Reforming Syrian Building Regulations:

A Comparative Analysis and Strategic Roadmap

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Executive Summary

Introduction

The Syrian Arab Republic stands at a critical juncture, facing the monumental task of reconstruction after more than a decade of devastating conflict and the recent catastrophic earthquakes of 2023. The nation's built environment has suffered extensive damage, and pre-existing vulnerabilities in building practices and regulatory oversight have been starkly exposed. This report provides a comprehensive review of Syrian building regulations, combined with an analysis of regulatory frameworks in Jordan, Israel, the United Arab Emirates, Cyprus, Greece, Spain, Italy, and the United Kingdom.

Current Syrian building regulations, including the Syrian Arab Code for seismic design, are often outdated or, more critically, suffer from a near-total collapse of enforcement mechanisms due to protracted conflict, weakened institutional capacity, and pervasive issues such as corruption. The 2023 earthquakes tragically underscored the fatal consequences of non-compliant construction, with tens of thousands of casualties and widespread destruction. Furthermore, urban planning and property laws enacted during the conflict, such as Law No. 23 of 2015 and Law No. 10 of 2018, have been criticised for potentially undermining Housing, Land, and Property (HLP) rights, posing significant challenges to equitable reconstruction.

Comparative analysis reveals that benchmark countries have adopted more advanced, regularly updated, and robustly enforced building codes. Key lessons include the importance of: independent and technically competent bodies for code development and oversight (e.g., Israel, Jordan); phased adoption of modern international codes (e.g., UAE); strong national frameworks for seismic design (e.g., Greece, Italy, Cyprus), energy efficiency (e.g., EU countries, UAE), fire safety, and accessibility; and integrated urban renewal strategies linked to seismic safety (e.g., Israel, Cyprus). However, these international models must be carefully adapted to Syria's unique post-conflict realities, particularly its HLP crisis and limited institutional capacity.

Recommendations

This report puts forward a series of strategic recommendations for a comprehensive reform of Syrian building regulations. These are cantered on:

1. Foundational Legal and Institutional Strengthening: Establishing an independent National Building Code Authority and urgently addressing HLP rights to ensure fair and equitable reconstruction.
2. Phased Technical Modernization: Immediately adopting life-safety-focused seismic and fire codes, followed by the integration of energy efficiency, sustainability, and accessibility standards.
3. Building a Culture of Compliance: Rebuilding enforcement mechanisms with a focus on capacity, integrity, professional accountability, and stringent penalties for non-compliance.
4. Embedding Resilience: Updating codes based on current risk assessments (seismic and climate) and integrating them with land-use planning.
5. Championing Sustainability: Mandating energy and resource efficiency, with a particular emphasis on leveraging Syria's solar potential.
6. Investing in People: Launching extensive capacity-building programs for all construction sector stakeholders.
7. Fostering Collaboration: Engaging the public, private sector, and international partners in the reform process.

The path to a resilient and sustainable built environment in Syria is challenging but imperative. By learning from international best practices while tailoring solutions to its specific context, Syria can lay a foundation of safety and quality for its reconstruction, contributing to the long-term well-being of its people and the sustainable development of the nation.

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1. Introduction: Rebuilding Syria on a Foundation of Resilient Construction

1.1. The Syrian Context: Reconstruction Imperatives and Inherent Vulnerabilities

The Syrian Arab Republic confronts an unparalleled challenge: rebuilding a nation ravaged by over a decade of conflict while simultaneously addressing deep-seated vulnerabilities. The conflict has inflicted immense damage upon the country's infrastructure, leading to the widespread destruction of buildings and the displacement of millions of its citizens. Estimates for the cost of reconstruction range from $250 billion to $400 billion, a figure that underscores the sheer scale of the task ahead.

Compounding this devastation is Syria's geographical position within a seismically active region. This inherent risk was tragically realised in the February 2023 earthquakes, which not only caused further extensive damage and loss of life but also brutally exposed the pre-existing frailties within the nation's building stock and the critical failures in regulatory enforcement. In northwest Syria alone, an estimated 10,600 structures were entirely or partially destroyed by these seismic events. The earthquakes served as a grim reminder that unsafe construction practices can have catastrophic human consequences.

The socio-economic fabric of Syria has also been severely torn. Approximately 90% of the population lives in poverty, with a heavy reliance on humanitarian aid for survival. Administrative capacity within state institutions has been significantly weakened by years of conflict and displacement. The complexities surrounding the return of refugees and the resettlement of internally displaced persons (IDPs) present further intricate challenges, particularly concerning housing, land, and property (HLP) rights.

Recent political developments since December 2024, including the gradual restoration of ties with some international and regional actors, may signal new opportunities for support and investment in the reconstruction process. The potential easing or lifting of certain international sanctions could further facilitate these efforts, although the legacy of comprehensive sanctions has historically impeded economic recovery and humanitarian aid delivery.

The Syrian situation is thus a complex interplay of urgent post-conflict reconstruction needs, significant inherent seismic risk, profound socio-economic distress, and a fluid geopolitical environment. This unique confluence of factors demands that any strategy for reforming building regulations be exceptionally nuanced. It cannot merely focus on adopting technically advanced codes; it must also be practical to implement within a state with diminished capacity, sensitive to immediate humanitarian needs (such as

shelter), and designed to address the deeply complex HLP rights issues that have arisen from years of conflict and displacement. A failure to acknowledge and integrate these contextual realities would render even the most technically sound regulatory reforms ineffective.

1.2. Purpose of this Comparative Review

This report aims to conduct a comprehensive and critical review of the existing building regulations in the Syrian Arab Republic. To provide a robust evidence base for reform, Syrian regulations will be systematically compared against the building codes and regulatory frameworks of a selection of countries. These include neighbouring Middle Eastern nations (Jordan, Israel, the United Arab Emirates), European Union member states with broadly similar climatic conditions (Cyprus, Greece, Spain, Italy), and the United Kingdom as an additional example of a well-established regulatory system.

The primary objective of this comparative analysis is to derive actionable, evidence-based recommendations for the modernization and enhancement of Syrian building regulations. The focus will be on improving standards related to structural safety (with a particular emphasis on seismic resilience), energy efficiency, sustainability, fire safety, and accessibility. Crucially, these recommendations will be tailored to Syria's specific post-conflict reconstruction context, considering the urgent need for safe and resilient infrastructure, the capacity challenges, and the imperative to build a more sustainable future.

2. Syrian Building Regulations: Current Landscape and Critical Assessment

2.1. Evolution and Key Legislative Pillars

The legal framework governing construction and property in Syria has evolved over many decades, with some foundational laws retaining relevance to this day. The Civil Code, promulgated as Legislative Decree 84/1949, remains a cornerstone of property law, addressing matters of ownership, acquisition, conveyance, and other related rights. The country's constitutional history has seen numerous shifts in governance, including periods under emergency law. A notable provision retained in successive constitutions is the statement that Islamic jurisprudence (fiqh) is to be a main source of legislation, which may have an underlying influence on property-related matters, though specific impacts on technical building codes are less direct.

Several key pieces of legislation shape the current regulatory landscape for building and urban development:

- Foreign Ownership Law (Law 11/2011): This law, promulgated in April 2011, sets out conditions for foreign nationals and families to purchase residential property, including minimum size requirements (140 square meters) and restrictions on resale (a two-year waiting period).
- Property Investment Law (Law 15/2008): Enacted in July 2008, this law aims to encourage investment in the real estate sector by both Syrian and foreign investors. It provides for the establishment of real estate development zones and offers incentives such as tax exemptions and reduced import restrictions. Critically, Article 6 of this law grants the board of directors of the "General Commission for Real Estate Development and Investment" the authority to propose real estate development zones and potential expropriations, while Article 10 allows the commission to propose demolition and reconstruction of existing residential areas. This law has been identified as a tool potentially used by regime loyalists to seize and expropriate land, particularly in areas whose residents opposed the regime, under the pretext of removing irregular structures or undertaking development projects.
- Land-Use Planning Law (Legislative Decree 82/2010): Promulgated in September 2010, this decree applies to areas designated for land-use planning by local administrative authorities. It regulates the construction and sale of real estate units, sets time limits for licensing and construction, and sanctions off-plan sales.
- Urban Planning and Urbanisation Law No. 23 of 2015: Issued in 2015, this law is considered a pillar of urban planning in Syria. It defines the methods for preparing land for construction—either through zoning or regulation—in accordance with an approved Master Plan.[1] This law grants administrative units the power to increase "free deductions" from property owners for the provision of amenities like roads

and parks. However, Law No. 23 has faced significant criticism, particularly for its potential impact on property rights in a conflict and displacement context. Concerns include the ignoring of informal settlements, the lack of provision for compensation housing for those whose properties are affected, excessively short periods for owners to prove their property rights (initially 30 days, later amended to one year after protests), the acquisition of large land tracts by administrative authorities, high financial burdens on owners, the principle of compulsory distribution of shares, and the absence of effective mechanisms for representing the interests of the affected population.[1] These provisions are particularly problematic for displaced persons who may be unable to meet claim deadlines or navigate complex bureaucratic processes from afar.

The Ministry of Public Works and Housing plays a significant role in the planning of urban development affairs, drawing up general policies for sustainable urban planning and preparing development plans from regional to local levels. It is also involved in housing and real estate development, aiming to provide ingredients for the housing sector to meet societal needs.[2]

The legislative environment in Syria, particularly with laws like No. 15/2008 and No. 23/2015, presents a complex challenge. While ostensibly aimed at development and urban planning, these laws contain provisions that have been, or could be, used to facilitate the dispossession of property owners, especially those displaced by conflict or perceived as being opposed to the government.[1] The "General Commission for Real Estate Development and Investment," for example, has extensive powers that could override individual property rights under the guise of redevelopment. Therefore, any reform of technical building codes must be acutely aware of this broader legal context. Implementing technically sound building codes within a planning and property rights framework that is perceived as unjust or facilitates expropriation could inadvertently legitimise or enable inequitable reconstruction processes.

Table 1 Key Syrian Legislation Governing Construction and Urban Development

Legislation Title & Number	Year of Promulgation	Key Provisions Relevant to Building/Urban Development	Administering/Relevant Authority
Civil Code (Legislative Decree 84/1949)	1949	Governs property law, ownership, acquisition, conveyance, possession, usufruct rights, collateral, etc.	Judiciary, Relevant administrative bodies
Land Reform Law (Law 161/1958)	1958	Places limitations on land ownership, allows state expropriation of excess land for redistribution. Amended by LD 88/1963 and LD 31/1980.	State, Ministry of Agriculture and Agrarian Reform (historically)
Property Investment Law (Law 15/2008)	2008	Allows Syrian and foreign investment in real estate; establishes development zones; companies licensed for projects; tax/import incentives. Allows General Commission for Real Estate Development to propose expropriations/demolitions.	General Commission for Real Estate Development and Investment, Ministry of Local Administration and Environment
Land-Use Planning Law (Legislative Decree 82/2010)	2010	Applies to designated land-use planning areas; regulates construction/sale of real estate units; time limits for licensing/construction; sanctions off-plan sales.	Local Administration Authorities, Ministry of Local Administration and Environment
Foreign Ownership Law (Law 11/2011)	2011	Regulates foreign family purchase of residences (min. 140 sqm), 2-year resale waiting period, inheritance provisions.	Relevant municipal/administrative bodies, Land Registry

Urban Planning and Urbanisation Law No. 23 of 2015	2015	Defines methods for land preparation for construction (zoning/regulation) per Master Plan; allows increased free deductions by admin units; establishes dispute-settlement committees.[1]	Administrative Units (Municipalities), Ministry of Local Administration and Environment
Law No. 10 of 2018	2018	Allowed creation of redevelopment zones within master plans, potentially leading to expropriation if ownership not proven within a set time. Criticised for dispossessing displaced persons [[3], S16 (mentions amendments to Law 23/2015 due to Law 10 criticism)].	Local Administrative Units, Ministry of Local Administration and Environment
Syrian Arab Code for Seismic Design (e.g. 2004)	2004 (update)	Specifies parameters and methodologies for earthquake-resistant design of buildings, including static and dynamic analysis methods.	Ministry of Public Works and Housing, Order of Syrian Engineers and Architects (potentially)
Syrian Arab Code for Design and Implementation of Reinforced Concrete Structures - Loads on Buildings	2005 (update)	Provides standards for the design and implementation of reinforced concrete structures, including load calculations.	Ministry of Public Works and Housing, Order of Syrian Engineers and Architects (potentially)

2.2. Technical Provisions of the Syrian Arab Code (Emphasis on Seismic, Structural, Materials)

Syria has had technical codes in place, notably the Syrian Arab Code for seismic design, which has seen updates over the years. A version from 1995 was followed by the "Syrian Arab Code for Loads on Buildings - Appendix No. 1 - Seismic Loads," seemingly updated around 2004 or 2005. This 2004 code outlines methodologies for seismic analysis, including a "First Static Method" (similar to the 1995 code with modifications) and a "Second Static Method," as well as provisions for dynamic analysis.

