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Article

Evaluation of the Legal Framework for Building Fire Safety Regulations in Spain

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Abstract: There is a trend in Europe towards increasing the quality and performance of regulations. At the same time, regulatory failure has been observed in the area of building fire safety regulation in England and elsewhere. As a result, an analysis of the appropriateness of fire safety regulations in Spain is warranted, with the objective being to assess whether a suitable level of fire safety is currently being delivered. Three basic elements must be considered in such analysis: the legal and regulatory framework, the level of fire risk/safety of buildings that is expected and the level which actually results, and a suitable method of analysis. The focus of this paper is creating a legal and regulatory framework, in particular with respect to fire safety in buildings. Components of an "ideal" building regulatory framework to adequately control fire risk are presented, the existing building regulatory framework is summarized, and an analysis of the gaps between the ideal and the existing systems is presented. It is concluded that the gaps between the ideal and the existing framework are significant, and that the current fire safety regulations are not appropriate for assuring delivery of the intended level of fire risk mitigation.

Keywords: policy evaluation; fire risk; legal framework; regulatory approach; fire regulations

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1. Introduction

After the tragic fire at the Grenfell Tower in London, the European Commission observed that "EU Member States remain responsible for setting the level of fire safety in buildings on their territory and to enforce their building regulation" [1]. This points to the importance of building fire safety legislation and regulation assessment in all member states, including Spain.

Europe has a substantial body of legislation that must follow the evolution of political, societal, and technological developments. As expressed in the guidelines of the Better Regulation Initiative, the European Commission (EC) is determined to propose policies that provide an optimal balance between the cost and the benefits to citizens, businesses, and workers. With this initiative, the EC intends to achieve the policy goals avoiding unnecessary regulatory burdens [2]. This objective is essential for job creation and, at the same time, reinforces the competitiveness of the European Union in the global economy, while maintaining social and environmental sustainability. The Better Regulation Initiative poses a way of working that guarantees an open and transparent process for the political decision-making, which includes the consideration of the best available evidence and the involvement of all the stakeholders.

Within the framework of the better regulation agenda, the European Commission established in 2012 the Regulatory Fitness and Performance (REFIT) program as a process to carry out the analysis of the existing legislation and measures to guarantee that they achieve their policy objectives with the minimum cost for stakeholders, citizens, and public administrations [3,4].

Subsequent guidance highlighted why such review is important. It signaled the fact that a particular legislation, which may be well-designed and appropriate for a given problem at a time, may become obsolete due to different circumstances, like changes in the market, new techniques allowing a better achievement of the policy goal, or knowledge acquired from the policy assessment that may recommend different policy solutions [5].

It is also noted that planning and political validation, stakeholder consultation, evaluation/fitness checks, impact assessment, quality control, and implementation support and monitoring are essential aspects to sharpen the performance of European regulations [6].

The European Commission has recently recognized that many regulatory issues that come to the fore, such as concerning emission testing, water pollution, and security, often do not result from a lack of legislation, but rather, are a function of the lack of effectiveness in the application of legislation. Furthermore, the Commission acknowledges the crucial role of the members of the public, businesses, and civil society in reporting shortcomings in the application of EU law [7]. With respect to safety from technological hazards, this aspect had already been recognized some decades ago by authors such as Otway and Peltu [8], who expressed that the risk affecting society is mainly influenced by the regulations and its effective implementation and enforcement, and more recently by Meacham [9], who noted similar concerns for building fire safety, noting that the issues defining the appropriateness of the performance may not be functions of the code, the design methods, or of the materials used, but of the overall performance of the regulatory system and the market working together to deliver the intended goal. The treatment of the risk associated with innovative methods and materials, within the regulatory system, is also signaled by Meacham [9] as a possible factor affecting the fire safety of buildings. Arguably, the same sentiment has been expressed by Dame Judith Hackitt [10] with respect to the review of the building regulatory system in England following the Grenfell Tower fire, which concluded in part that the complete body of regulations explored and the way of enacting them, is not appropriate and allows shortcuts. Furthermore, assessment of the interaction of components in the building regulatory system, intended to deliver fire safe buildings in England, demonstrates the importance of aligning legal structures, policy objectives, technical safety provisions, and supporting infrastructure [11]. In light of issues such as these, this study looks to contribute to the implementation of the Better Regulation Initiative principles in building regulations concerning fire safety in Spain [12].

Coupling this with previous efforts on the need to adopt better regulation practices [13], an assessment of the adequacy of building fire safety regulations in Spain is warranted. A comprehensive assessment of the building fire safety regulatory system requires an in-depth analysis of the legal provisions covering the building sector and of the roles and responsibilities of professionals, building and fire officials, and other actors in the market. In addition, an assessment of the data that are available on the fire performance of buildings in Spain is needed. Such a comprehensive assessment was undertaken by Osácar [14] prior to the Grenfell Tower tragedy. It is suggested that outcomes of this assessment not only highlight concerns that should be addressed in Spain, but can be useful for those assessing building fire safety regulations in other countries as well.

2. Materials and Methods

The research approach used for this assessment is largely a case study approach, using as a basis the Better Regulation Initiative principles as outlined above, and the concept that the building regulatory system in which fire safety provisions are embodied is a complex sociotechnical system (STS), in which institutions, people, and technology interact with the aim of delivering safe and well-performing buildings [15]. Fundamentally, STS theory provides a broad perspective that integrates both social and technical systems and how they interact. This is needed given the complexity of the building regulatory system and buildings [15–19].

The sociotechnical building regulatory system (STBRS) framework proposed by Meacham and van Straalen [15] provides one model of the building regulatory system framework. This framework contains two operational environments, "legal and regulatory" and "market". There is also an "interactions" environment representing the space for decision-making. In the overall STBRS framework, there are subsystems related to technology (Built Environment (BESS), Fire Hazard (FHSS) and Design, Construction and Evaluation (DCESS)), with policy/decision-making (Political, Economic, and Societal (PESSS) and Policy Formulation, Implementation, and Adoption (PFIASS)). They are also subsystems associated with the market (Organizational Implementation Decision-Making (OIDMSS)).

Figure 1 illustrates the high-level interactions between subsystems [15]. Description of the fire hazard characterization, assessment, and mitigation options development is reflected within the interactions between the BESS, FHSS, and DCESS subsystems. The decision-making associated with "risk acceptability" and associated performance levels, which form the regulatory (policy) basis for a regulation, are deliberated in the PESSS, PFIASS, and Risk Characterization and Regulatory Decision interactions. Finally, to gain stakeholder agreement, policy decisions are considered within the context of the market and available market options in the OIDMSS.

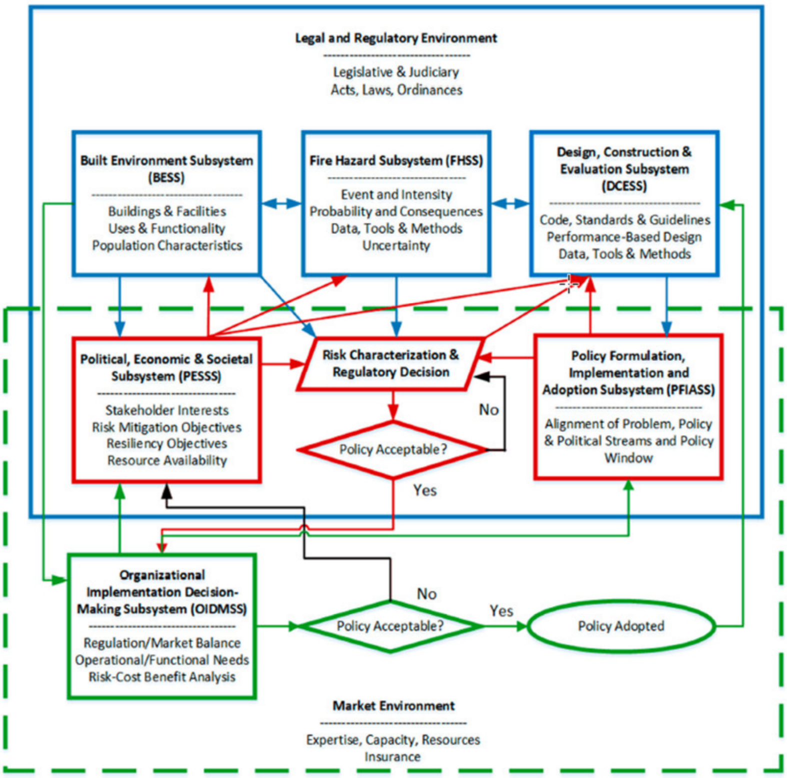

Figure 1. Representation of sociotechnical building regulatory system [15].

