. Associations and centres are private and intend to promote health and safety at work by involving a large number of OSH stakeholders inside and outside companies. In particular, the British Safety Council (BSC) is a registered charity in the United Kingdom, which is one of the largest independent occupational health, safety, and environmental organisations in the world. For example, Cyprus has the Safety and Health Association (CySHA), and Portugal has the Association of Occupational Health and Safety Companies (AEST).

In three countries – France, Germany, and Italy – insurance institutions have been identified as active bodies providing advice and support to companies by continuously developing assistance interventions across different sectors and industries. Similar to insurance bodies, inspectorates primarily enforce regulations into companies, support companies, and develop OSH interventions by raising their awareness and willingness. France and Italy emphasise the role of regional labour inspections which are spread over the territory and can closely support companies in implementing activities.

Most of the selected countries (i.e. Belgium, Denmark, Germany, Italy, Norway, Poland, Portugal, Switzerland, and the United Kingdom) identify membership associations, professional associations, trade unions, and employers' associations as promising bodies for disseminating knowledge across (affiliated) companies and providing support for the development of interventions, especially employers' associations which can help small, low-qualified realities.

A.5 Insurance

Social insurance is handled differently across EU countries. The major difference lies in the number of providers and how the premium is paid to workers if they get injured or ill. In some cases, workers and consequently employers are obliged to insure the worker to a specific provider, decided by law (e.g. Belgium, Denmark, and Italy); in other cases, several insurers and workers/employers decide what to opt for (e.g. United Kingdom). All identified bodies are at the national level and some examples are provided below.

Labour Market Insurance (AES) is a Danish independent institution administrated by the Danish Labour Market Supplementary Pension Scheme (ATP). AES is mandatory for all private- and public-sector employers in Denmark. Similarly, every worker in Italy is insured at the National Institute for Insurance against Accidents at Work (INAIL), which is a nationally independent agency. In Germany, there are different social accident insurance institutions for industry and trade, for the public sector and agriculture, among others. Switzerland has a particular structure: Swiss Accident Insurance Agency (SUVA) is the largest accident insurance organisation. It is an independent non-profit company under public law. It has three core business areas, namely prevention, insurance, and rehabilitation. SUVA's activities are based on the Accident Insurance Act (UVG) and the Accident Prevention Regulation (VUV), which state that employees are compulsorily insured by SUVA. In addition, a further 38 insurance associations provide social accident insurance, as stated in the UVG, which divides the areas of activity between SUVA and other insurance companies.

A.6 Financial incentives

Financial incentives are allocated by national bodies in favour of companies through periodic funds which support the improvement of OSH conditions inside companies, such as the Danish Working Environment Research Fund. Belgium, through the Federal Public Service for Employment, work, and social dialogue, for instance, proposes the Experience Fund, co-financed by the government, which promotes initiatives and projects carried out by companies to improve the working conditions of older workers.

The most common body promoting financial incentives among the selected countries is the labour inspectorate (e.g. the Working Environment Authority [DWEA] for Denmark, Local Health Units [ASL] in Italy, the cantonal labour inspectorates in Switzerland, and the Health and Safety Executive [HSE] in the UK). Labour inspection authorities, by carrying out inspections and enforcing regulations throughout the territory, also sustain the improvement of OSH levels

in companies by giving them financial incentives. These funds can be generalised to all companies or specific to groups, particularly at risk. Insurance institutes provide financial assistance to companies, as well as specific calls (e.g. the National Health Insurance Fund for Salaried Workers [CNAMTS] in France and the National Institute for Insurance against Accidents at Work [INAIL] in Italy). In Italy, INAIL publishes ISI calls every year, which are non-repayable funds that encourage companies to carry out projects for the improvement of health and safety levels at work.