Key parameters defined in the 2004 seismic code include:

- Importance Factor (I): Assigns higher values to critical structures like hospitals and buildings with large occupancy (e.g., I=1.5 for hospitals, I=1.25 for occupancy > 300).
- Ductility Factor (K) / Response Modification Factor (R in second method): Reflects the building system's capacity to deform in a ductile manner (e.g., K=0.80 for frame systems bearing 50% of lateral loads, K=1.30 for bearing wall systems).
- Dynamic Factor (C): Represents the ratio of equivalent structural acceleration to ground acceleration, dependent on the fundamental period (T) of the structure.
- Soil Coefficient (S): Accounts for local soil conditions influencing seismic response.
- Total Weight (W): Includes all dead loads and a percentage of live loads (typically 25%).
- Base Shear (V): The total lateral seismic force at the base of the structure, calculated using these factors and the seismic zone factor (Z). The code specifies upper and lower limits for base shear.
- Lateral Load Distribution: Formulas are provided for distributing the base shear over the height of the structure, including an additional concentrated force (Ft) at the top for taller buildings.
- Structural Period (T): Approximate formulas are given based on building type (steel frame, RC frame, other) and height, or number of stories for shear wall and frame systems.
- Soil Profile Types: The code references soil profile types (e.g., SD, SE) for determining seismic coefficients, particularly in the simplified design base shear method.

The codes emphasise the use of reinforced concrete (RC) as a primary structural material. The design principles highlight the compressive strength of concrete and the tensile strength of steel reinforcing bars (rebars). Proper detailing, including concrete mix proportions, dimensions and spacing of rebars, columns, beams, and slab thickness, are specified as critical for structural integrity, especially for earthquake resistance. Reinforcement of masonry walls, particularly at vulnerable points like corners of openings, and the use of continuous tie beams are also advocated. The "Syrian Arab Code for the Design and Implementation of Reinforced Concrete Structures - Loads on Buildings, 2005" is a specific document guiding these aspects.

More recently, an initiative known as the "Syrian Building Code (SBC)" appears to have been developed or proposed, accessible via the website sbc.codes.[3] This platform outlines a comprehensive suite of codes, including SBC-SE (Seismic), SBC-C (Concrete), SBC-DM (Debris Management), SBC-L (Structural Loads), SBC-GB (Green Buildings), SBC-FC (Fire Code), SBC-SS (Security and Safety), SBC-EB (Existing Buildings), and SBC-M (Mechanical). It also features associated online calculators for parameters like base shear, concrete mix design, and energy efficiency. The exact official status, level of adoption, and enforcement of this newer "SBC" framework are unclear from the provided materials, but its structure suggests an ambition to modernise and broaden the scope of Syrian building regulations significantly.

Despite the existence of these technical provisions, particularly the 2004/2005 codes, the extensive damage observed in past seismic events, most notably the 2023 earthquakes, strongly suggests that these codes were either technically inadequate for the seismic forces experienced, not consistently applied in design, or, most critically, not enforced during construction. The prevalence of "pancake collapses" is a hallmark of structures lacking the ductility and robustness required by modern seismic codes. If the newer "SBC" is a recent official development, its successful implementation would depend heavily on overcoming the deep-rooted enforcement challenges that plagued older codes. If it remains a proposal, then the older, likely outdated 2004/2005 codes represent the de facto standard, which, in addition to enforcement issues, may require substantial technical updates.

2.3. Urban Planning Frameworks and Development Control

Urban planning and development control in Syria are primarily governed by legislation enacted both before and during the conflict. The Land-Use Planning Law (Legislative Decree 82/2010) provided a framework for regulating construction and sale in designated planning zones. However, the Urban Planning and Urbanisation Law No. 23 of 2015 has become a central, and controversial, piece of legislation in this domain.[1] This law empowers administrative authorities to prepare land for construction through zoning or regulatory planning, guided by a Master Plan. It also allows these authorities to increase "free deductions" from property owners to fund public amenities.

Law No. 23 of 2015, and its precursor Legislative Decree No. 66 of 2012, have drawn considerable criticism, particularly concerning their implementation mechanisms and potential impact on property rights.[1] Key criticisms include:

- Ignoring Informal Settlements: The law does not adequately address the status and rights of residents in informal settlements, which constitute a significant portion of urban areas in Syria.
- Lack of Compensation or Alternative Housing: There is no recognised lawful right to alternative housing for occupants whose properties are affected by redevelopment under this law.[1] Compensation for informal structures built on state land is limited to the value of the rubble.

- Short Timeframes for Ownership Claims: A very short period (initially 30 days for Law No. 23, similar to LD 66/2012) is provided for right holders to prove their ownership after a regulatory plan is issued.[1] While this was reportedly extended to one year for Law No. 23 after protests, such timeframes remain challenging for displaced populations or those who have lost documentation during the conflict.
- Acquisition of Large Land Tracts: The law facilitates the acquisition of large areas of land by administrative authorities, potentially leading to widespread displacement.
- Financial Burden and Compulsory Share Distribution: The law can impose significant financial burdens on owners and includes provisions for compulsory distribution of shares, which may not align with owners' interests.
- Lack of Representation and Unfair Dispute Settlement: Committees established for dispute settlement and rights establishment under Law No. 23 are criticised for not adhering to fair trial standards and for unfair land value assessments.[1] There is a perceived absence of effective mechanisms to represent the affected population.

Further complicating the HLP landscape is Law No. 10 of 2018. This law enabled the creation of redevelopment zones within general organisational plans, allowing the state to seize properties of individuals, particularly those displaced, who could not prove ownership within specified, often impractical, timeframes.[3] This legislation has been widely seen as a tool for demographic engineering and systematic dispossession, especially in areas formerly held by opposition groups.[3] For instance, in the al-Haydariya area of Aleppo, the regime reportedly used residents' flight as a pretext for widespread demolitions, claiming the area for a real estate development project and preventing displaced residents from returning or rebuilding.

The UN-Habitat emphasises that planning law is a critical component in guaranteeing the right to sustainable cities and interacts directly with building codes. However, in Syria, the urban planning framework, as shaped by laws like No. 23/2015 and No. 10/2018, appears to prioritise state-led redevelopment initiatives with mechanisms that can systematically disadvantage or dispossess original property owners, particularly the vast numbers of displaced Syrians. This creates a profound justice and HLP rights challenge. If building code reforms are implemented without addressing the inequities embedded in these planning laws, there is a significant risk that new, safer buildings could be constructed on land acquired through unjust means, thereby perpetuating grievances and undermining sustainable and equitable reconstruction.

2.4. Implementation Realities: Enforcement, Compliance, and Systemic Challenges

The existence of building codes and urban planning laws in Syria is starkly contrasted by the realities of their implementation and enforcement. A pervasive disregard for building codes has been widely reported, contributing significantly to the scale of devastation seen in recent earthquakes. It is highly probable that earthquake-resistant

design codes were not mandated or, if mandated, were not effectively enforced in many parts of the country prior to the 2023 disaster.

Several interconnected factors contribute to this systemic failure:

- Corruption and Profit-Driven Motives: Corrupt practices among officials and unscrupulous behaviour by builders and property developers are frequently cited. These include skimping on essential construction materials like steel reinforcement and using weak concrete mixes to reduce costs and maximise profits, directly compromising structural integrity. The drive for profit often leads the construction industry to take shortcuts, ignoring established best practices.
- Weakened Administrative Capacity: Years of conflict have severely weakened the administrative capacity of state institutions responsible for oversight and enforcement. This includes a potential shortage of qualified personnel, lack of resources for inspections, and breakdown of regulatory processes.
- Governance Issues: The Syrian regime's centralised control over legislative and judicial branches allows it to pass and enforce (or selectively not enforce) laws in a manner that may prioritise political objectives or the interests of loyalists over public safety. The "General Commission for Real Estate Development and Investment," established under Law 15/2008, holds significant power for demolition and reconstruction, which has reportedly been used to dispossess communities and reward supporters.
- Government Amnesties: Similar to practices observed in neighbouring Turkey, government amnesties for non-compliant buildings, often granted in the name of facilitating rapid or affordable urban development, have institutionally sanctioned the neglect of building codes, further entrenching risky construction practices.
- Lack of Publicly Available Data: The absence of publicly accessible data on building stock, compliance levels, and damage assessments hinders independent risk analysis and makes it difficult to scrutinise the effectiveness of existing regulations or hold relevant parties accountable.

The core problem in Syria's building sector appears to be less about a complete absence of technical regulations and more about a profoundly dysfunctional implementation and enforcement environment. This dysfunction is rooted in deep-seated governance failures, systemic corruption, and the debilitating effects of prolonged conflict. Consequently, any technical improvements or modernization of the building codes themselves will likely prove futile unless these fundamental systemic challenges are addressed concurrently. Building a robust, transparent, and accountable system for enforcement is as critical, if not more so, than refining the technical specifications of the codes.

2.5. Insights from Recent Seismic Events and their Implications for Syrian Codes

The February 2023 earthquakes that struck southern Türkiye and northern Syria provided a devastating, real-world test of building performance and regulatory efficacy in the region. The scale of destruction and loss of life in Syria served as an undeniable indictment of prevailing construction practices and the failure to implement and enforce adequate building codes.

Several critical observations from these events have direct implications for Syrian building code reform:

- Widespread Non-Compliance: The sheer number of collapsed buildings, many exhibiting "pancake collapse" (where floors stack on top of each other), is a clear indicator that they were not designed or constructed to withstand the experienced seismic forces. This points to a widespread disregard for even basic principles of earthquake-resistant design, such as adequate steel reinforcement in concrete structures and proper reinforcement of masonry walls.
- Compliance Saves Lives: Amidst the ruins, instances of intact buildings standing adjacent to collapsed ones were observed. This strongly suggests that where building codes were followed, and construction quality was adequate, structures performed significantly better, protecting occupants even under severe seismic stress. This underscores the life-saving potential of well-enforced, appropriate building standards.
- Deficiencies in Newer Stock: Investigations in Türkiye revealed that deficiencies were present even among the newest building stock, indicating systemic issues within the construction industry, including the use of non-compliant materials and improper construction methods. Given the similarities in regional construction practices and the additional pressures of conflict and sanctions in Syria, it is probable that such deficiencies are equally, if not more, prevalent in Syrian buildings.
- Urgent Need for Retrofitting and Resilient Reconstruction: The earthquakes damaged or destroyed at least 10,600 buildings in northwest Syria alone, with around 3,500 buildings damaged and 700 classified as unsafe in Aleppo. This necessitates a massive effort in retrofitting repairable structures and ensuring that all new reconstruction adheres to significantly improved and rigorously enforced building codes. The World Bank estimated direct physical damages in Syria from the earthquakes at $5.1 billion, with residential buildings accounting for nearly half of this.
- Catalyst for Reform: The tragic outcomes of the 2023 earthquakes should serve as a powerful catalyst for comprehensive reform of building regulations and practices in Syria. The disaster provides irrefutable evidence of the current system's failures and the profound human cost of non-compliance and neglect. This understanding must be leveraged to generate the political will and public demand necessary for

meaningful and lasting change. The event highlights that this is not an abstract technical issue but one of immediate life-or-death importance.