In outlining the STBRS framework, Meacham and van Straalen [15] identify eight steps that should be taken when assessing how risk has been characterized and reflected within the regulatory systems:

- Understand the legal system and culture;
- Understand what knowledge exists for the hazards being addressed;
- Understand the actors and forces in the market;
- Select appropriate risk characterization approach;
- Identify risk criteria and methods of assessment;
- Quantify, deliberate and characterize the risk;
- Determine appropriate risk-informed design approaches;
- Implement the system and institute monitoring processes.

In the research effort described in this paper, the STBRS framework and focal areas are used, along with the Better Regulation Initiative principles, as a model to assess the appropriateness of the performance-based fire safety regulation with respect to the Spanish building sector, to identify and describe the actors playing an active role in the national building legal and regulatory system, and to help the study of the interactions existing between them. This evaluation of the building fire safety regulations in Spain from an STS perspective represents one component of the comprehensive assessment of the Spanish system by Osácar [14]. In this paper, the focus is on steps 1–2 of the STBRS framework. The legal and regulatory structure of building regulations is presented, the identified gaps of the current regulatory framework are set out, and recommended changes are suggested. The primary sources of data and information used in this assessment include:

- Risk and regulatory systems literature, with a focus on building regulation and regulatory regimes;
- Laws, ordinances, and regulations that make up the Spanish building regulatory system;
- Data related to building sector, fire risk situation, and fire engineering practitioners in Spain.

The flow of the article and the topics addressed are presented in Table 1.

Table 1. Assessment of fire risk management in Spanish building regulatory system.

Topic	Issues Considered/Addressed	Section
Defining components of an ideal building fire safety regulatory regime	Understand how risk can be managed through regulation	3
	Understand how fire risk can be managed through building regulation	
	Understand forms of building regulation	
	Understand components of a building regulatory regime to manage (fire) risk	
Benchmark current legal and regulatory environment and building regulatory regime in Spain	Present legal structure	4
	Present components of laws and regulations pertaining to buildings and agents (actors)	
	Present technical regulations components	
	Present types of standards referenced	
Benchmark risk level in Spain	Present fire loss statistics and situation for Spain	5
Analyze regulatory regime in Spain against ideal	Present analysis of Spanish building regulatory regime for fire	6
Discussion and conclusions		7 and 8

3. Managing Risk through Regulations

In this section, discussion is provided regarding principles of managing fire risk through building regulation and on what constitutes a good building regulatory regime.

3.1. Building Regulations and Management of Fire Risk

3.1.1. Role of Regulations in Establishing Tolerable Levels of Risk in Society

The appropriateness of building regulations as a mechanism for managing fire risk in buildings is based on the premise that building regulations in general are an instrument for societies to manage risk to human life from a range of hazards [20,21]. The concept of risk within this article is defined as a function of hazards that may impact buildings and their occupants, the potential consequences of the event occurrences, and the likelihood of unacceptable consequences occurring [15,22].

From a broad perspective, the literature associated with the regulation of risk and hazards through the building regulatory system has been particularly helpful in providing benchmarks and framing the analysis (e.g., [15]). Relevant areas include architectural design (e.g., [23]); seismic performance of buildings (e.g., [24]); moisture performance of building exteriors (e.g., [9,25,26]); energy performance of buildings (e.g., [27]); fire safety in building regulations [28–31]; and management of risk more broadly through building regulation (e.g, [8,32–34]). Questions posed by Meacham and van Straalen [15] help frame the overall evaluation.

3.1.2. Use of Regulations to Manage Fire Risk in Buildings

The objective of protecting the community, along with ensuring harmony between individuals, were early drivers of safety regulation, including as related to structural performance (collapse protection), sanitation, and fire [15,32,35,36]. Nonetheless, as explained by Meacham and van Straalen [15] the concrete use of risk in regulation is a recent matter brought about by the recognition of consistent patterns of fatalities revealed by historical accidents having the potential to be used for predictive purposes.

With respect to historical fire losses, researchers such as Lundin [28] suggest that if the number of fatalities associated with fire events is low, there is a general perception amongst the public that risk reduction resources are sufficient and that the risk is tolerable. However, at the same time, the experience of tragic events such as the Grenfell Tower disaster of 14 June 2017, which resulted in at least 71 casualties, or the other fire events causing important economic losses, such as the 2005 Windsor Tower fire in Madrid [37], illustrate that catastrophic building fires are intolerable to the public. One can conclude that the risk is tolerable only when fatalities and costs are low.

To effectively use risk as a basis of regulation, one needs to consider the context of the risk decision and how concepts will be used in the regulatory setting (e.g., [15,21,22,33,34]). An analytic–deliberative approach, wherein risk data and perceptions can be balanced, is essential [15,21].

3.1.3. Evolution of the Regulations Managing Fire Risk in Buildings

The perception that the control of fire hazard must be dealt with has its origin in historical times. The legal treatment of fire events in buildings is traceable back to the Hammurabi Code (1772 B.C.), passing through medieval texts or numerous regulations of a penal or urban planning nature, established in Roman Urban and Visigoth Law [38]. Concerning the fire safety of buildings, the succession of fires and the evolution in the way of controlling them have led over the years to the development of fire protection regulations, traditionally based on empirical observations. As in other areas, World War II brought about important changes in this field. In fact, the systematic generation of fire scenarios was very useful in maximizing urban destruction through fire during the war period and marked the beginning of modern fire science. Recognition of its destructive potential during the war encouraged renowned scientists to dedicate their careers to the study of the phenomenon. In this way, research focused on destruction was followed by a study aimed at fire control and prevention. Advances in the knowledge of fire brought to light the limitations inherent in the prescriptive design of infrastructures [39]. In 1971, given the need to establish common criteria that favored global trade, efforts began in some countries to incorporate the concepts of performance into building regulation, giving rise to the first generation of performance-based codes. This was the beginning of the transition from prescriptive regulations to performance-based regulatory systems [17,20].

3.1.4. Forms of Regulations

Concerning safety in general, and fire safety in particular, three "pure" types of regulations can be considered [28,40]: performance-based regulation, regulation governing safety management systems and safety cases, and prescriptive regulation.

Prescriptive-based regulations assume adequate levels of fire safety based on the scientific and empirical information that forms their basis. In this regulatory approach, the fire safety goal is commonly expressed in terms of building physical requirements. The regulations collect concrete demands that a building must count on, in terms of constructive aspects and installation equipment. It is assumed that the building will be safe, in terms of fire safety, as long as it meets the regulatory prescriptions.

System-based regulations propose systems for the supervision of production processes by companies to monitor the achievement of regulatory goals. Compliance is determined by whether a company has an appropriate plan and not on the basis of detailed compliance with prescriptions or results of the production processes. Shortcomings in regulatory outcomes are considered as potential signs of defects in the management plan [28].