A.7 Health surveillance and Safety surveillance

Health and safety surveillance functions are discussed together because they have many common bodies. Health and safety surveillance ensures higher-level performance and better enforcement of regulations by inspector authorities. Compliance with regulations starts from daily management inside companies with figures that can range from representatives, inspectors, and ad-hoc committees that report directly to employers, especially in small realities. These functions are mostly regulated by EU Directive 89/391/EEC [56] on the introduction of measures to encourage improvements in the safety and health of workers at work, which determines high similarities across countries. Article 6 regulates the duties of employers who have to ensure, with all the means in their power, the health and safety protection of workers. Accordingly, employers' activities are described by every selected country, and some countries include information on prevention and protection services acting on behalf of the employer. As also stated by the EU directive, 'the employer shall designate one or more workers to carry out activities related to the protection and prevention of occupational risks for the undertaking and/or establishment' [56]. This service is always under the supervision of employers. The service can be either internal or external, and in small realities, health and safety surveillance is often deferred to external providers because it is too resource- and time-consuming. External providers are usually consultants, OSH professionals, employers' associations, and trade unions. For instance, in Belgium, Co-Prev is a professional association for external prevention services. It covers all the external prevention and protection services at work in Belgium.

The participation of workers is highly recommended; hence, many companies have workers' representatives on their health and safety committees. They do not usually have any decisional role, but they give voice to workers by outlining criticalities and suggesting possible solutions. A shared figure among countries is the physician who periodically checks the health of workers and suddenly informs the employer or the demanded service if there are risks for the workers. This figure is almost external in SMEs, and each physician is in charge of more than one company at a time. Other figures can support the assurance of health and safety in enterprises by, for instance, appointing safety groups responsible for day-to-day tasks (as in Denmark) or safety committees for sharing information and making decisions by including major actors (as in Portugal).

A.8 Monitoring health and safety/Statistics

This function shows that every analysed country has a system of monitoring health and safety conditions at the workplace. Every selected country performs high-level analyses at the national level by gathering data on accidents and diseases at work and providing periodic reports and statistics on the current conditions and prevention activities to be implemented. These activities are delegated to bodies that, for other reasons, already have available data on accidents and diseases, which can be public insurance bodies (e.g. the National Institute for Insurance against Accidents at Work [INAIL] in Italy), and government bodies and labour inspection authorities (e.g. Belgium, Cyprus, Denmark, Germany, Italy, Norway, Switzerland, and the United Kingdom). Moreover, some countries identify specific statistical offices, government-based, for the analysis of OSH conditions (e.g. Germany, Norway, Poland, Portugal, and Switzerland).

A.9 Enforcement of regulations/inspections

Inspections and enforcement of regulations in companies are demanded by labour inspection authorities, which can slightly change names but are a common body across countries. It is difficult to think of a different non-public entity. In some cases, inspections are overseen by both the Ministry of Labour and the Ministry of Health (in countries with this distinction) with different tasks. For instance, in Poland, the National Labour Inspectorate (PIP) is responsible for the supervision and inspection of enterprise compliance with labour law, OSH regulations, and standards compliance audits, while the State Sanitary Inspectorate Inspection (PIS) is responsible for the public health protection of infectious disease control, conducts a sustained and preventive sanitary supervision, and prepares epidemiological studies. In France, the Labour Medical Inspectorate constitutes a specific technical support body within the labour inspectorate services. Countries might designate separate agencies that monitor specific sectors or activities, such as in Norway, where the Maritime Directorate monitors the working environment at sea, the Petroleum Directorate monitors the working environment in offshore oil activities, and the Directorate for Civil Protection and Emergency Planning (DSB) monitors the electrical safety and prevention of fire and explosion.

In addition, most national labour inspectorates have a network of local authorities spread over the territory. Having local entities controlled by a main national body ensures the homogeneous treatment of companies in terms of the enforcement of regulations. Federal states identify authorities for each state of the confederation (e.g. Germany and Switzerland), while others have decentralised services on a regional basis (e.g. Italy, Norway, Poland, Portugal, and the United Kingdom). In Switzerland, the Inter-cantonal Association for Employee Protection (IVA) is an umbrella organisation that collects the voice of labour inspectorates and represents an important platform for exchanging OSH ideas and experiences. Similarly, in the United Kingdom, the Health and Safety Executive (HSE)/Local Authority (LA) Enforcement Liaison Committee (HELA) supports effective liaison between the HSE and LAs. HELA provides a national forum for discussion and exchange of information on LA activities and enforcement.