The lessons from these recent seismic events are stark: existing building codes in Syria, or at least their application and enforcement, were catastrophically inadequate. Future efforts must focus not only on updating the technical content of the codes but, more importantly, on establishing a system that ensures these codes are actually implemented and verified on the ground.

3. Regional Benchmarking: Building Regulations in the Middle East

A comparative look at building regulations in neighbouring Middle Eastern countries—Jordan, Israel, and the United Arab Emirates—offers valuable perspectives for Syria's reform efforts. These nations, while having their own unique developmental paths and challenges, provide insights into different approaches to code development, enforcement, and thematic priorities like seismic safety and sustainability.

3.1. Jordan

Overview: Jordan's efforts to formalise building regulations began in 1980 with the establishment of the Jordanian National Building Council (JNBC) and the initial development of the Jordan National Building Codes. The Royal Scientific Society (RSS), a prominent research institution, plays a key role in assisting the JNBC and the Ministry of Public Works and Housing in preparing and updating these codes. The overarching aim is to regulate building design and construction through sound, uniform engineering principles and rules.

Seismic Design: The Jordan Code for Loads and Forces (JC) has historically included seismic provisions. In 2017, the Jordanian Code for Earthquake Resistant Buildings (JCERB) became the national standard, reportedly drawing from UBC-97 for buildings exceeding three stories. Earlier evaluations of Jordan's seismic recommendations, however, indicated some shortcomings, such as inconsistencies with the established seismic risk in the country and a tendency for code formulae to underestimate the fundamental period of structures when compared to analytical values or other international codes. This suggests an ongoing process of refinement in seismic design standards.

Energy Efficiency & Sustainability: Jordan has placed a growing emphasis on energy performance in buildings. Codes and manuals have been developed for thermal insulation, natural lighting, ventilation, and overall energy-efficient design. The Jordan Green Building Guide (JGBG), introduced in 2013, provides a framework and rating system for sustainable buildings. Key legislative tools include the Jordan Thermal Insulation Code and the Jordan Energy Efficient Building Codes. The Jordan Green Building Council (JGBC), a non-profit organisation, actively promotes green building practices and collaborates with public and private sectors.

Fire Safety: The Jordan National Building Codes encompass provisions for fire fighting systems. Reports from initiatives like Better Work Jordan, while focusing on industrial settings, have highlighted fire safety risks such as substandard electrical installations, inadequate means of escape, and insufficient fire suppression systems. However, these

reports also note that overall fire and building safety conditions in Jordan's formal sector are comparatively better than in some other developing countries.

Accessibility: Jordan has a Building Requirements Code for the Disabled (BRCD). Despite this, studies, particularly focusing on educational buildings, have revealed significant gaps in the implementation of these accessibility standards. A disability rights law passed in 2017 mandates accessibility measures in public facilities and infrastructure, but progress towards full implementation has been described as slow, with a low percentage of buildings in Jordan being fully accessible.

High-Density Construction: Jordanian codes include general design and performance standards addressing aspects like noise, waste management, air pollution, and visual screening for developments. Specific subdivision design standards also regulate street arrangements, cul-de-sac dimensions, and right-of-way widths in planned areas.

Official Sources: Key institutions include the Ministry of Public Works and Housing (mpwh.gov.jo) [4], the Jordan National Building Council (jnbc.gov.jo) [5], and the Royal Scientific Society (rss.jo).

Jordan's regulatory system demonstrates a structured approach involving collaboration between governmental bodies and a national scientific institution for code development and updates. There is a clear trajectory towards enhancing energy efficiency and promoting green building standards. However, like many countries, Jordan faces challenges in ensuring the full and consistent implementation and enforcement of all its regulations, particularly evident in the areas of accessibility and, historically, the precision of its seismic codes. For Syria, Jordan's model of leveraging a national scientific body for technical code development could be highly beneficial, given the need for expertise. The Jordanian experience also underscores that establishing codes is only the first step; sustained effort in capacity building for enforcement and continuous review based on evolving risk assessments and international best practices is equally crucial.

3.2. Israel

Overview: Israel's building standards system is primarily managed by the Standards Institution of Israel (SII), a state-owned corporation responsible for developing Israeli Standards (SI), as well as testing and certifying products and services.[6] While Israeli Standards are generally voluntary, the Minister of Economy and Industry has the authority to declare specific standards, or parts thereof, as "Official Standards." This mandatory status is typically invoked when deemed necessary for protecting public health, safety, the environment, ensuring product compatibility, or preventing significant economic damage to consumers due to substandard construction materials or practices. The Ministry of Interior's Planning Administration oversees broader aspects of spatial planning, infrastructure development, housing policy, and the regulation and licensing of construction projects.

Seismic Design: The cornerstone of seismic design is Israeli Standard SI 413, "Design Provisions for Earthquake Resistance of Structures". First published in 1961, SI 413 has undergone numerous revisions and amendments (e.g., in 1975, 1995, with further amendments in 2013 and 2023) to reflect advancements in seismic engineering and understanding of local geological conditions. The standard defines critical parameters such as seismic coefficients, importance factors, site coefficients for soil conditions, and response modification factors. Amendment No. 5 to SI 413 (December 2013) introduced significant updates, including refined classifications for soil types, specific considerations for proximity to active faults, and adjustments to response modification factors based on structural ductility. Israel has also implemented proactive urban renewal programs like "TAMA 38" and "Pinui Binui" (Evacuate and Rebuild). TAMA 38, in particular, allows owners of apartment buildings constructed before 1980 (when modern seismic standards became mandatory) to collectively opt for redevelopment. This often involves reinforcing the existing structure and adding extra floors, or complete demolition and reconstruction with increased density, with the sale of new units funding the upgrade. These programs aim to improve earthquake resilience in older, vulnerable building stock, especially in areas prone to seismic activity.

Energy Efficiency & Sustainability: Israel has developed a suite of standards for green and energy-efficient buildings. Key among these are SI 5281 "Sustainable Building" (the Green Building Standard), first written in 2005 and updated in 2011 and 2016; SI 5282 "Energy Rating of Buildings"; and SI 1045 "Thermal Insulation of Buildings". SI 5281 addresses a wide range of sustainability aspects including energy, land use, water, waste management, occupant health and well-being, transportation, and materials. Initially voluntary, SI 5281 was adopted as a mandatory requirement for new construction by the "Forum 15" group of municipalities (representing major cities) and subsequently mandated nationally through a regulation approved by the National Planning and Construction Council in 2020.

Fire Safety: While SI 413 focuses primarily on earthquake resistance, comprehensive fire safety provisions are covered by other specific Israeli Standards developed and maintained by the SII. The SII's broad mandate for setting standards for products and services ensures that fire safety aspects of construction materials and building systems are addressed, although detailed fire-specific code content comparable to seismic or green building standards was not as extensively covered in the provided research snippets.

Accessibility: The Green Building Standard SI 5281 includes "Health and Well Being" as one of its nine assessment areas, which may encompass certain aspects of accessibility. However, detailed and specific accessibility standards for persons with disabilities are typically addressed through separate regulations and standards, enforced by planning and licensing authorities as part of the building permit process.

High-Density Construction & Urban Renewal: Recognizing land scarcity and a rapidly growing population, Israel's National Outline Plan 35 (Tama 35) has approved measures for greater residential density in urban areas. The aforementioned TAMA 38 and Pinui Binui programs are integral to this strategy, linking the need for seismic retrofitting of older buildings with opportunities for urban regeneration and increased housing density. These schemes are fundamentally based on agreements between homeowners and developers.

Official Sources: The Standards Institution of Israel (sii.org.il) is the primary source for Israeli Standards.[5] The Ministry of Interior Planning Administration (gov.il) provides information on planning and licensing.

Israel's regulatory system is characterised by its strong reliance on a national standards body (SII) and a clear mechanism for elevating voluntary standards to mandatory "Official Standards." This provides a structured approach to ensuring quality and safety. The TAMA 38 program is a particularly noteworthy innovation, offering a market-driven mechanism to address the seismic vulnerability of a significant portion of the existing building stock by tying upgrades to development incentives. For Syria, which also has a vast stock of older, potentially non-compliant, and conflict-damaged buildings, the concept of incentivizing retrofitting and reconstruction through carefully managed redevelopment could be relevant. However, a critical distinction is that Israel's TAMA 38 operates on agreements with existing, clearly identified homeowners. In the Syrian context, with mass displacement, contested property claims, and the HLP crisis [3], any similar model would require extreme caution and must be predicated on the prior establishment of a fair and transparent HLP resolution framework to prevent further dispossession or injustice.

3.3. United Arab Emirates (Dubai & Abu Dhabi)

Overview: In the United Arab Emirates (UAE), building codes are primarily developed and enforced at the Emirate level. Dubai Municipality (DM) is the authority responsible for the Dubai Building Code (DBC) and related regulations.[6] In Abu Dhabi, the Department of Municipalities and Transport (DMT) implements the Abu Dhabi International Building Code (ADIBC), which is notably based on the 2009 International Codes (I-Codes) from the International Code Council (ICC).[7] A significant national-level regulation is the UAE Fire and Life Safety Code of Practice, enforced by the UAE Civil Defence.

Dubai Building Code (DBC): The DBC aims to unify building design standards across Dubai, emphasizing health, safety, welfare, environmental impact reduction, and sustainable development. The 2021 edition appears to be the current version.[6] It is structured thematically, covering general provisions, definitions, references, structural requirements, incoming utilities, indoor environment quality, security, and specific stipulations for villa construction. The DBC is supplemented by an extensive series of circulars issued by Dubai Municipality, which provide detailed technical requirements and guidance on a wide array of topics. These include building use modifications, permit

processes, MEP (Mechanical, Electrical, and Plumbing) systems, fire safety, construction materials (e.g., reinforcing steel, concrete, masonry blocks), thermal and waterproofing insulation, Building Information Modelling (BIM) implementation, sustainability (through the "Al Sa'fat" Green Building System), building control procedures, and standards for practicing engineering professions.[6] The Dubai Electricity and Water Authority (DEWA) also issues its own regulations for electrical and water installations, which incorporate green building specifications and requirements for new connections.