Performance-based regulations set out the fire safety goal in terms of the desired performance of the building in case of fire. Normally, the adequacy of the building behavior takes into account different aspects: fire spread (external and internal), occupant's evacuation, fire service intervention, and building resistance in terms of load-bearing and nonload-bearing elements. This fact requires the general aim of the regulation (e.g., occupant life safety) to be completed within the setting of a particular goal for each aspect of the building behavior intended to be assessed. Performance-based regulations must include the minimum values for each feature of the building performance, and a clear definition of the procedure to verify the compliance of the code. Effective performance analysis, design, and regulation allows for a more efficient, flexible, and appropriate way of dealing with the risk of fire in buildings.

To understand and analyze how the fire safety regulations are currently formulated in Spain, this article focuses on prescriptive and performance-based regulation [25,28,29,41,42]. There are both benefits and concerns with these, however, as have been identified in the literature [15,17,21,29]. Some of these concerns are explored in the context of the Spanish building and fire regulatory system described below.

3.2. Building Regulatory Regimes

3.2.1. Building Regulatory Regimes and Fire Risk Management

May [41] expresses that a regulatory regime is a means to achieve a regulatory goal concerning a particular matter and comprises, apart from the regulatory framework—legal rules—covering the specific issue, an institutional structure and the allocation of responsibilities to develop the regulatory tasks [25,34,41]. Each regulatory regime entails a governmental role in setting forth regulations and enforcing them, and they differ with respect to the nature of the rules and the way to ensure their application [28].

The type of the rules intending to achieve the regulatory goal (prescriptive or performance-based regulations), conditions the governmental role and the way to ensure their enforcement, and it is accompanied for an institutional structure and a concrete distribution of responsibilities to develop the regulatory tasks. Meanwhile, prescriptive regulations consist of prescribed rules and standards telling regulated entities and individuals what to do and how to do it, performance-based regulations establish the performance objectives, focusing on obtained results [25].

The change from a prescriptive to a performance-based approach to fire safety regulations implies a shift in key regulatory responsibilities, from governmental regulators to nongovernmental actors. It affects the tasks of the authorities and the freedom of the professionals, and places demands on both the reviewer and the practitioner [28]. This change in the type of regulations has brought about fundamental issues concerning regulatory accountability, as the obligation or willingness to accept responsibility or to account for one's action.

May [41] establishes four levels of accountability that can be observed within a regulatory regime: legal, bureaucratic, professional, and political accountability. Legal responsibility is the liability arising from actions or inactions of the State exercising the legislative power that affect the rights of private individuals. It concerns the responsibility held by those involved in the enactment of legislation. Bureaucratic accountability entails accountability of official code enforcers and other entities playing a control role. Professional responsibility refers to the accountability held by undesirable outputs caused by the exercise of professional activities and concerns the need for an adequate professional competency. Political accountability concerns the responsibility held by elected officials for regulatory regime shortfalls. It highlights the importance of avoiding regulatory excesses, facing gaps in regulatory provisions, and implementing the needed adjustments [41]. Arguably, all types of accountability were lacking leading up to the Grenfell Tower tragedy [10,11].

3.2.2. Basic Components of the Ideal Building Regulatory Regime

The idea that each regulatory regime involves a way of developing, implementing, and enforcing regulations is essential to develop and maintain an efficient legal framework. According to this, it is suggested that the ideal building regulatory regime is founded on a sound definition of five fundamental aspects: (a) regulatory goal, (b) building agents, (c) roles, (d) professional prerequisites, and (e) accountability.

The provision of an assessment methodology is fundamental to help the subsequent analysis of the regulation itself: (a) complete statement of the regulatory goal or goals concerning the building is an essential aspect, which, in turn, must be clarified by specific acceptance criteria; (b) identify the agents involved in the process of developing, implementing, or enforcing the regulation (stakeholders); (c) clear definition of the role that each stakeholder plays in the process; and (d) enable professional prerequisites for any agent to dutifully perform. To finish, (e) all these aspects have to be complete with a crystal-clear setting for the accountability and responsibility of every agent. Table 2 shows the basic components of a building regulatory regime.

Table 2. Basic components of a building regulatory regime (elaborated by the authors).

a	Goal statement	General goal statement
		Particular goals definition
		Implementation procedure
		Verification procedure
b	Agent identification	
c	Agent roles definition (responsibilities)	
d	Agent professional prerequisites	
e	Agent accountability	

The nature of the regulatory goal (structural safety, fire safety, environmental protection, and others) is closely linked with the type of its regulatory regime. The institutional structure and the allocation of responsibilities to develop the regulatory tasks, as components of the building regulatory regime, must be consistent one with each other and be consistent with the type of in-force regulation intended to achieve the particular regulatory goal.

4. Legal and Regulatory Environment in Spain

In this section, discussion is provided with respect to the basis of analysis, that is, issues of importance with respect to the legal culture (system), building regulations, and how they manage risk, in particular fire risk, aspects of building regulatory regimes, and suggestions on what might constitute an ideal building regulatory regime.

4.1. Form of Legal System

The form of legal system—Common Law or Civil (Napoleonic) Law—is one of the key issues affecting the regulatory content, its implementation and acceptance by the society, and the responsibilities derived from them [15]. Spain has a Civil Law structure. As a Civil Law system, emphasis is generally placed on providing details, and considerable trust is placed in decision-makers, since critical decisions are made within the institutional systems. A fundamental aspect of civil law is that the law defines what are unlawful or unjust acts, and for each of these, the penalty. As such, anything not expressly forbidden is allowed [15].

4.2. Legal and Regulatory Structure

In addition to the form of legal system, the legal and regulatory structure and responsibilities of parties are important to consider. There is a wide range of possible legal structures, from monarchies to federations, and national (top–down) systems to distribute responsibilities. This impacts decision-making responsibility and authority.

Spain is a social and democratic constitutional state. The form of government is a parliamentary monarchy. Sovereignty rests upon the nation, which elects its representatives to a bicameral parliament [43]. The Constitution was approved by national referendum and sanctioned by the King on 27 December 1978. The form of government, the territorial structure of the State, and the powers of the Head of State and the Executive in respect of Parliament were determined by the Constitution at that time. The definition of the fundamental rights and freedoms of citizens and the establishment of a system of guarantees for their protection were also established at this time.

The territorial organization of the State was one of the most difficult problems to solve, partly because even within the different political groups the position as to whether to opt for a federal or unitary state was not clearly defined. The Constitution chose a unitary but decentralized State by which the different historical territories were recognized. As such, Spain is composed of 17 autonomous communities, each of which has an autonomous Parliament and Executive with powers shared with the central or national Parliament and the Executive. Constitutional states are organized according to the idea of the "material division of functions" and "formal division of powers" (Figure 2).