A.10 Accreditation standards

Each of the selected countries has an institution for standard accreditation. The division between public and privately controlled bodies is almost homogenous (7 versus 5, respectively). Public institutions are in Belgium (NBN: Bureau of Normalisation), Cyprus (CYS: Cyprus Organisation for Standardization), Poland (PKN: Polish Committee for Standardization), and Portugal (IPAC: Portuguese Institute of Accreditation). Private institutions are in Denmark (DS: Danish Standards), France (AFNOR: French Standards Association), Germany (DIN: German Institute for Standardisation), Italy (UNI: National Italian Unification Body), Norway (SN: Standards Norway), Switzerland (SNV: the Swiss Association for Standardisation), and the United Kingdom (BSI: British Standards Institution). In particular, BSI is not only the national organisation responsible for the development and publication of standards in the United Kingdom but its standards are spread across 140 countries, together with ISO standards.

A.11 Research

In all the selected countries, there is a blend of public and private entities conducting research with some public bodies that, besides their main functions, have a budget for research, such as in Switzerland with the State Secretariat for Economic Affairs (SECO) that coordinates and supervises employee health and safety and in Belgium with the directorate general for the humanization of work that runs the Department of Research on the Improvement of Working Conditions (DIRACT). Most of the selected countries delegate this function to national research institutes which are public or private based. In Denmark, the NRCWE is a government research institute under the Danish Ministry of Employment that disseminates research-based knowledge to social partners, enterprises, and working environment counsellors, contributes to higher education at universities, and serves as an entrance to general information about working environment issues through the Working Environment Information Centre. Similarly, Norway has the National Institute of Occupational

Health (STAMI), and in Poland, the Central Institute for Labour Protection – National Research Institute (CIOP-PIB). In the United Kingdom, the Health and Safety Executive (HSE) is a scientific and evidence-based organisation that employs over 850 science and engineering experts. In particular, the Health and Safety Laboratory (HSL), under the umbrella of the HSE, has researched new methods for industrial safety. In Italy, there was a separate National Institute for Prevention and Safety at Work (ISPESL), then incorporated in 2010 inside the National Institute for Insurance against Accidents at Work (INAIL), which now finances its research programmes.

Among public bodies, there are also universities with specific research groups; two examples are provided. First, SINTEF is the largest independent research organisation in Norway, with international top-level expertise in technology, medicine, and the social sciences, not only in OSH, and operates in partnership with the University of Oslo and the Norwegian University of Science and Technology (NTNU) in Trondheim. Second, the Cardiff Work Environment Research Centre (CWERC) in the United Kingdom focuses on understanding the relationship between health, safety, and well-being in the working environment. Several institutions/associations/centres support public bodies in the active research for OSH improvement. Two examples are provided below. In Switzerland, for health matters, the leading research institute is the Institute for Health in the Workplace in Lausanne (IST). In France, the INRS, an impartial and independent player, conducts study and research programmes in a wide variety of fields covering most occupational risks, from toxic to physical or psychological risks. There are also research groups in universities, such as the Centre of Excellence for Risk and Decision Sciences (CERIDES) of the European University Cyprus (EUC), that implement horizontal research activities in risk assessment, safety management, human factors, risk management, risk perception, and risk communication.

Other bodies are sector-specific, such as the Institute for Radiological Protection and Nuclear Safety (IRSN) in France, the Central Mining Institute (GIG) in Poland, the Welding Institute (ISQ), the Technological Centre for Metal Industry (CATIM), and the Technological Centre for Ceramics and Glass (CTCV) in Portugal, the Institute of Ergonomics & Human Factors (IEHF), and the British Psychological Society in the United Kingdom.

Additional component

A.12 Focal points

The focal points designed by each country are official representatives of EU-OSHA in the considered country. They are typically the competent national authorities for safety and health at work and the primary contributors to the implementation of the EU-OSHA's work programmes.

By considering the 11 countries included in the analysis, two main types of bodies play the role of a focal point (Table A.1): the Ministry of Labour (including equivalent bodies and bodies appointed by it) in Belgium, France, Germany, Poland (the Central Institute for Labour Protection – National Research Institute [CIOP-PIB] supervised by the Ministry of Labour), and Switzerland; labour inspection authorities (including equivalent bodies) in Cyprus, Denmark, Norway, Portugal, and the United Kingdom. Italy is an exception where the National Institute for Insurance against Accidents at Work (INAIL), the national insurance provider, is identified as the focal point, as it is active across the country in the implementation of interventions for OSH improvement.