Abu Dhabi International Building Code (ADIBC): The ADIBC, officially adopted in 2013 with an effective date for government buildings in 2014, is based on the 2009 suite of I-Codes.[7] Its development involved a phased approach to allow local practitioners to adapt. The ADIBC is designed to be fully compatible with other Abu Dhabi International codes, such as the Abu Dhabi International Energy Conservation Code (ADIECC), Fuel Gas Code (ADIFGC), Mechanical Code (ADIMC), Private Sewage Disposal Code (ADIPSDC), and Property Maintenance Code (ADIPMC).[7] The ADIBC is organised into chapters that mirror the structure of the IBC, covering scope and administration, definitions, use and occupancy classification, special detailed requirements based on use, general building heights and areas, types of construction, fire and smoke protection features, means of egress, accessibility, interior environment, energy efficiency (referencing ADIECC), exterior walls, roof assemblies, structural design, materials (concrete, steel, wood, masonry), and various building systems.[7]

Seismic Design: Seismic regulations were introduced in the UAE in 2013, specifically addressing mid-rise and high-rise buildings. In Dubai, the municipality has revised its building codes to require that new constructions be capable of withstanding earthquakes up to a magnitude of 6.0 on the Richter scale, an increase from the previous threshold of 5.5. The ADIBC's Chapter 16 on Structural Design incorporates provisions for seismic loads and design methodologies.[7]

Energy Efficiency & Sustainability: The UAE Cabinet approved national Green Building and Sustainable Building standards in 2010, with implementation in government buildings starting in 2011. Dubai's "Al Sa'fat – Dubai Green Building System" is a key component of its regulatory framework, detailed in municipal circulars.[6] Abu Dhabi's ADIBC references the ADIECC and the Estidama Pearl Rating System, which assesses sustainability across various criteria including energy and water efficiency, site location, indoor environment quality, and materials and waste management.[7]

Fire Safety: The national UAE Fire and Life Safety Code of Practice is a primary reference. The DBC (likely Part B) and ADIBC (Chapters 7 and 9) contain detailed provisions for fire and smoke protection systems, and fire-resistant construction.[6] The Dubai Civil Defence (DCD) and Abu Dhabi Civil Defence (ADCD) are the key enforcement authorities for fire safety, including requirements for means of egress.

Accessibility: Dubai has the Dubai Universal Design Code, which is referenced in the DBC. The ADIBC's Chapter 11 is dedicated to accessibility and references the ICC/ANSI A117.1 standard for technical provisions.[7]

High-Density Construction: Given the prevalence of high-rise buildings and large-scale projects, UAE codes are tailored to address the specific challenges of high-density urban environments. The ADIBC includes special requirements for high-rise buildings in its Chapter 4.[8] Dubai regulations specify minimum live load requirements for flat slab and post-tensioned slab designs, minimum thickness for prestressed concrete slabs, and mandate vibration analysis for office building slabs. Ensuring adequate and safe means of egress in high-density buildings is a critical focus.

Official Sources: Dubai Municipality (dm.gov.ae) [6], Abu Dhabi Department of Municipalities and Transport (dmt.gov.ae) [7] , and the International Code Council (ICC) for the underlying I-Codes.

The UAE, through the distinct approaches of Dubai and Abu Dhabi, demonstrates how internationally recognised building codes like the I-Codes can be effectively adopted and adapted to support rapid, large-scale, and technologically advanced urban development. The establishment of clear institutional responsibilities within each Emirate, coupled with the integration of specific codes for energy conservation (Estidama, Al Sa'fat), a national fire code, and dedicated accessibility standards, offers a robust model of a modern building regulatory system. For Syria, the UAE's experience highlights a potential pathway for accelerated modernization by leveraging existing, well-regarded international code families. This could be more efficient than attempting to develop entirely new codes from scratch, especially given Syria's current capacity constraints and the urgent need for a functional regulatory framework to guide reconstruction. The phased adoption approach used in Abu Dhabi for the ADIBC also provides a practical template for managing such a transition.

3.4. Comparative Strengths and Adaptable Practices for Syria

The review of building regulations in Jordan, Israel, and the UAE reveals several strengths and practices that, with careful adaptation, could inform Syria's reform process.

Jordan's model of institutional collaboration, particularly the involvement of the Royal Scientific Society in code development and updates, showcases a valuable approach to ensuring technical rigor and local relevance. This could be a pertinent model for Syria, suggesting the engagement of Syrian universities and technical institutions in rebuilding its own code development capacity. Jordan's explicit focus on green building and energy efficiency codes also aligns with Syria's long-term sustainability needs.

Israel's system, characterised by a strong national standards body (SII) and a clear process for mandating standards, offers lessons in establishing regulatory authority. More specifically, Israel's urban renewal programs like TAMA 38, which link seismic safety upgrades for vulnerable buildings with development incentives, present an innovative concept for addressing aging or damaged building stock. While the mechanism of homeowner-developer agreements would need significant adaptation for Syria due to the HLP crisis, the underlying principle of finding financial models to support widespread retrofitting is highly relevant.

The UAE's experience, particularly in Dubai and Abu Dhabi, demonstrates the effective adoption and customization of comprehensive international code systems (I-Codes) to manage rapid and complex urban growth.[7] The clear institutional roles within each Emirate and the existence of a national fire code provide a model for structured governance. The phased rollout of the ADIBC in Abu Dhabi [7] offers a practical example of how a transition to modern codes can be managed, allowing time for industry and regulators to adapt.

For Syria, these regional experiences suggest several adaptable practices:

Leveraging National Expertise: Empowering Syrian technical and academic institutions in the code development and review process, similar to Jordan's RSS involvement.

Phased Code Modernization: Adopting a phased approach to introduce new codes, starting with critical life-safety aspects (seismic, fire) and gradually incorporating more comprehensive standards for energy efficiency, sustainability, and accessibility, as seen in Abu Dhabi's ADIBC implementation.

Addressing Vulnerable Existing Stock: Exploring mechanisms, inspired by Israel's TAMA 38 or Cyprus's school retrofitting program (discussed later), to assess and upgrade existing vulnerable buildings. However, any such program in Syria must be inextricably linked to a just and comprehensive resolution of HLP rights to prevent abuse and ensure equitable outcomes for displaced populations.

National Standards for Critical Areas: Considering national-level codes for overriding safety concerns like fire protection, as practiced in the UAE, to ensure a consistent minimum standard across all regions.

Adopting and Adapting International Codes: Rather than reinventing the wheel, Syria could accelerate its modernization by adopting and adapting a reputable international code family (such as the I-Codes or Eurocodes), as successfully done by the UAE. This would require significant technical assistance and capacity building but could provide a faster route to a robust regulatory framework.

While direct replication of any single system is unlikely to be appropriate for Syria's unique post-conflict environment, these regional neighbours offer a rich source of

contextually relevant strategies and institutional models that can inform a bespoke Syrian reform path. The paramount consideration must always be the establishment of fair HLP frameworks before or alongside the implementation of new development and building regulations.

4. International Perspectives: EU Models (Similar Climate) and the UK

Examining building regulations in European Union countries with climates comparable to Syria (Cyprus, Greece, Spain, Italy) and the United Kingdom provides further valuable insights. These countries often operate within the framework of EU directives, particularly concerning energy performance, while also developing national standards for seismic safety and other specific concerns.

4.1. Cyprus

Overview: As an EU member, Cyprus aligns its building standards with European Norms (EN), including the Eurocodes for structural design. The primary national legislation includes the Buildings Regulation Law (Chapter 96) and the Immovable Property (Tenure, Registration, and Valuation) Law (Chapter 224). Recent amendments, such as Laws N. 53(I)/2021 and N. 54(I)/2021, address issues like unauthorised construction works and the transfer of property, indicating an evolving regulatory landscape. The Ministry of the Interior holds overall responsibility for implementing the EU Construction Products Regulation (No 305/2011), which mandates CE marking and Declarations of Performance for construction products.

Seismic Design: Cyprus utilises Eurocode 8: "Design of structures for earthquake resistance" (EN 1998-1), supplemented by a National Annex that provides a seismic zoning map specific to the island's conditions. This framework has been in use in the southern part of Cyprus since 2007. A significant initiative has been the seismic retrofitting program for all school buildings, undertaken following a series of damaging earthquakes in 1995, 1996, and 1999. This comprehensive program involved detailed assessment of existing school structures, followed by retrofitting, refurbishment, or, in some cases, demolition and replacement. The target performance level for these retrofitted buildings was "Life Safety," meaning structures might suffer extensive but repairable damage in a design earthquake, preventing collapse and protecting occupants.

Energy Efficiency & Sustainability: Cyprus implements the EU's Energy Performance of Buildings Directive (EPBD), which includes requirements for Nearly Zero-Energy Buildings (NZEB) for all new constructions from 2021 (and public buildings from 2019). The Energy Performance of Buildings Law N. 155(I) 2020 is the national legislation transposing these EU directives. Energy Performance Certificates (EPCs) are mandatory for buildings when sold or rented, providing information on energy consumption.

Fire Safety: Fire safety regulations in Cyprus emphasise containment to allow safe evacuation, prevent fire spread to adjacent buildings, and facilitate access for firefighting personnel, aligning with the principles of the EU Fire Safety Guide.

Regulations cover the fire stability of structural components, the fire performance of internal linings, the integrity of fire walls and compartments, and the treatment of concealed voids or cavities. Passive fire protection measures, such as fire-resistant walls, floors, doors, and the use of non-combustible insulation strips in facade systems (e.g., with EPS insulation), are considered crucial.

Accessibility: National Disability Action Plans in Cyprus incorporate targets related to accessibility. The Regulation of Roads and Buildings Law (Chapter 96) and its associated Regulation 61H stipulate that publicly used buildings must be accessible. However, full harmonization of these national regulations with the newer European standard EN 17210:2021 ("Accessibility and usability of the built environment – Functional requirements") was reported as pending, and there was no general infringement or sanctions regime specifically for non-compliance with built environment accessibility requirements. The European Blue Badge for disabled parking is recognised and accepted across the island.

Official Sources: Legislative acts are published in the official gazette of the Republic of Cyprus. The Ministry of the Interior is the key governmental body for construction product regulation.

Cyprus's adoption of the Eurocodes, particularly Eurocode 8 for seismic design, offers a model of how a country with significant seismic risk can align with robust, internationally recognised standards. Its extensive and systematic school retrofitting program provides practical lessons in managing large-scale seismic upgrading of existing, vulnerable public building stock, including assessment methodologies, setting performance targets (Life Safety), and managing costs. This experience is highly relevant for Syria, which faces a similar challenge of widespread seismic vulnerability in both public and private buildings. The challenges Cyprus has encountered in fully harmonizing and rigorously enforcing accessibility standards also highlight a common difficulty that Syria will need to proactively address by embedding strong compliance and enforcement mechanisms from the outset of its reforms.

4.2. Greece

Overview: Greece's building regulations are primarily codified in laws and Presidential Decrees published in the Official Greek Government Gazette (Φύλλο Εφημερίδας της Κυβερνήσεως - ΦΕΚ). Notable examples include Presidential Decree 41/2018 concerning Building Fire Protection Regulation and Presidential Decree 71/1988 on the Regulation on fire protection of buildings. Specific regulations also govern building in small settlements and define land use parameters.

Seismic Design: The Greek Code for Seismic Resistant Structures (EAK 2000), which was enhanced in 2003, is the primary standard for earthquake-resistant design.[8] EAK 2000 is based on the ultimate strength design method and a limit state design approach. It mandates that structures satisfy two primary limit states: the Ultimate Limit State (ULS),

to prevent collapse under a design earthquake with a 475-year return period, and the Serviceability Limit State (SLS), to limit damage and maintain functionality under more frequent, less intense seismic events.[8] The code specifies detailed procedures for structural modelling, methods of analysis (including the dynamic response spectrum method and a simplified spectrum method), and defines key parameters such as ground seismic acceleration based on four seismic risk zones, importance factors for different building types, behaviour factors (q-factors) reflecting structural ductility, soil classification, and foundation influence factors.[8]

Energy Efficiency & Sustainability: Greece implements the EU Energy Performance of Buildings Directive (EPBD) through its national Regulation for the Energy Performance of Buildings (Κανονισμός Ενεργειακής Απόδοσης Κτιρίων - KENAK). KENAK was significantly revised in July 2017 to align more closely with EPBD guidelines, notably by increasing thermal insulation requirements for building envelopes. Energy Performance Certificates (EPCs) are mandatory when buildings are sold or rented, and new buildings or those undergoing major renovations must achieve a minimum energy class of 'B'. The Technical Chamber of Greece (TEE) provides technical guidelines and software (TEE KENAK) used by energy inspectors for calculations and issuing EPCs.