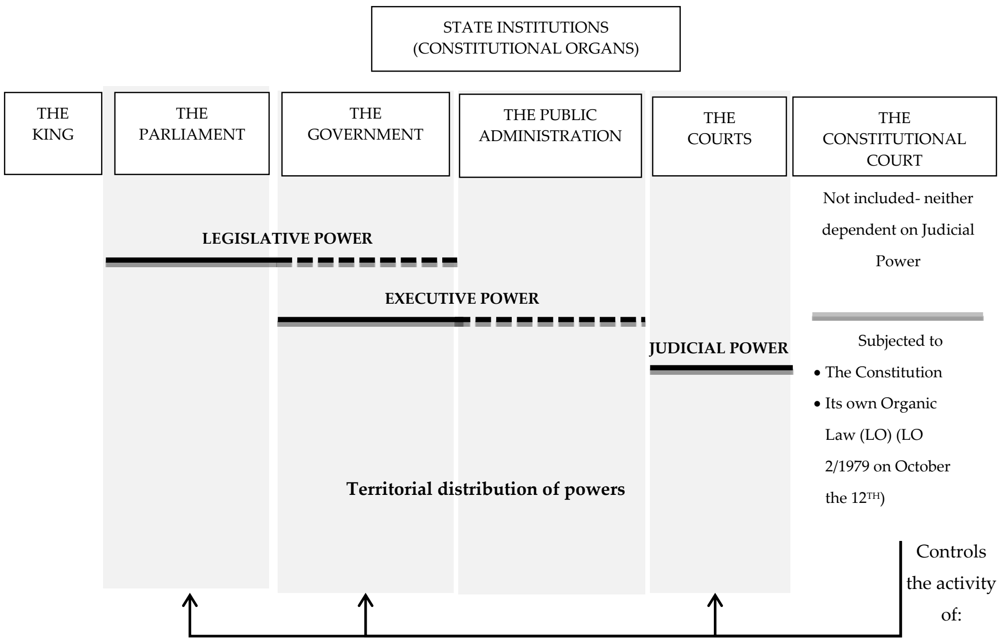

Figure 2. Territorial distribution of powers [14].

The supremacy of the Constitution over the legal dispositions is guaranteed by the Constitutional Court [44]. When there is a gap or inconsistency between legislations and/or regulations, the issue is solved by the judges through the jurisprudence, developing, in this way, another source of reference apart from the laws and regulations. Hence, the concept of "regulatory regime", as discussed below in reference to case studies from other countries, is more appropriately referred to as "judicial regime" in the Spanish context, since the term judicial relates to the activity of the courts. This is reflected in Figure 3.

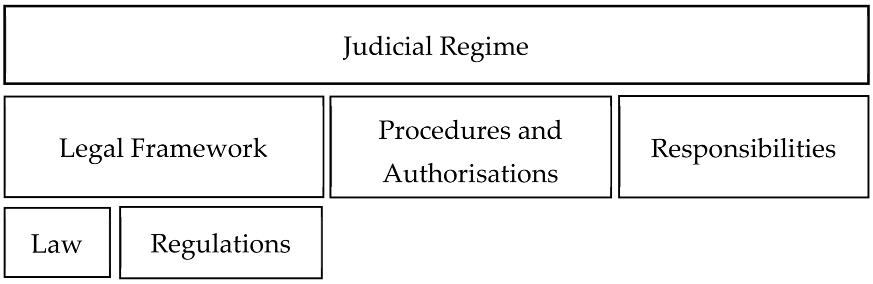

Figure 3. Elements of a judicial regime in Spain [14].

4.3. Laws Governing Buildings and Agents

The development and promulgation of legislation and regulation governing the built environment, and those responsible for those activities, differ by country and can range from central government to regional (provincial) to combinations (e.g., [42]).

The Spanish Building Management Law (LOE) [45], written by members of parliament, establishes the general requirements for the construction sector within the country. The LOE has an integrative character and includes the basic components of any regulatory regime; it motivates further regulatory development [46], refers to proceedings and permits, and defines the resultant responsibilities. It provides that minimum building quality requirements are satisfied in each stage of a building. The objective of the law is to establish the minimum degree of quality in terms of functionality, security, and habitability. Each of these objectives covers a different aspect: functionality refers to utility, accessibility, and access to telecommunications; security refers to structural safety, safety in case of fire, and safety in use; and habitability refers to hygiene, health, indoor environmental protection, protection against noise, energy saving, and thermal insulation.

As in other EU countries, these goals were initially transposed from the Construction Products Directive [47], and later, adapted according to the European Regulation Nº305/2011 [48]. As shown in Table 3, there is no variation between them in terms of the fire safety objective.

Table 3. Correspondence between the essential requirements of fire safety laid down by 89/106/EEC [47] and EU N305/2011 of 9 March 2011 [48] and by the Spanish Building Management Law (LOE) [14].

CD 89/106/EEC [47] and EU 305/2011 [48]	LOE [45]
The construction works must be designed and built in such a way that in the event of an outbreak of fire:	
The load-bearing capacity of the construction can be assumed for a specific period of time	
The generation and spread of fire and smoke within the works are limited	The fire spread inside and outside the building can be limited
The spread of the fire to neighboring construction works is limited	
Occupants can leave the building or be rescued by other means	It is possible for the occupants to safely abandon the building
The safety of rescue teams is taken into consideration	It is possible for the fire services to carry out the rescue and fire extinguishing actions

The LOE, Articles 9 to 14, identifies the building agents that take part in the process and defines their roles at any stage of the building process. Among the tasks of the designer(s) is to prepare the project consistent with the binding contract and the technical and planning regulations, and to handle it with the compulsory authorization from the correspondent professional association, known as "visado". The building agents must meet the educational and professional requirements regarding the type of construction work (A, B, or C) set in Article 2 of the LOE. Table 4 identifies the different types of construction works governed by the LOE. Table 5 provides, for each building agent, the role, the specific stage of the project in which they are responsible, and the educational requirement based on type of building.

Table 4. Type of buildings according to the LOE. Source: LOE. Translated by the authors.

Group	Use
A	Administrative, health, religious, residential in all its forms, educational and cultural.
B	Aeronautical; agriculture; related to energy; hydraulic; mining; telecommunications (relative to telecommunications engineering); road, sea, river, and air transport; forestry; industrial; naval; and sanitation engineering.
C	All other buildings whose uses are not specifically listed in the groups above.

Table 5. Summary of the building agents, functions, and professional prerequisites according to the LOE [14].

Building Agents per the Building Act	Functions	Building Stage Intervention	Enabling Educational Qualifications	
Developer (art. 9)	Promotes, plans, and finances the building work	Design and Construction		
Designer (art. 10)	Drafts the project	Design	A building	Architect
			B buildings	Architect or Engineer
			C buildings	Architect, Technical Architect, or Engineer
Constructor/manufacturer (art. 11)	Executes the construction work	Construction work	Degree or professional qualifications to enable compliance with builder duties	
Construction manager/project manager (art. 12)	Directs construction work	Construction work	A building	Architect
			B buildings	Engineer, technical engineer, or architect
			C buildings	Architect, technical architect, engineer, or technical engineer
Director of the execution of the work (art. 13)	Technical direction of the construction work and quality checks	Construction work	A building	Technical architect
			B buildings led by architects	Technical architect
			B buildings led by others than architects and C buildings	Architect, technical architect, engineer, or technical engineer
Institutions and laboratories for quality control of the building (art. 14)	Provide technical assistance in quality verification of the project, materials, and execution of the work and its facilities	Construction work		
Suppliers of products		Construction work		
Owners and users		Maintenance, Conservation, and Use		

Finally, Article 19 of the LOE establishes the period of liability held by the persons or legal entities involved in the building process. The type of damages and the period of warranty are shown in the Table 6. The defined guarantees are aimed to protect owners and third-party purchasers of buildings from building material damages arising from building flaws or defects.

Table 6. Guarantees scheme of reference provided by the LOE per type of material damages. Source: LOE. Translated by the authors.

Guarantee	Damages	Warranty Period
Property damage insurance or surety bond	Material damage or defects affecting implementation elements of termination or completion of the works.	1 year
	May be replaced by retention by promoter than 5% the amount of the actual execution of the work.	
Property damage or surety	Damage or defects of construction elements or facilities that cause the breach of the conditions of habitability.	3 years
Insurance of property damage or surety	Damage caused to the building by faults or defects originated in or affecting the foundation, supports, beams, slabs, load-bearing walls, or other load-bearing elements, and which directly compromise the resistance and mechanical stability of the building.	10 years

The building demands (general goals) required by the LOE are detailed within the building regulations, which in Spain include the Technical Building Code (CTE), as adopted by the Royal Decree 314/2006 [46] and the Fire Safety of Industrial Buildings Regulation (RSCIEI).