A.13 Committees

All countries have committees that work towards higher coordination among bodies, social partners, and public authorities. Ten countries out of 11 identify committees at the enterprise level, 3 at the territorial level, and 11 at the national level. Two countries present committees at all levels, two at the territorial and enterprise levels, ten at the national

and enterprise levels, and three at the national and territorial levels (Table A.1). The structure and involved bodies of committees are too country-dependent, just their roles at different levels can be compared.

National committees are consultative bodies between social partners and public authorities. They are often tripartite bodies, including government and social partners (i.e. trade unions and employer associations), such as the Pancyprian Safety and Health Council (PSHC) in Cyprus, the Advisory Council for the Promotion of Safety and Health at Work (CCPSST) in Portugal, the Permanent Advisory Committee for health and safety at work in Italy, and the Social Dialogue Council in Poland. Still in Poland, the Commission for Safety and Health at Work makes a periodic assessment of safety and health at work, advises preventive measures, suggests measures to improve working conditions, and cooperates with employers in the OSH area. At this level, committees provide legislative proposals, define promotional activities, process standard procedures for the realisation of risk analysis, and identify the organisation and safety management models. Confederations of trade unions are organisations present in some countries, such as in Norway with the Confederation of Trade Unions (LO) and in the UK with the Trade Union Congress (TUC).

Territorial committees are often derived from national boards and built as tripartite (sometimes bipartite) bodies. They play an important role as interfaces between national committees and companies. They disseminate information, identify good practices, evaluate the application of national prevention recommendations, find solutions to health and safety problems within specific industries, and assist individual companies within the sector in resolving working-environment issues. In France, there are regional Working Conditions Advisory Boards (CROCT), and in Italy, the regional committees of coordination have similar functions and compositions.

Enterprise committees promote cooperation within the work environment to implement health and safety measures and safe production methods. They collaborate with the labour inspectorate on all OSH matters. In general, these committees include workers' representatives elected by employees at the workplace, employers or delegates, safety officers, OSH service members, and occupational physicians. In France, the Health, Safety, and Working Conditions Committee (CHSCT) analyses occupational risks with technical examinations of risks, proposes actions for improving working conditions, and is watchful to ensure that legislative and regulatory instructions and guidelines are complied with.

A.14 Legislation

EU Directive 89/391/EEC [56] was transposed into all EU countries' laws and led to a new concept of safety and health at work, which was less prescriptive and more preventive. Subsequently, national regulations have been updated regularly in parallel with European directives. This ensures similarities across countries in national bodies and activities performed.

A.15 National bodies

The aim of this work is not to evaluate how each country works but to identify commonalities and differences and potential best practices; therefore, this section with the classification of the major national bodies supports the understanding of the 13 selected functions. No insights into this section are provided because out of the scope of the work but are kept in the framework for their functionality in other sections of the study.

A.16 National strategies and programmes

This section is functional to the discussion of the 13 functions, and national strategies and programmes, where relevant, were introduced to explain the kinds of activities run by national bodies. Therefore, no further details are provided here.

Table A.1 Additional data: main bodies across countries.

[cell colours: yellow – enterprise level; green – territorial level; blue – national level] [text colours representing bodies: red – privately controlled; light blue – public controlled].

			Focal Points	Committees
Nations	**1. Belgium**	**Enterprise**		X

		Territorial		
		National	Government body	X
	2. Cyprus	**Enterprise**		X
		Territorial		
		National	Labour Inspection authority	X
	3. Denmark	**Enterprise**		X
		Territorial		
		National	Labour Inspection authority	X
	4. France	**Enterprise**		X
		Territorial		X
		National	Government body	X
	5. Germany	**Enterprise**		X
		Territorial		
		National	Government body	X
	6. Italy	**Enterprise**		
		Territorial		X
		National	Insurance institute	X
	7. Norway	**Enterprise**		X
		Territorial		X
		National	Labour inspection authority	X
	8. Poland	**Enterprise**		X
		Territorial		
		National	Government body	X
	9. Portugal	**Enterprise**		X
		Territorial		
		National	Labour inspection authority	X
	10. Switzerland	**Enterprise**		X
		Territorial		
		National	Government body	X
	11. UK	**Enterprise**		X
		Territorial		
		National	Labour inspection authority	X