Fire Safety: Fire safety in buildings is governed by specific regulations, including the Building Fire Protection Regulation (Presidential Decree 41/2018) and the earlier Regulation on fire protection of buildings (Presidential Decree 71/1988). Businesses and establishments are typically required to obtain a fire protection certificate. The regulatory framework aims to ensure the protection of occupants, facilitate safe evacuation, restrict the internal and external spread of fire, and enable effective firefighting operations.

Accessibility: Greece has measures in place to ensure accessibility for persons with disabilities to the physical environment, transportation, and information, covering buildings, roads, schools, housing, and medical facilities, in line with international conventions like the UNCRPD. National accessibility plans and strategies are developed to guide these efforts (though the specific snippet refers to a plan by a Hellenic organisation in Canada, the principle of national planning is relevant to Greece's approach).

Official Sources: The Official Government Gazette (ΦΕΚ) is the primary source for laws and decrees. The Ministry of Environment and Energy is responsible for KENAK and the EPC system. The Organisation for Earthquake Resistant Planning and Protection (OASP) is a key body related to seismic safety.

Greece, a country with high seismicity and EU membership, provides a compelling example of a nation that has developed a sophisticated national seismic code (EAK 2000) tailored to its specific geological conditions and construction practices, while concurrently aligning with broader European standards for aspects like energy performance through KENAK. This dual approach—national specificity for overriding

local risks like earthquakes, combined with harmonization with regional directives for other areas—could offer a valuable model for Syria. Syria could benefit from developing a robust national seismic code, potentially drawing on principles from established international codes but adapted to its own context (geology, common building types, available materials, and technical capacity), while adopting or adapting regional or international standards for energy efficiency, fire safety, and accessibility.

4.3. Spain

Overview: The primary building regulation in Spain is the Código Técnico de la Edificación (CTE - Technical Building Code), which was approved by Royal Decree 314/2006.[9] The CTE is a comprehensive regulatory framework that establishes the basic quality requirements for buildings concerning safety and habitability. It is structured into two main parts: Part I contains general provisions and conditions for compliance, while Part II consists of a series of Basic Documents (Documentos Básicos - DBs) that detail specific technical requirements. The Ministry of Transport, Mobility and Urban Agenda (formerly Ministry of Public Works/Development) is the overarching governmental body responsible for the CTE.

Basic Documents (DBs): The CTE's technical requirements are articulated through several DBs, each addressing a fundamental aspect of building performance:

- DB-SE: Structural Safety
- DB-SI: Safety in Case of Fire
- DB-SUA: Safety in Use and Accessibility
- DB-HE: Energy Saving
- DB-HR: Protection Against Noise
- DB-HS: Health, Hygiene and Environmental Protection

Seismic Design: Seismic design in Spain is governed by the Norma de Construcción Sismorresistente (Earthquake-Resistant Construction Standard). The most recent version, NCSR-23, was approved by Royal Decree, updating previous standards (NCSE-02 for buildings and NCSP-07 for bridges). NCSR-23 establishes technical conditions for building structures and civil engineering works to ensure appropriate behaviour during seismic events, aiming to prevent serious consequences for human safety, avoid significant economic losses, and promote the maintenance of essential services. It applies to new constructions as well as the seismic evaluation and, where necessary, adaptation (retrofitting) of existing buildings undergoing significant renovation or restoration.

Energy Efficiency & Sustainability: The Basic Document DB-HE (Energy Saving) is central to Spain's energy efficiency regulations for buildings. A notable provision within the CTE is the mandatory contribution of solar thermal energy to cover 30-70% of the Domestic Hot Water (DHW) demand in new and refurbished buildings.[9] Spain also adheres to EU directives regarding Nearly Zero-Energy Buildings (NZEB). Energy Performance

Certificates (Certificado de Eficiencia Energética - CEE), rating buildings from A (most efficient) to G (least efficient), are mandatory for all new constructions, major renovations, and for properties being sold or rented. Regional variations in energy requirements exist; for instance, Catalonia has additional stipulations for solar thermal installations, Valencia has stricter window efficiency standards in coastal zones, and Andalusia mandates solar hot water systems for most new buildings and major renovations.

Fire Safety: Fire safety requirements are detailed in the Basic Document DB-SI (Safety in Case of Fire). This document specifies standards to prevent and manage fires, with a priority on ensuring safe evacuation of occupants.

Accessibility: Accessibility standards are primarily governed by the Basic Document DB-SUA (Safety in Use and Accessibility). DB-SUA outlines detailed technical requirements for various building types, including specifications for entry and circulation (e.g., minimum door and hallway widths, ramp inclines, elevator provisions), accessible bathrooms (e.g., turning circles, reinforced walls for grab bars), and accessible living spaces (e.g., clear turning circles, height of outlets/switches). The principle of "Ajustes Razonables" (Reasonable Adjustments) applies to renovations of existing buildings, balancing accessibility needs with technical and financial feasibility. Regional variations in accessibility standards also exist, with some autonomous communities imposing more stringent or specific requirements.

Official Sources: The official website for the Código Técnico de la Edificación is codigotecnico.org. The Ministry of Transport, Mobility and Urban Agenda (mitma.gob.es) is the responsible ministry.

Spain's Código Técnico de la Edificación (CTE) stands out as a comprehensive and modern building code that strongly integrates energy efficiency and accessibility alongside traditional structural and fire safety requirements. The mandatory requirement for solar thermal energy contribution for DHW [9] is particularly noteworthy and highly relevant for countries with similar solar resources, like Syria. The modular structure of the CTE, with its distinct Basic Documents (DBs) for different performance aspects, and its allowance for regional variations within a national framework, offers a sophisticated yet potentially adaptable model. For Syria, the CTE, especially its DB-HE (Energy Saving) and DB-SUA (Accessibility), provides excellent examples of how to codify and mandate advanced sustainability and inclusivity principles within a national building regulatory system.

4.4. Italy

Overview: Italy's technical standards for construction are consolidated in the Norme Tecniche per le Costruzioni (NTC). The NTC 2018, approved by Ministerial Decree on January 17, 2018, is the current primary regulatory document governing the design, execution, and testing of constructions.[10] While the Ministry of Infrastructure and

Transport is responsible for these national standards, their implementation and enforcement are largely carried out at the local municipal level. The Ente Italiano di Normazione (UNI) serves as the national standardization body, developing and publishing a wide range of technical standards that often complement or are referenced by the NTC.

Seismic Design: The NTC 2018 includes detailed provisions for seismic design, defining seismic actions and hazard parameters based on the specific location of the structure within Italy. It recommends the verification of seismic vulnerability both before and after any structural upgrading, particularly with respect to defined limit states. The code specifies ductility classes for structures, soil type classifications, and topographic categories, all of which influence the calculation of seismic loads and the design response spectrum.

Energy Efficiency & Sustainability: Energy performance in Italian buildings is prominently addressed through the Attestato di Prestazione Energetica (APE), an Energy Performance Certificate that evaluates a building's energy efficiency on a scale from A4 (most efficient) to G (least efficient).[11] The APE is a legal requirement for most property transactions, including sales, new rental agreements, and major renovations that affect energy performance. Its purpose is to promote the construction and retrofitting of energy-efficient buildings and to inform consumers about potential energy costs and environmental impact.

Fire Safety: Fire safety regulations in Italy are largely overseen by the Ministry of the Interior, which also directs the National Fire Corps (Vigili del Fuoco). The Italian Fire Code (often referred to as the Codice di Prevenzione Incendi) provides a framework for fire safety design. A key feature of the Italian approach is the allowance for performance-based design solutions ("alternative solutions") if the standard prescriptive ("deemed-to-satisfy") solutions are not feasible or appropriate for a specific building. This performance-based approach requires demonstrating that the alternative design achieves the required level of safety through methods like Fire Safety Engineering. The code also emphasises consideration for different types of disabilities in fire-safety design to ensure inclusive safety measures. The NTC 2018 itself also contains provisions related to the structural performance of buildings under fire conditions.

Accessibility: Italy has a well-established legal framework for accessibility. Law No. 13 of 1989 ("Disposizioni per favorire il superamento e l'eliminazione delle barriere architettoniche negli edifici privati") and the subsequent Presidential Decree D.P.R. 503 of 1996 ("Regolamento recante norme per l'eliminazione delle barriere architettoniche negli edifici, spazi e servizi pubblici") are foundational. These laws aim to guarantee the accessibility, visitability, and adaptability of buildings for people with disabilities, providing technical prescriptions for new constructions, renovations, and adaptations of both public and private buildings.

Official Sources: The Ministry of Infrastructure and Transport is the primary national authority for the NTC. UNI (uni.com) is the national standards body. The National Fire Corps (Vigili del Fuoco) provides resources on fire codes (e.g., VVF Norme app). Municipalities are responsible for local enforcement and may have their own supplementary regulations.

Italy's NTC 2018 provides advanced and detailed seismic design provisions, crucial for a country with significant seismic risk. The APE system offers a clear and mandatory mechanism for rating and communicating building energy performance. Furthermore, Italy's long-standing and specific legal framework for accessibility (Law 13/89 and D.P.R. 503/96) demonstrates a strong commitment to inclusive design. The allowance for performance-based solutions in its fire safety code offers flexibility, which can be particularly valuable in complex projects or when dealing with existing buildings. For Syria, Italy's model of having distinct, robust national frameworks for these critical areas (seismic, energy, accessibility, fire), coupled with local enforcement, could be instructive. The performance-based option in fire safety might allow for more innovative and context-appropriate solutions in Syria, especially where resources for strictly prescriptive measures might be limited or where unique reconstruction challenges arise.

4.5. United Kingdom

Overview: Building regulations in the United Kingdom are statutory instruments made under the Building Act 1984, which has been significantly amended by the Building Safety Act 2022, particularly in response to events like the Grenfell Tower fire.[12] Instead of a single prescriptive code, the UK system relies on a series of "Approved Documents" (Parts A through S, excluding I and N currently).[12] These documents provide practical guidance on how to meet the performance-based requirements of the Building Regulations. Compliance can be achieved by following the guidance in the Approved Documents, or by other means that demonstrate the requirements have been met (e.g., using relevant British Standards or European Standards).[12] Responsibility for building regulations is devolved: the UK Government (Department for Levelling Up, Housing and Communities - DLUHC) is responsible for England, with separate administrations in Wales, Scotland, and Northern Ireland developing their own technically similar but distinct regulations and guidance.

Approved Documents (Key Parts relevant to this review):

Part A (Structure): Ensures the structural safety and stability of buildings, including resistance to disproportionate collapse and considerations for ground movement.[12]

Part B (Fire safety): Provides comprehensive guidance on fire safety, covering means of warning and escape, internal fire spread (linings and structure), external fire spread, and access and facilities for the fire service.[13] This part has seen significant updates recently.

Part L (Conservation of fuel and power): Addresses energy efficiency, setting standards for insulation, building services, lighting, and air permeability. It also mandates Energy Performance Certificates (EPCs) and aims to reduce carbon emissions from buildings. [12]

Part M (Access to and use of buildings): Focuses on ensuring buildings are accessible and usable by everyone, including people with disabilities, covering aspects like approach, entry, circulation within the building, and facilities. [12]

Seismic Design: The UK is an area of low seismicity. Therefore, specific, detailed seismic design codes comparable to those in highly seismic regions are not a prominent feature of its general building regulations. Structural robustness requirements in Approved Document A, along with adherence to relevant structural design standards (which may include Eurocode 8 for specific, sensitive structures or by engineer's choice), would address seismic considerations to the extent deemed necessary for the UK's risk level. The emphasis is more on overall structural integrity and resilience to various loads rather than prescriptive seismic detailing for all buildings.

Energy Efficiency & Sustainability: Approved Document L is the key regulation for energy efficiency in both new and existing buildings in England (with equivalent documents in devolved nations). [12] It implements requirements stemming from the EU Energy Performance of Buildings Directive (EPBD), including targets for Nearly Zero-Energy Buildings (NZEB) and the mandatory provision of EPCs upon construction, sale, or rental.