4.4. Building Regulations: The CTE and the RSCIEI

4.4.1. The Technical Building Code (CTE)

The Technical Building Code (CTE) addresses requirements for all building types. The CTE is structured in two parts. Part 1 provides the fundamental goals and Part 2 provides one means of compliance, the set of Basic Documents (DBs). The CTE states that the basic exigencies set by the CTE can be achieved through either the implementation of the technical instructions provided by the DBs (Part 2), referred to in other countries as "prescriptive requirements" or "deemed to comply" solutions, or through the development of alternative solutions (complete or partial), which are demonstrated to comply with the fundamental goals (Part 1) through an engineering or "performance-based" approach.

In the case of the CTE, application of the performance-based option requires demonstration that the outcome of the design, in terms of building performance, is at least equivalent to the performance as would result with the implementation of the specific (prescriptive) technical solutions provided by the respective basic document. It should also be noted that Article 5 of the CTE also states that the responsibility for compliance with the CTE lies with the agents that take part in the construction process as defined in the LOE.

Table 7 shows the correspondences between the Basic Requirements provided by the LOE and the Basic Exigencies given by the CTE with the reference to the pertinent Basic Documents.

As with most building regulatory systems, the "deemed to comply" solutions—the Basic Documents (DBs)—refer to the set of classification, test, and product standards more linked to the implementation of these types of solutions. As presented in Table 8, being part of the EU, reference is made to harmonized European standards. In the case of DB SI, Basic Document for Safety in case of fire; this would include standards that address areas as reaction to fire property; resistance to fire; heat, ventilation and air conditioning systems and systems for smoke control. References are also made for Spanish standards.

Table 7. Basic Requirements provided by the LOE and Basic Exigencies and associated Basic Document of the CTE. (As interpreted by the authors).

LOE		CTE	
Basic Requirements (a)		Basic Exigencies (a)	Basic Documents
Involving Functionality	Utility		
	Accessibility		
	Access to telecommunications		
Relating to Security	Structural safety	Structural safety	DB SE
	Safety in case of fire	Safety in case of fire	DB SI
	Safety in use	Safety in use and accessibility	DB SUA
Involving Habitability	Hygiene, health, and environmental protection	Healthiness	DB HS
	Protection against noise	Noise protection	DB HR
	Energy saving and thermal insulation	Energy saving	DB HE
	Other functional aspects		

Table 8. Summary of harmonized European standards and Spanish referred to by the Basic Document (DB) SI in the Annexe G. Adapted by the authors.

Furniture, Textiles and Other Fabrics and Coverings	UNE-EN 1021
	UNE-EN 1101:1996
	UNE-EN 14115:2002
	UNE-EN 13773:2003
	UNE-EN 13823:2012
	UNE-EN 15619:2014
	UNE-EN 14135:2005
Classification Criteria	UNE-EN 13501
Test Methods	REACTION TO FIRE
	UNE-EN ISO 1182:2011
	UNE-EN ISO 1716:2011
	UNE-EN ISO 9239-1:2011
	UNE-EN ISO 11925-2:2011
	UNE-CEN/TS 1187:2013
	FIRE RESISTANCE
	UNE-EN 1363
	UNE-EN 1364
	UNE-EN 1365
	UNE-EN 1366
	UNE-EN 1634
	UNE-EN 13381
	UNE-EN 81-58:2018
	EXTENDED FIELD OF APPLICATION
	UNE-EN 15080
	UNE-EN 15254
	UNE-EN 15269

Table 8. *Cont.*

Design	UNE-EN 1991-1-2:2019
	UNE-EN 1992-1-2:2011
	UNE-EN 1993-1-2:2016
	UNE-EN 1994-1-2:2016
	UNE-EN 1995-1-2:2016.
	UNE-EN 1996-1-2:2011
	UNE-EN 1999-1-2:2007
	UNE-EN 12101
	UNE-EN 15650:2010
	HVAC AND SMOKE CONTROL SYSTEMS
	UNE 23584:2008
	UNE 23585:2017
	SIGNALING
	UNE 23034:1988

According to the DB SI, the applicable version or the Spanish norms, UNE and UNE-EN ISO, are the ones specified by the DB SI. Differently, the applicable version of the harmonized standards UNE-EN translated from EN norms is the last version of the original document published in the Official Journal of the European Union. The DB SI also allows for the substitution of these norms by others used by any other member of the EU or that takes part in the Agreement on the European Economic Area or subjected to European agreements, as long as the use of equivalent technical specifications is demonstrated.

In the case of performance-based options, it is possible to apply fire safety engineering. However, unlike in the UK, where there is a well-regarded set of guidance documents (BS7974:2019), there is no clearly identified and required fire safety engineering guidance. Table 9 shows the existing guidance concerning this topic. These references are provided in Annex G of the DB SI as indicative standards. In addition, fire safety engineering, as a discipline, is not well recognized. In Spain, fire safety design of buildings generally falls under the purview of architects, and is overseen by the architect associations (colleges of architects).

Table 9. List of the standards for the development of performance based design proposed by the Basic Document DB SI, Annex G. Adapted by the authors.

UNE-EN ISO 13943:2018	**Fire Safety—Vocabulary**
UNE-EN ISO 16730-1:2017	Fire safety engineering—Procedures and requirements for verification and validation of calculation methods—Part 1: General
UNE-EN ISO 16733-1:2017	Fire safety engineering—Selection of design fire scenarios and design fires—Part 1: Selection of design fire scenarios
UNE-EN ISO 23932:2017	Fire safety engineering—General principles—Part 1: General

The specific characteristics of fire safety installations are provided by the Regulation of Fire Safety Installations (RIPCI), approved by RD 513/2017 [49]. The RIPCI includes the requisites for the design, installation, maintenance, and inspection of the systems and equipment, and includes the list of the applicable harmonized European and Spanish standards.

4.4.2. Fire Safety of Industrial Buildings Regulation (RSCIEI)

Although the general provisions of Part 1 of the CTE generally apply to all building types, there is an exception for fire safety, that the BD that provides the technical provisions for fire safety, DB SI, is not applicable to industrial buildings. This is related to the fact that, historically, industrial facilities have been considered particularly dangerous for both the natural environment and people, leading to a special control and treatment of these types of structures by governments [14].

As such, the fire safety objectives for industrial facilities are currently addressed by a different regulation: the Regulation of Fire Safety in Industrial Establishments (RSCIEI) approved by the Royal Decree 2267/2004 [50]). The RSCIEI includes the general requirements, which are further developed within four appendices that specify technical criteria and requirements to achieve the regulatory goals.

4.4.3. Overview of the Spanish Building Regulatory System for Fire Safety

To summarize, the regulation of buildings, including fire safety, is established in the LOE. Performance requirements and technical provisions intended to achieve the desired fire safety performance are primarily stated in the CTE, except in the case of industrial buildings, which are provided within the RSCIEI. This is reflected in Table 10.

Table 10. Documents of the legal framework containing the provisions for fire safety in Spain [14].

	Industrial Buildings		**Other Buildings than Industrial**	
General Provisions	LOE			General Courts
	Agents definitions, roles and responsibilities (d)			
	Basic Fire Safety requirement statement (a)			
	Buildings classification and correspondent educational prerequisites (b)(c)			
	Minimum guarantees			
	CTE PART 1			Ministry of Housing
	Regulatory regime			
	Responsibility of its application €			
Specific Requirements	RSCIEI According to typology and risk level	Ministry of Industry, Tourism, and Commerce	CTE DB SI According to the use of the building	Ministry of Development
Guide for the interpretation	Technical guide for the application of the RSCIEI	Promoted by the Ministry of Industry, Tourism and Commerce	Commented version of the Basic Document for Fire Safety (DB SI)	Promoted by the Ministry of Development
			Support documents: DA DB SI (1–4)	
Registered recognized documents			CTE-DR/048/14	Approved by the Ministry of Development
Other supplementary documents			http://uaaap.blogspot.com.es/	Undertaken by the Union of Architects of the Spanish Public Administrations together with the Ministry of Development.

5. Fire Loss Data in Spain

In Section 3, principles of risk management via regulation and attributes of an ideal regulatory regime were presented. In Section 4, the structure of the Spanish building regulatory system was illustrated. In this section, we briefly explore data that can be used to help inform the efficacy of fire risk management via regulation in Spain.

In Section 3, it was noted that researchers such as Lundin [28] suggest that if the number of casualties associated with fire events is low, there is a general perception amongst the public that risk reduction resources are sufficient. When one looks at the Spanish fire loss history, on the surface it appears fire risk is managed reasonably well.

Figure 4 reflects the average yearly frequency of casualties from accidental sources (Spanish National Institute of Statics (INE), Death Statistics According to Cause of Death). Figure 5 focuses in on reported fatalities associated with fire or explosion (Spanish Asociación Profesional de Técnicos de Bomberos [51–54]. Overall, deaths due to fire are rather low. This is comparable with many developed countries. In Spain, 165 people lost their lives in 2019. The index of 3.51 fatalities per million inhabitants per year in 2019 reflects a substantial growth in comparison with the 2.63 index in 2018 [55,56].

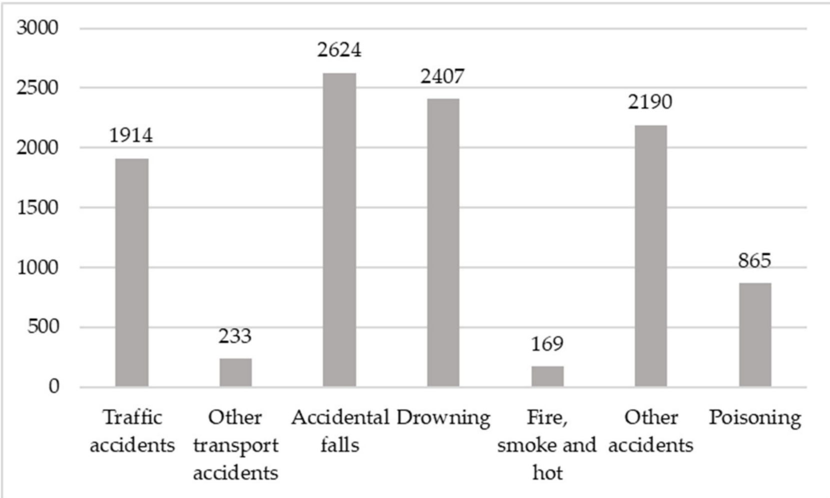

Figure 4. Average yearly number of casualties due to the most frequent accident types in Spain (based on the Spanish National Institute of Statics (INE), Death Statistics According to Cause of Death).

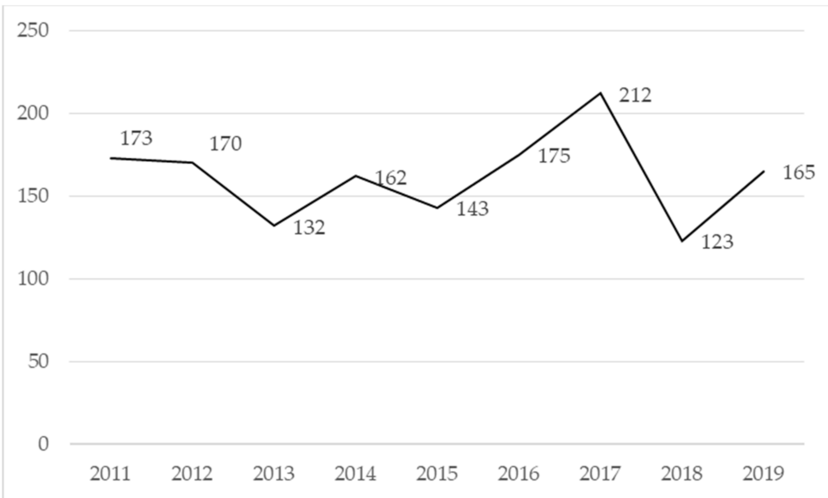

Figure 5. Yearly number of casualties due to fire or explosions in Spain based on the yearly reports of the Spanish Asociación Profesional de Técnicos de Bomberos [51–57].

Based on such data, as suggested by Lundin [28], there is a general perception that the risks are managed well and there are adequate available public resources [28]. However, the potential for significant loss is not necessarily considered by the public (e.g., [38]). Consider the Windsor Tower fire in Madrid [37]—while there were no casualties in that event, the potential for life loss was high had the fire occurred at a time of full building occupancy. Had the fire occurred during occupancy of the building, a tragedy more like the Grenfell Tower fire could have resulted.

In addition, recent studies into the fire data in Spain have shown that statistics may not be very accurate, especially for vulnerable populations [58,59]. This points to a shortcoming in the necessary evidence based for good risk-informed decision-making.

6. Analysis and Results

6.1. Analysis of the Basic Components of an Ideal Regulatory Regime within the Spanish Building Judicial (Regulatory) Regime

Analysis of the Spanish building regulatory framework shows that, on the surface, it contains all the essential elements of an ideal regulatory framework. In line with European criteria, it sets the regulatory goal covering different aspects of the building performance, including the (a) stakeholder identification within the LOE, and defines the (b) role, (c) responsibility, and (d) professional prerequisites of each building agent. Nonetheless, the detailed study of each component evidences some disruptions that complicate the achievement of the regulatory goals. The pertinent observations of the building regulatory framework and the relevance concerning each of the basic components of a regulatory regime are displayed in Table 11.

Table 11. Identified drawbacks concerning the components of an “ideal” building regulatory regime.

Components of an “Ideal” Building Regulatory Regime	Where and How Addressed in Spanish Building Regulatory System	Shortcomings or Gaps between Current Spanish Regulatory Regime and Ideal Regime
Appropriate structure for legal system	LOE, CTE, and RSCIEI	
Regulatory regime consistency between components	LOE sets out societal goals, CTE sets technical requirements and options, and RSCIEI sets specific fire safety requirements for industrial buildings	
Adequate goal statement(s)	Fire safety goals align with EU CPR as stated in LOE/CTE.	Adequate
Clear performance requirements/expectations	CTE has prescriptive requirements in DBs, but it is not clear that they meet fire safety goals in all cases.	Difficult to assess if achievement of the minimum degree of fire safety (risk) is met. In addition, it is not clear that level of risk, based on fire loss statistics is acceptable, or that the fire risk statistics are adequate.
	CTE allows for performance-based design.	CTE lacks performance criteria for verification of performance-based design.
	CTE cites references standards and guidelines for analysis and design.	CTE lacks reference to required or recommended guidelines for performance-based design.
Clear regulatory implementation procedure(s)	LOE and CTE define how designs should be implemented.	Lack of definition of the bureaucratic procedures (CTE Art. 6.1.3). Reference to the competencies of different public administrations. Huge variety of bureaucratic procedures.
Clear regulatory compliance (verification) procedure(s)	CTE provides for prescriptive (DBs) or performance-based solutions.	Wide range in interpretation of CTE requirements on an individual project basis. No requirements for project quality control, or the quality of other nonspecified aspects influencing the building. The control can be carried out with respect to some or all basic requirements, at the discretion of the approving authority. Significant uncertainty concerning the outcome of the project checking (approval).