Fire Safety: Approved Document B is the critical guidance document for fire safety. [12] It is divided into two volumes: Volume 1 for Dwellings and Volume 2 for Buildings other than Dwellings. This document is regularly updated to reflect new research, technologies, and lessons learned from fire incidents, providing detailed guidance on fire detection and alarm systems, escape routes, fire compartmentation, fire resistance of materials and structures, and provisions for firefighting access.

Accessibility: Approved Document M provides detailed guidance on how to make buildings accessible and usable for everyone, including people with various types of disabilities. [12] It covers aspects from parking and approach routes to internal layouts, sanitary facilities, and switches and controls.

Official Sources: For England, Approved Documents are published by the Department for Levelling Up, Housing and Communities on the GOV.UK website. For Wales, similar documents are available via GOV.WALES.

The United Kingdom's building regulation system, with its performance-based Approved Documents, offers a different philosophical approach compared to more prescriptive code systems. It emphasises the required outcomes (e.g., a safe structure, an energy-efficient envelope) rather than dictating the exact methods or materials to achieve them. This approach can foster innovation in design and construction. However, it relies heavily on the competence and diligence of designers, builders, and building control

bodies (either Local Authority Building Control (LABC) or private sector Approved Inspectors) who assess compliance. For a country like Syria, which is in a phase of reconstruction and may have variable levels of professional capacity and institutional strength, a purely performance-based system might initially be challenging to implement effectively across the board. Clear, prescriptive guidance is often more straightforward to apply and enforce in such contexts. Nevertheless, the principle of focusing on performance outcomes, and perhaps incorporating performance-based options within a generally prescriptive framework (similar to Italy's approach to fire safety), could be a long-term aspiration for Syria as its construction sector and regulatory capacity mature.

4.6. Innovations and Best Practices Relevant to Syria's Climatic and Developmental Context

The comparative review of building regulations in the selected EU countries and the UK reveals several common themes and specific innovations that hold relevance for Syria, particularly given its climatic conditions (similar to Southern Europe) and its pressing developmental needs in the post-conflict era.

Common themes across these more developed regulatory systems include:

Robust Seismic Codes: Countries in seismically active zones (Greece, Italy, Cyprus, Spain) have highly developed seismic codes (EAK 2000, NTC 2018, Eurocode 8, NCSR-23) that are regularly updated based on new research and hazard assessments. These codes typically involve limit state design, performance objectives, and detailed provisions for various structural types and soil conditions.

Increasing Focus on Energy Efficiency and Sustainability: Driven largely by EU directives like the EPBD, all these countries have strong regulations promoting energy efficiency (NZEB targets, mandatory EPCs, minimum thermal performance standards). Green building standards and the integration of renewable energy sources are increasingly common.

Comprehensive Fire Safety Regulations: Detailed codes or guidance documents address both passive and active fire protection measures, means of egress, material performance, and firefighter access.

Dedicated Accessibility Standards: Specific laws and technical standards aim to ensure that buildings are accessible and usable by people with disabilities, promoting inclusive design.

Specific innovations and best practices that could be particularly relevant for adaptation in Syria include:

Mandatory Solar Thermal Integration (Spain): Spain's CTE, through DB-HE, mandates a significant contribution from solar thermal systems for domestic hot water in new and

refurbished buildings.[9] Given Syria's high solar insolation, adopting a similar requirement could drastically reduce reliance on conventional energy for water heating, leading to cost savings and lower emissions during reconstruction.

Systematic Seismic Retrofitting Programs (Cyprus, Israel): Cyprus's comprehensive program for the seismic retrofitting of school buildings provides a model for a state-led initiative to address vulnerabilities in critical public infrastructure. Israel's TAMA 38 program, while needing careful adaptation for HLP reasons, demonstrates how development incentives can be used to encourage the upgrading of private residential buildings. Syria faces an enormous task in assessing and retrofitting its existing building stock, and these examples offer strategic approaches.

Rapid Adoption and Adaptation of International Codes (UAE): The UAE's success in quickly establishing modern building regulatory systems in Dubai and Abu Dhabi by adopting and customizing the International Codes (I-Codes) [7] shows a viable path for countries seeking rapid modernization, especially when local capacity for de novo code development is limited.

Performance-Based Approaches (UK, Italy for Fire): While a fully performance-based system like the UK's [12] might be a longer-term goal for Syria, the principle of allowing performance-based solutions as an alternative to prescriptive requirements (as seen in Italy's fire code) can offer flexibility and encourage innovation, particularly for complex projects or when dealing with the unique challenges of retrofitting historic or damaged structures.

Syria's reconstruction offers a critical window to leapfrog outdated practices and build a resilient, sustainable, and inclusive built environment. The challenge lies not in a lack of international models, but in selectively adapting elements from these diverse systems to create a framework that is technically sound, contextually appropriate for Syria's post-conflict realities (including its HLP crisis and institutional weaknesses), and, crucially, enforceable. The emphasis should be on robust seismic protection, maximizing the use of abundant solar energy, ensuring accessibility in all new constructions, and developing clear, implementable, and verifiable standards that can realistically be achieved and enforced in the Syrian context.

5. Comparative Insights and Gap Analysis for Syria

This section provides a systematic comparison of Syrian building regulations (based on available information and inferred status) against the benchmark countries across key thematic areas. This analysis aims to identify specific gaps in Syrian regulations and practices, thereby informing the subsequent recommendations.

5.1. Seismic Design Philosophies and Resilience Strategies

Syria: Syria possesses a seismic design code, with the 2004/2005 versions of the Syrian Arab Code being the most recently detailed in available documentation. These codes outline static and dynamic analysis methods and define parameters like importance factors and soil coefficients. However, the catastrophic performance of buildings in the 2023 earthquakes strongly indicates that these codes were either technically insufficient for the seismic intensity, were not applied in the design of many buildings, or, most critically, their provisions were not enforced during construction. The emergence of a proposed comprehensive "Syrian Building Code (SBC)" with a dedicated seismic section (SBC-SE) suggests an aspiration for modernization, but its official status and technical robustness against international standards like Eurocode 8 or the IBC require thorough evaluation. A significant gap is the lack of a systematic national strategy for assessing and retrofitting the vast stock of existing vulnerable buildings.

Comparators: Countries in the region and in Southern Europe with high seismicity have evolved sophisticated seismic design codes.

Jordan: Progressed to the JCERB 2017, though earlier codes were found to have underestimated seismic risk parameters.

Israel: SI 413 is regularly updated, incorporating considerations for active fault proximity and structural ductility, and is complemented by the TAMA 38 program for retrofitting older buildings.

UAE: While traditionally considered lower risk, has adapted I-Codes with seismic provisions, with Dubai mandating resistance up to magnitude 6.0 Richter.[7]

Cyprus: Employs Eurocode 8 with a National Annex and has practical experience from its extensive school retrofitting program.

Greece: EAK 2000 is a mature national code based on limit state design for a 475-year return period earthquake.[8]

Spain: The NCSR-23 standard covers new and existing buildings, including seismic evaluation and adaptation.

Italy: NTC 2018 provides detailed seismic hazard parameters and mandates vulnerability verification, particularly for existing structures.

UK: Due to lower seismicity, relies on general structural integrity principles (Approved Document A) and Eurocode 8 where specifically required.

Gap Analysis for Syria: The primary gap is not merely the potential outdatedness of the 2004/2005 codes, but the catastrophic failure of the entire implementation and enforcement ecosystem. Even if the proposed "SBC-SE" is technically sound, without addressing enforcement, it will remain ineffective. Furthermore, Syria lacks a coherent strategy for its existing vulnerable building stock, a problem magnified by conflict damage.

The evidence from comparator countries points towards the necessity of seismic codes that are not only technically advanced (based on probabilistic seismic hazard analysis, performance-based principles, and detailed local geological data) but are also part of a system that ensures their application through rigorous design review, quality control during construction, and competent supervision. The proactive approaches to existing building stock seen in Israel and Cyprus, while resource-intensive, highlight the importance of addressing legacy risks, a critical issue for Syria.

5.2. Pathways to Energy Efficiency and Sustainable Construction

Syria: There is limited evidence of comprehensive, mandatory energy efficiency or green building codes being in widespread, enforced use in Syria currently. The proposed "SBC-GB" (Green Buildings) component of the new Syrian Building Code initiative indicates a future intention to address this area, but its current impact is likely minimal.

Comparators:

Jordan: Has actively developed codes for energy performance, including the Jordan Green Building Guide (JGBG), a Thermal Insulation Code, and Energy Efficient Building Codes.

Israel: Mandates SI 5281 (Sustainable Building), SI 5282 (Energy Rating), and SI 1045 (Thermal Insulation) in many jurisdictions, driving green building practices.

UAE: Implements national Green Building standards, with Dubai's Al Sa'fat system and Abu Dhabi's ADIECC (based on I-Codes) and Estidama Pearl Rating System providing robust frameworks.[6]

EU Countries (Cyprus, Greece, Spain, Italy) & UK: All are subject to or influenced by the EU's Energy Performance of Buildings Directive (EPBD), mandating Nearly Zero-Energy Building (NZEB) targets and Energy Performance Certificates (EPCs). Specific national regulations like Greece's KENAK, Spain's DB-HE (which notably includes mandatory solar

thermal contributions [9]), Italy's APE system, Cyprus's Energy Performance of Buildings Law, and the UK's Approved Document L translate these directives into national requirements.

Gap Analysis for Syria: Syria faces a significant gap in terms of codified and enforced energy efficiency standards and green building practices. Given the country's high solar insolation and the massive scale of reconstruction required, there is a substantial untapped potential for incorporating passive solar design, active solar technologies, and other energy-saving measures from the ground up.

The comparator countries, particularly those in the EU and the UAE, have made considerable progress in legislating for energy efficiency and sustainability. This is driven by environmental concerns, energy security, and long-term economic benefits. Syria's reconstruction offers a unique opportunity to bypass older, less efficient construction practices and directly integrate modern principles of energy conservation and sustainable design. This would not only reduce the future operational costs of buildings but also lessen the strain on energy infrastructure and contribute to environmental protection.

5.3. Modernising Fire Safety and Life Protection Standards

Syria: Specific details regarding the current, enforced fire safety codes in Syria are not extensively available in the provided research, beyond the general understanding that code non-compliance during the conflict era likely compromised all aspects of building safety, including fire safety. The proposed "SBC-FC" (Fire Code) within the new Syrian Building Code initiative suggests an intent to develop a dedicated fire code.

Comparators:

Jordan: The JNBC includes provisions for firefighting systems. However, issues with fire safety in industrial settings have been noted, such as substandard electrical systems and inadequate means of escape.

Israel: Specific Israeli Standards for fire safety are developed by the SII, covering various aspects of fire prevention, detection, suppression, and safe egress.

UAE: A comprehensive national UAE Fire and Life Safety Code of Practice is in place and enforced by the Civil Defence authorities in each Emirate. Both the DBC and ADIBC contain dedicated chapters on fire protection and life safety systems.[6]

Cyprus: Follows EU Fire Safety Guide principles, focusing on fire containment, safe evacuation routes, and ensuring the structural stability of buildings during a fire.

Greece: Fire safety is regulated through Presidential Decrees, such as PD 41/2018 (Building Fire Protection Regulation) and PD 71/1988 (Regulation on fire protection of buildings), requiring fire protection certificates for many establishments.

Spain: The CTE includes Basic Document DB-SI (Safety in Case of Fire), which outlines specific requirements for fire prevention, compartmentation, material reaction to fire, and means of escape.

Italy: The Ministry of Interior and the National Fire Corps oversee fire safety regulations. The Italian Fire Code allows for performance-based design solutions alongside prescriptive requirements and notably considers the needs of persons with disabilities in fire safety design.