Table 11. *Cont.*

Components of an "Ideal" Building Regulatory Regime	Where and How Addressed in Spanish Building Regulatory System	Shortcomings or Gaps between Current Spanish Regulatory Regime and Ideal Regime
Clear and comprehensive agent identification	LOE and CTE define roles and responsibilities.	Public administration and professional associations not considered building agents. Furthermore, neither roles nor responsibilities are adequately defined.
Clear and appropriate definition of agent roles (responsibilities)	The designer and the construction manager are entitled under its own responsibility and prior approval of the developer, to adopt alternative solutions (CTE Art. 5.1). AAAAPromoter and designer must agree on the basic exigencies out of the limits established by the CTE (CTE ANEJO I: Contenido del Proyecto)	Designer, construction manager and the developer have significant responsibilities, but no professional requirements or responsibilities are defined.
Clear and appropriate requirements for professional qualifications	No stated requirements for professional qualifications.	Inappropriate definition of the professional requirement for the building agents in terms of fire safety for both prescriptive and performance-based approaches. Professional requirements are specified according to the type of construction work, for any approach and/or quality requirement (LOE) Uncertainty concerning the achievement of the regulatory goals.
Clear explanation of agents' accountability	No references to legal, bureaucratic, professional, and political accountability of building agents.	Building agents' uncertainty.

6.2. Regulatory Regime Consistency

Until the publication of the LOE in 1999, the building sector in Spain was lacking a legal framework and was ordered by the general civil code and a variety of rules. Up until then, the set of legal dispositions did not include the identification of the intervening actors, their obligations, or responsibilities. There was no explicit concern about the minimum guaranties to protect the owner.

The publication of the LOE meant the introduction of a civil accountability system consistent with the regulatory trend of consumers and users protection at that moment, by guaranteeing the minimum standards of quality [42]. The LOE was tailored for the building sector characteristics of that time; it identified the building agents, their roles, and professional prerequisites. It also configured the minimum set of guaranties that any building should offer. It was consistent with the regulatory approach of building regulation in force at that moment: the Spanish Basic Standards (NBE). Each standard of the NBE set had a prescriptive approach.

The mandate of the LOE to develop an inclusive building code addressing the variety of matters covered by the NBE (Second Final Provision) brought about, in 2006, the released of the CTE. Different from the set of NBE regulations, the Technical Building Code (CTE), driven by the influence of international organisms like the International Building Council or the Inter-Jurisdictional Regulatory Collaborating Committee, adopted a double regulatory regime: a prescriptive and/or performance-based approach.

The differences between the different types of regulation at the level of both institutional and management structure, and the distribution of responsibilities, often mean that when several types are mixed, one dominates over the others. A change in the regulatory approach entails a necessary reorganization of procedures and a redefinition of existing responsibilities.

Although the consistency between the different components of a particular regulatory regime (legal framework, procedures and authorizations, and responsibilities) is an essential aspect; seventeen years after its entry into force, the LOE has undergone some minor modifications, none of them addressing the required adaptation to the regulatory regime shift.

6.3. Regulatory Goal (a)

Like many performance-based codes, the CTE and its Basic Document for Fire Safety (DB SI), settle the acceptable level of fire risk in qualitative terms. The socially acceptable level of fire risk is expressed by a set of functional goals, which are meant to be concrete safety goals [60].

On one hand, it is not clear that the implementation of the technical solutions provided within the regulations (DB SI and RSCIEI) assures the achievement of the basic exigencies as it is claimed by the code. The regulatory development of the LOE, the CTE, specifies that the basic requirement for any building in terms of fire safety is to reduce to acceptable limits the risk, to the users of a building, of being harmed because of an accidental fire due to the characteristics of the building project, the construction works, or the building's use or maintenance. To conclude the definition of this goal, the Basic Document, DBSI, identifies the fire safety at a building with an acceptable behavior in each of these aspects: internal fire spread, external fire spread, occupant evacuation, fire protection facilities, fire service intervention, and fire resistance of load-bearing elements. Table 12 presents the specific goals that conform to the general goal of fire safety for buildings, as provided by the CTE.

Table 12. Definitions of the particular goals laying out the fire safety general goal. (Source: CTE. Translated by the authors).

	Goal	Definition
1	Internal fire spread	The risk of a fire to spread inside the building must be limited.
2	External fire spread	The risk of external spread of a fire to itself or to other buildings must be limited.
3	Occupants evacuation	The building must count on appropriate evacuation means to allow the occupants to safely abandon it or reach a safe place inside.
4	Fire protection facilities	The building must count on the appropriate equipment and installations to detect, control, and extinguish the fire as to transmit the alarm to the occupants.
5	Fire service intervention	The intervention of the fire fighters must be eased.
6	Fire resistance of load-bearing elements	The load-bearing elements must resist time enough to allow the achievement of the other basic exigencies.

The achievement of an acceptable level of fire safety within the building requires the structure to be safe for each of these aspects. However, as reflected in fires such as the Windsor Building, analysis by Osácar [14], and data presented by Fernández-Vigil and Echeverría [58,59], there are questions as to whether an "acceptable" level of fire risk is achieved.

In addition, considering that a performance-based option for regulatory compliance is available, one would expect "acceptance criteria" to be included somewhere in the regulatory system (e.g., [21]). However, in Spain, there are no clear acceptance criteria or acceptable methods of verification or assessment; rather, there are only references made to broad standards and guidelines that lack such details.

Finally, the fact that safety in case of fire in industrial establishments is governed by a different regulation (RSCIEI) than safety in case of fire in other buildings (CTE DB SI) implies certain difficulties in assessing whether a consistent level of risk is achieved across all building types. In fact, the general goal for fire safety in industries according to the RSCIEI is not only to protect people in case of fire, but also, different from the DB SI, to reduce the potential damages or losses to material goods. This aspect must be taken into account in the assessment of the regulatory efficiency of the fire safety at buildings regulations.

6.4. Roles Identification (b) and Agent Roles Definition (c)

The adoption of a performance-based approach means an increase of the technical complexity of the design process, which in turns required an adaptation of the bureaucratic procedures and construction work authorizations. Those changes have an impact on the roles of the building agents (functions and phase of involvement). Although the way at which the designer should perform and function changes substantially depending on the approach of the project; there is no reference to this matter, neither to the required educational background nor professional expertise. These prerequisites must be in accordance to the way of performing its role.

Administration enforces the regulations and gives the due permits. They watch over the adherence to the legal and regulatory framework. Professional associations through the "visado" or "professional visa" survey the completeness and technical accuracy of the project and, indirectly, the professional qualification of the designer. The particular economic significance of this visa for the services sector is emphasized by the Royal Decree 1000/2010 of compulsory "professional visa" [61]. Despite the active role that public administrations and professional associations play, none of these stakeholders are considered building agents by the LOE, so no definition of their roles, neither professional qualification nor existing responsibilities, are defined within the law.

When dealing with performance-based projects, the code enforcer cannot be focused on checking constructive prescriptions, but instead on the achievement of the fire safety regulatory goal. As stated before, the regulatory objectives are functional requirements expressed in qualitative terms—the code enforcers from the public administrations are expected to take part in the acceptance-criteria setting to assure that the basic exigencies are met and then verify that the final design performs as expected [60]. Since code enforcers are not considered building agents, there is no reference to its function. In order to carry out its role, it is necessary for the code enforcers to have an educational and professional qualification similar to the project designer.