UK: Approved Document B (Fire safety), in two volumes, provides extensive guidance on all aspects of fire safety for different building types and has been significantly updated in recent years.[12]

Gap Analysis for Syria: Syria likely suffers from outdated or poorly enforced fire safety provisions. There is a critical need for a modern, comprehensive fire code that addresses passive fire protection (e.g., fire-resistant construction, compartmentation), active fire protection systems (e.g., alarms, sprinklers), safe means of egress, and the fire performance of construction materials.

Modern fire safety codes in the benchmark countries adopt a holistic approach. This includes ensuring adequate escape routes, limiting the spread of fire and smoke through compartmentation and appropriate material selection, providing for early detection and suppression, and ensuring access for firefighting services. Given the likelihood of increased urban density in reconstructed areas and the use of diverse construction materials, the adoption and rigorous enforcement of a comprehensive fire code are paramount for protecting lives and property in Syria.

5.4. Ensuring Accessibility and Inclusive Design

Syria: There is no specific information in the provided research detailing current, enforced accessibility codes or standards for persons with disabilities in Syria. This area appears to be a significant lacuna.

Comparators:

Jordan: Has a Building Requirements Code for the Disabled (BRCD) and a 2017 disability rights law mandating accessibility measures, but faces significant implementation gaps.

Israel: While SI 5281 (Green Building) mentions "Health and Well Being", specific, detailed accessibility standards are typically covered by separate regulations within the planning and building approval process.

UAE: Dubai has the Dubai Universal Design Code, and Abu Dhabi's ADIBC includes a dedicated chapter (Chapter 11) on Accessibility, referencing the ICC/ANSI A117.1 standard.[7]

Cyprus: Regulations require public building accessibility, and National Disability Action Plans include accessibility targets. However, harmonization with the European standard EN 17210:2021 is pending, and enforcement is a challenge.

Greece: Has measures to ensure accessibility to the physical environment for persons with disabilities, covering a range of public and private buildings and facilities.

Spain: The CTE's Basic Document DB-SUA (Safety in Use and Accessibility) provides detailed technical requirements for accessibility in various building types, covering entry, circulation, ramps, elevators, and sanitary facilities.

Italy: Law 13/1989 and Presidential Decree D.P.R. 503/1996 form a strong legal basis for the removal of architectural barriers and mandate accessibility in public and private buildings.

UK: Approved Document M (Access to and use of buildings) provides comprehensive guidance on achieving inclusive access for all. [12]

Gap Analysis for Syria: There appears to be a major gap in both the codification and enforcement of accessibility standards in Syria. The years of conflict have tragically likely increased the proportion of the population living with disabilities.

The reconstruction phase in Syria presents a critical and unmissable opportunity to build back more inclusively. Many comparator nations have established specific legislation and detailed technical standards to ensure that the built environment is accessible to people with diverse abilities. Adopting principles of universal design and mandating clear accessibility standards for all new construction and major renovations from the outset will be essential to ensure that Syria's rebuilt infrastructure serves all its citizens equitably. This is not just a technical requirement but a fundamental aspect of social justice and sustainable development.

5.5. Governance of Building Codes: Development, Updates, and Adaptation

Syria: The Ministry of Public Works and Housing is involved in urban development planning and housing sector development. The Syrian American Engineers Association (SAEA), a diaspora group, expresses an aim to employ global engineering and quality standards in Syria's rebuilding, suggesting a potential external resource for expertise. The historical context of frequent constitutional and political changes in Syria may have hindered the stable and consistent governance of building codes. The "sbc.codes" initiative, if it is a genuine and Syrian-led effort, could represent a new approach to code development and dissemination, but its authority and process need clarification.

Comparators:

Jordan: A collaborative model involving the Jordan National Building Council (JNBC), the Royal Scientific Society (RSS), and the Ministry of Public Works and Housing.

Israel: The Standards Institution of Israel (SII) develops standards, the Ministry of Economy and Industry can declare them official and mandatory, and the Planning Administration handles broader planning and licensing.

UAE: Municipal authorities in Dubai and Abu Dhabi are responsible for adopting and adapting international codes (like I-Codes), while a national body oversees the fire code.

EU Countries: National standards bodies and relevant ministries in Cyprus, Greece, Spain, and Italy are responsible for transposing EU directives (e.g., EPBD) and developing/maintaining national codes (e.g., Eurocode national annexes, CTE, NTC).

UK: The Department for Levelling Up, Housing and Communities (DLUHC) is responsible for Building Regulations and Approved Documents in England, with devolved administrations managing their respective systems.

Gap Analysis for Syria: Syria needs a clear, transparent, technically competent, and adequately resourced institutional framework for the development, regular review, updating, and adaptation of its building codes. This framework should ideally be insulated from undue political interference and should incorporate mechanisms for stakeholder participation.

Effective governance of building codes is fundamental to their relevance and efficacy. Comparator countries typically have dedicated institutions or well-defined inter-agency collaborations responsible for the entire lifecycle of their codes. These processes often involve regular review cycles (e.g., aligned with updates to international parent codes like the I-Codes or Eurocodes) and formal consultations with industry professionals, academics, and the public. Syria must establish or significantly empower such a body, equipping it with the necessary technical expertise, resources, and autonomy to manage the national building codes effectively. International collaboration and technical assistance could be vital in the initial stages of establishing this governance capacity.

5.6. Enhancing Enforcement, Compliance, and Quality Assurance

Syria: As repeatedly highlighted, Syria suffers from major systemic failures in the enforcement of building codes and a very low level of compliance. This is attributed to a combination of factors including corruption, lack of institutional capacity, profit-driven shortcuts by developers and builders, and potentially a history of government amnesties for non-compliant structures.

Comparators:

Israel: The Commissioner of Standardization, under the Ministry of Economy and Industry, is responsible for auditing and supervising compliance with Official (mandatory) Standards.

Spain: Local autonomous communities are primarily responsible for checking construction plans and conducting site inspections. The Ministry of Public Works and Transport may intervene if local resources are insufficient. Penalties for non-compliance include refusal of construction or occupancy permits and fines.

UK: Compliance is overseen by Local Authority Building Control (LABC) departments or by private sector Approved Inspectors, who carry out plan checks and site inspections.

The experience in Türkiye, a country with some similar contextual challenges, showed that fines alone were often insufficient deterrents if not consistently applied or if amnesties were periodically granted.

Gap Analysis for Syria: The enforcement system in Syria is critically deficient and requires a complete overhaul. This includes rebuilding inspection mechanisms, establishing clear lines of professional accountability, implementing robust anti-corruption measures, and ensuring that penalties for non-compliance are meaningful and consistently applied.

Enforcement is often the weakest link in regulatory systems globally, and this is acutely true in Syria's post-conflict context. Lessons from other countries emphasise the need for adequately resourced and independent inspection bodies (whether local or national), transparent permitting and inspection processes, clear accountability for all professionals involved in the building process (designers, engineers, contractors), and penalties that genuinely deter violations. Furthermore, raising public awareness about building safety standards and empowering citizens to demand compliance can also contribute to a better-enforced system.

5.7. Material Standards, Construction Quality, and Professional Capacity

Syria: Reports from the aftermath of the 2023 earthquakes consistently point to poor quality construction, including the use of substandard materials and skimping on essential components like steel reinforcement and cement in concrete mixes. The Syrian American Engineers Association (SAEA) has stated an aim to promote global engineering and quality standards in Syria's reconstruction, indicating an awareness of this deficit.

Comparators:

EU Countries (Spain, Cyprus): Adhere to EU-wide standards for construction products, including the mandatory CE marking, which signifies conformity with harmonised European standards, and the requirement for a Declaration of Performance from manufacturers.

Italy: The NTC 2018 specifies requirements for materials used in construction.

UK: Approved Document 7 provides guidance on "Materials and Workmanship," ensuring that materials are appropriate for their intended use and that work is carried out in a skilled manner.

Gap Analysis for Syria: There is a clear lack of effective quality control for construction materials and workmanship in Syria. This necessitates the establishment or adoption of material standards, the development of a system for material testing and certification, and significant efforts to upskill the construction labour force and enhance the capacity of engineering and architectural professionals.

The quality of construction materials and the standard of workmanship are as crucial to building safety as the codes themselves. If materials do not meet specified strengths or if they are not assembled correctly, even the best-designed building can fail. Comparator countries, especially within the EU, rely on established systems of material standardization, testing, and certification (like CE marking). Syria needs to develop a similar infrastructure. This includes not only adopting appropriate material standards but also creating or rebuilding accredited material testing laboratories and, critically, investing heavily in vocational training for construction workers and continuous professional development for engineers and architects to ensure they are familiar with modern standards and quality construction techniques.

5.8. Integrating Urban Planning with Building Regulation for Coherent Development

Syria: Syria has a Land-Use Planning Law (Legislative Decree 82/2010) and the more recent, and controversial, Urban Planning and Urbanisation Law No. 23 of 2015.[1] The Ministry of Public Works and Housing is also involved in broader urban development planning. However, as discussed previously (Section 2.3), these planning laws, particularly those enacted during the conflict, have been heavily criticised for their potential to facilitate dispossession and for lacking adequate safeguards for property owners, especially the displaced.[1] UN-Habitat emphasises that planning law and building codes are interactive tools essential for guaranteeing sustainable cities and healthy urban environments.

Comparators:

Israel: The Planning Administration oversees spatial planning, and National Outline Plans like Tama 35 guide development, including aspects like urban densification.

Spain: The Código Técnico de la Edificación (CTE) interacts with local urban planning documents (e.g., Plan General de Ordenación Urbana - PGOU) which dictate land use and zoning.

UK: Town Planning (which grants 'planning permission' for development based on land use, aesthetics, and community impact) is a separate legal process from Building Regulations approval (which focuses on the technical safety and performance of the building itself), but they are complementary and both must be satisfied.

Gap Analysis for Syria: There is a potential and dangerous disconnect, or even conflict, between the objectives of urban planning laws (which may currently prioritise state control, rapid redevelopment, or specific demographic outcomes) and the fundamental goals of building regulations (which should prioritise public safety, resilience, and equitable access to safe housing). Without harmonization and a clear centring of HLP rights within the urban planning framework, reformed building codes could be applied in a manner that exacerbates existing injustices.

Building regulations and urban planning are intrinsically linked and must function cohesively. Urban planning decisions (e.g., zoning, density allowances, designation of hazardous areas) set the context within which building codes operate. Effective urban planning can proactively mitigate risks by, for example, restricting construction in known seismic fault zones or floodplains. Building codes then ensure the safety and resilience of individual structures built within the approved planning framework. In Syria, the highly controversial nature of recent urban planning and property-related legislation means that building code reform cannot be pursued in isolation. There is an urgent need for an integrated approach that reviews and potentially reforms these planning laws alongside building codes, ensuring that HLP rights are protected and that reconstruction efforts are guided by principles of fairness, equity, and social cohesion. Failure to do so could result in technically improved buildings being constructed on a foundation of unresolved grievances and injustice.