6.5. Professional Prerequisites (d)

Concerning technical expertise, counting on the professional qualification established by the LOE is enough to carry out the designer tasks for the corresponding type of construction work. Though this is legal enough, it is important to consider that the technical knowledge needed for the layout of a prescriptive approach to achieve the basic requirement for fire safety is completely different from the technical expertise required to carry out a performance-based approach for the fire performance of the same building. There is no evidence of the convenience of specifying the required professional qualification for the professional responsible for defining the fire safety strategy for the building (either with a performance-based analysis or with a prescriptive approach) according to the type of construction work. However, it is highly recommendable to set it out regarding the design approach for the project.

The fact that the general provisions of the Building Management Law (LOE): identification of the stakeholders (b), their role (c) and they professional prerequisites (d); are common for all the basic quality requirements for buildings which involve functionality (utility, accessibility and access to telecommunications), security (structural safety, safety in case of fire and safety in use) and habitability (hygiene, health and environmental protection; protection against noise; energy saving and thermal insulation; another functional aspects), causes some maladjustment given the specifics of fire risk. The enabling education programs to develop the fire safety strategy of a building has nothing to do with the knowledge and expertise required to define the heating and air-conditioning system, the building structure, or the layout of the building distributions. None of the educational qualifications settled by the law can guarantee that the designer has the minimum fire science background or an understanding of human behavior and simulation tools management.

The implementation of the technical provisions is ensured by the administration enforcement and the observance of the professional designer requirements through the "professional visa" [62]. Professional authorization and "professional visa" refer to professional qualifications that, as explained before, do not include the necessary background in terms of fire safety. Professional qualification of public officials presents the same handicap.

One of the main challenges of this type of regulation rests on the difficulty of the official code enforcers to reach the necessary technical expertise to undertake the assessment of these sorts of projects. Meanwhile, technologies are becoming more complex and are based on increasingly specialized knowledge; the attention paid by the governments to the regulation enforcement is decreasing. There is an "expert asymmetry" by which the code enforcers will have less understanding of the technology than those whose work is being assessed [31].

These days, there is little prospect for the public administrations to have enough founding to improve the code enforcers' technical skills, thus it is not likely that "expert asymmetry" will be reduced in the short term.

6.6. Accountability Matters (e)

The need to provide information on the distribution of responsibilities between each economic operator and the users of the revision of the basic requirements for construction works, and to have systems for evaluating and verifying the constancy of performance, is expressly stated in EU Regulation No 305/2011 [48]. On the same line, the law of professional associations shows that professionals and society in general must be informed about the responsibility of the professional associations derived from the "professional visa" function [14]. These aspects are not completely addressed within the regulatory framework covering the building sector in general, and the fire safety in building regulations in particular.

Furthermore, responsibility for nonmaterial damages: personal, moral, or property damages, or the noncompliance with contractual service requirements, remain subject to the civil code [63]. Fire safety objectives create some questions concerning responsibility, which are not clarified by the LOE provisions. The minimum requirement for buildings fire safety in Spain affects the design, construction, maintenance, conservation, and use of buildings and their installations, and is aimed to guarantee that, in the case of a fire, occupants can evacuate safely; the spread of fire within its own building and the adjacent is limited, and performance of rescue and fire equipment is allowed.

Sometimes, the trigger of the fire is in the building itself: gas pipes malfunction, or lack of maintenance of electric facilities. Nonetheless, many other times the cause of the fire is alien to the building, as happens when the fire is due to a lit cigarette in a bin or an electric overload. In any of those situations, buildings should perform allowing occupants to evacuate or stay safely inside until they are rescued or until the fire is under control. Furthermore, the building is expected to not contribute to the spread of the fire to adjoining buildings.

It is important to be aware of the responsibility implications in the case of an accidental fire occurring within a building but is caused by external factors. In such a case, the building performance has a direct impact on public safety, property, and environmental protection.

The shift of the regulatory approach, from prescriptive-based to performance-based, led to a swing of responsibilities of the building agents. However, there is no clarification of the responsibility held by each agent in the building procedure, neither for the prescriptive nor for the performance-based design approach.

6.7. Other Considerations

The stakeholders' interests vary from only protection of human life to the material goods protection or business continuity. The degree of protection achieved through the implementation of the prescriptive solutions (CTE DB SI or RSCIEI) is uncertain for it depends, mainly, on the fire characteristics, the physical space, and the occupants' characteristics. Only when a performance-based design is conducted can the stakeholders concerns can be properly addressed. To do so, it is basic to follow an appropriate performance-based procedure which, given the current circumstances, might not be adequately addressed.

7. Discussion

While shortcomings have been identified, these can be overcome by addressing a few key points.

With respect to the regulatory goal, the problems identified do not allow to adequately address the fire risk in buildings delivered through the implementation of the building regulations, particularly performance-based solutions. To advance in this direction it is necessary to carry out some adjustments within the current regime with regard to adding performance criteria and better defining a performance-based design approach for fire. More analysis of actual fire risk performance, given the first loss statistics, would also be beneficial.

Defining the specifics of the performance-based option in terms of administrative procedures, implementation, and enforcement is needed. That is, better definition of roles and responsibility, as well as technical guidelines within the LOE and CTE, could ease the understanding and adoption of such approach.

Regarding design for and verification of fire safety, it is important to specify the educational and professional requirements needed to develop and approve performance-based approaches. This aspect is particularly important, since a certain degree of knowledge is required, not only for designers but also for other actors, such as code enforcers (e.g., [64,65]).

Concerning the need to assure the adherence to the regulatory goals, the definition of the design process and the intervention of different stakeholders are essential within the system.

Other actors are involved in the construction process, which could be considered building agents (e.g., code enforcers, reviewers from professional associations), should have roles and responsibilities defined with respect to fire safety. Each has a particular role to play, requiring specific knowledge required to carry it out, and thus holds a social accountability for this as part of the fire safety system. These are considered crucial aspects that must be clarified.

Expansion of engagement with stakeholders is needed. Without an appropriate representation of the diversity of stakeholder interests, key issues can be missed, inadequate regulations can be enacted, or other unfortunate outcomes may occur.

As long as national guidelines and educational programs are not in place, some international tools and methods could be useful to highlight the implementation of fire regulations, such as the International Fire Safety Standards: Common Principles [66] or the SFPE Guide to Human Behavior in Fire [67], which could be included in the official registry of the Ministry of Development. These guides not only refer to the use of engineering tools or the implementation of the performance-based approach, but also other aspects related to the prescriptive option. Some interesting works addressing the relationship between building activity, space, and occupant characteristics have been done, which could be useful to achieve a desirable flexibility when choosing a prescriptive option; in this sense, the provision of the scientific background of the prescription could also be helpful.

With respect to the role that the code enforcers should play in the performance-based approach design process and the required educational background, international guidelines refer to the role of a peer reviewer (e.g., [60,68]). The municipal Ordinance on Urban Licenses Process of Madrid is an example of the progress towards the implementation of the performance-based design in Spain. This local ordinance, expresses that performance-based projects are to be monitored by local official enforcers from the earlier stages of the project until the proposal final validation. In the absence of other legal provisions on technical and procedural indications, it indicates the general stages for the evaluation and approval of the project, and points out the possible implication of a third reviewer when the official enforcers consider it appropriate [69].

8. Conclusions

It is concluded that relevant drawbacks exist within the current building regulatory regime in Spain with respect to fire safety provisions. Some of these are derived from the lack of consistency between the different approaches to legislation governing various aspects of the regulatory system, which results in an impact on procedures and responsibilities. Others concern the lack of a clear regulatory goal/mandate for fire safety, incomplete identification of responsibilities and accountability in the system, and inadequate reference to technical guidance. Furthermore, some accountability aspects in case of accidental fires remain unclear. It is important to notice that these problems may not affect solely the fire safety objective, but all the building basic requirements.

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