Table 2 Comparative Overview of Key Building Regulation Themes

Theme	Syria (Current/Likely Status)	Jordan	Israel	UAE (Dubai)	UAE (Abu Dhabi)	Cyprus	Greece	Spain	Italy	UK
Lead Regulatory Body/Approach	Ministry of Public Works & Housing; Potentially new "SBC" system. Historically weak enforcement.	JNBC, RSS, Ministry of Public Works & Housing	SII (Standards), Ministry of Economy (Official Standards), Planning Admin.	Dubai Municipality (DBC); National Fire Code	Abu Dhabi DMT (ADIBC, based on I-Codes); National Fire Code	Ministry of Interior (EU CPR); Eurocodes adopted	Ministries; National Codes (EAK, KENAK); Presidential Decrees	Ministry of Transport, Mobility & Urban Agenda (CTE)	Ministry of Infrastructure & Transport (NTC); Local enforcement	DLUHC (England), Devolved Admins; Performance-based Approved Documents (12)
Seismic Code Basis & Key Features	Syrian Arab Code (e.g., 2004/05); Proposed SBC-SE. Poor past performance.	JCERB 2017 (possibly UBC-97 based); Past codes underestimated risk	SI 413 (regularly updated), active fault considerations, TAMA 38 retrofitting	DBC based on I-Codes; Up to 6.0 Richter (6)	ADIBC (I-Codes based), Ch.16 Structural Design (7)	Eurocode 8 with National Annex; School retrofitting program	EAK 2000 (ULS/SLS, 475yr earthquake) (8)	NCSR-23 (new & existing buildings)	NTC 2018 (hazard parameters, vulnerability checks)	Low seismicity; Part A (Structure), Eurocode 8 if needed (12)
Energy Efficiency	Proposed SBC-GB; Currently	JGBG, Thermal Insulation Code,	SI 5281 (Green Building), SI 5282 (Energy Rating),	Al Sa'fat Green Building System;	ADIECC (I-Codes based), Estidama	EPBD compliant; NZEB; EPCs; Energy	KENAK (EPBD compliant); NZEB;	CTE DB-HE; NZEB; EPCs; Mandator	APE (Energy Perf. Cert.) A4-G; Mandatory	Part L (Conservation); EPBD influenced;

Code & Targets	limited/unenforced.	Energy Efficient Building Codes	mandatory in many areas	DEWA Green Bldg Specs [6]	Pearl Rating [7]	Perf. of Buildings Law 2020	EPCs; Min. Class B new/reno	y solar thermal for DHW [9]	for sale/rent/reno [11]	NZEB; EPCs [12]
Fire Safety Approach	Proposed SBC-FC; Current status unclear/unenforced.	JNBC provisions; Industrial risks noted	Specific SII standards.	National UAE Fire Code; DBC provisions; DCD enforces	National UAE Fire Code; ADIBC Ch. 7 & 9; ADCD enforces [8]	EU Fire Safety Guide principles; Containment, escape, stability	PD 41/2018, PD 71/1988; Fire Protection Certs.	CTE DB-SI (Safety in Case of Fire)	National Fire Code; Performance-based options; Considers disabilities	Approved Document B (2 Vols); Escape, spread, access [12]
Accessibility Standards	No specific info; Likely major gap.	BRCD; 2017 Disability Law; Implementation gaps	SI 5281 (Health/Wellbeing); Specific standards likely separate.	Dubai Universal Design Code	ADIBC Ch. 11 (Accessibility), ICC/ANSI A117.1 [7]	Regs for public bldgs; Harmonization w/ EN 17210 pending	Measures for PWD access to built environment	CTE DB-SUA (detailed technical reqs.)	Law 13/89, DPR 503/96 (detailed provisions)	Approved Document M (Access to and use of buildings) [12]
Enforcement Model	Systemic failure; Corruption; Weak capacity.	Municipalities, relevant ministries.	Commissioner of Standardization (Official Standards)	Dubai Municipality; DEWA; DCD [6]	Abu Dhabi DMT; ADCD [7]	Ministry of Interior; Local authorities.	Local authorities; Relevant ministries.	Local autonomous communities; Ministry	Municipal level; Ministry of Interior (Fire)	Local Authority Building Control (LABC) or

								can assist; Penalties		Approved Inspectors
Status of Green Building Codes	Proposed SBC-GB.	Jordan Green Building Guide (JGBG)	SI 5281 (Mandatory in many areas)	Al Sa'fat Green Building System [6]	Estidama Pearl Rating System; ADIECC [7]	EPBD/NZEB requirements integrated	KENAK integrates energy efficiency	CTE DB-HE (Energy Saving) is core; Strong solar focus [9]	APE promotes efficiency; Specific green bldg standards may exist.	Part L drives energy efficiency; BREEAM (voluntary standard) widely used.

6. Strategic Recommendations for Reforming Syrian Building Regulations

The preceding analysis underscores the critical need for a comprehensive overhaul of Syrian building regulations and, equally importantly, the systems for their development, implementation, and enforcement. The following strategic recommendations are proposed, taking into account Syria's post-conflict context, urgent reconstruction needs, existing vulnerabilities, and the necessary to build a safer, more resilient, and sustainable future. These recommendations aim to be actionable and are broadly sequenced from foundational reforms to more specialised enhancements.

6.1. Foundational Reforms: Legal and Institutional Strengthening

Before significant technical advancements in building codes can be effectively implemented and sustained, a robust legal and institutional foundation must be established. The current Syrian context, marked by weakened institutions and controversial property-related legislation, necessitates prioritizing these foundational elements.

- Establish an Independent National Building Code Authority (NBCA): A dedicated, technically competent, and sufficiently autonomous body should be established or designated with the primary responsibility for developing, updating, disseminating, and overseeing the implementation of all national building codes and standards. This NBCA should draw expertise from professional engineering and architectural bodies, academic institutions, relevant government ministries (e.g., Public Works and Housing, Local Administration, Environment), and the construction industry. Learning from models like Israel's Standards Institution of Israel (SII) or Jordan's collaborative JNBC/RSS structure, the NBCA should operate with a clear mandate, adequate resources, and a degree of independence to ensure technical decisions are prioritised. Its functions should include commissioning research, adopting/adapting international standards, and ensuring codes are appropriate for Syrian conditions.
- Review and Reform Housing, Land, and Property (HLP) Legislation: The effective and equitable application of new building codes during reconstruction is contingent upon a just HLP framework. Existing legislation, such as Law No. 23 of 2015 and Law No. 10 of 2018, which have been criticised for their potential to dispossess vulnerable populations [1], must be urgently reviewed. This review should aim to amend or replace provisions that undermine secure tenure, fail to provide fair compensation or alternative housing, or create undue barriers for displaced persons seeking to reclaim or regularise their property rights. This step is crucial to

ensure that reconstruction efforts do not inadvertently legitimise or build upon past injustices.

- Develop a Transparent and Participatory Code Development Process: The process for creating and revising building codes must be transparent and inclusive. This involves establishing clear procedures for drafting codes, public consultation periods to allow input from all stakeholders (including professionals, the construction industry, civil society organisations representing affected communities, and the general public), and a mechanism for considering and responding to feedback. This approach will enhance the legitimacy, practicality, and acceptance of the new codes.

Without these foundational legal and institutional reforms, even the most technically advanced building codes will likely fail to achieve their intended safety and resilience objectives. A trustworthy institutional anchor and a fair HLP environment are prerequisites for successful reconstruction.

6.2. Technical Modernisation: A Phased Adoption of Best-Practice Standards

Given Syria's current capacity constraints and the urgency of reconstruction, a phased approach to the technical modernisation of building codes is recommended. This allows for immediate improvements in life safety while progressively building the capacity to implement more comprehensive and complex standards.

Phase 1 (Immediate Priority: 0-2 Years): Foundational Life-Safety Codes:

- Seismic Safety: The immediate priority is a robust and enforceable seismic code.
    - Option A: If the proposed "Syrian Building Code (SBC)," particularly its seismic component (SBC-SE), is found to be technically sound after a rapid and rigorous independent evaluation against leading international standards (e.g., latest Eurocode 8, ASCE 7/IBC), its official adoption, dissemination, and mandatory enforcement for all new construction and major structural repairs should be fast-tracked.
    - Option B: If the SBC-SE is not ready or deemed inadequate, Syria should immediately adopt a simplified, prescriptive seismic code based on established international principles (e.g., core requirements of Eurocode 8 or IBC, adapted for common Syrian building typologies like reinforced concrete frames and masonry infill structures). This interim code should provide clear, unambiguous guidance that can be readily understood and applied by local engineers and builders.
- Fire Safety: Concurrently, a foundational fire safety code should be adopted and enforced. This could be based on the proposed SBC-FC (if evaluated as sound) or adapted from a clear, prescriptive international model (e.g., core elements of the

UAE Fire and Life Safety Code or simplified guidance from UK's Approved Document B). Emphasis should be on means of egress, basic fire resistance of structural elements, and prevention of rapid fire spread in common building types.

Phase 2 (Medium-Term: 2-5 Years): Comprehensive Standards Integration:

- Energy Efficiency and Sustainability: Develop and mandate comprehensive energy efficiency standards. This should include minimum thermal performance requirements for building envelopes (walls, roofs, windows), standards for energy-efficient HVAC and lighting systems, and provisions to encourage or mandate the use of renewable energy, particularly solar thermal for domestic hot water (drawing from Spain's DB-HE model [9]) and solar PV where feasible. The proposed SBC-GB could serve as a starting point for developing a Syrian Green Building code, learning from regional examples like Jordan's JGBG or the UAE's Al Sa'fat system.[6]
- Accessibility: Develop and mandate comprehensive accessibility standards for all new public buildings and multi-family residential constructions, and for major renovations. These standards should aim for universal design principles, drawing from robust international examples like Spain's DB-SUA or Italy's Law 13/89.
- Material Standards: Establish and enforce standards for key construction materials (cement, aggregates, steel, masonry units), including requirements for testing and certification.

Phase 3 (Long-Term: 5+ Years): Advanced Codes and Continuous Improvement:

- Transition towards a more comprehensive and potentially performance-influenced national building code system, covering all relevant aspects of building design, construction, and maintenance.
- Establish a regular review and update cycle for all codes (e.g., every 5-7 years) to ensure they remain aligned with international best practices, technological advancements, and evolving understanding of local risks (e.g., updated seismic hazard maps, climate change projections).

Parallel Track: Addressing Existing Buildings:

- Develop specific technical guidelines and a strategic program for the seismic assessment and retrofitting of existing vulnerable public and private buildings. This program should learn from the methodologies and experiences of Cyprus's school retrofitting program and potentially elements of Israel's TAMA 38, but must be implemented with stringent safeguards for HLP rights and tailored to Syria's resource availability and reconstruction priorities. Simplified assessment methods and cost-effective retrofitting techniques for common building types will be essential.

This phased approach acknowledges the urgency of immediate safety needs while providing a pathway towards a modern, comprehensive, and sustainable regulatory framework for Syria's built environment.

6.3. Building a Culture of Compliance: Robust Enforcement and Integrity Mechanisms

Technical codes, no matter how advanced, are ineffective without robust enforcement and a prevailing culture of compliance. Syria's history of widespread non-compliance necessitates a fundamental transformation in this area.

Strengthened Municipal Building Control:

Re-establish, adequately resource, and empower municipal building control departments. This includes:

- Recruiting and training a sufficient number of qualified building inspectors.
- Providing them with clear mandates, operational guidelines, and the necessary tools and equipment for plan checking and site inspections.
- Ensuring their operational independence from undue political or commercial influence. (Models like the UK's Local Authority Building Control or Spain's local community enforcement offer structural insights).

Professional Licensing and Accountability:

Implement a rigorous system for the licensing and certification of engineers, architects, and construction contractors.

- This system should define clear responsibilities and legal liabilities for code compliance at each stage of the building process (design, supervision, construction).
- Mandatory continuing professional development (CPD) should be introduced to ensure professionals remain updated on new codes, standards, and construction technologies.

Transparent Permitting and Certification:

Establish a transparent, streamlined, and accountable system for issuing building permits and occupancy certificates. Make information on permit applications, approvals, and inspection outcomes publicly accessible where appropriate, to enhance scrutiny and reduce opportunities for corruption.

Stringent and Deterrent Penalties:

Introduce and consistently apply stringent penalties for non-compliance with building codes.

- These penalties must go beyond nominal fines that might be treated as a mere "cost of doing business".
- They should include substantial financial penalties, the authority to halt non-compliant construction, mandatory rectification of defects at the violator's expense, suspension or revocation of professional licenses for repeated or egregious violations, and, where appropriate, legal action.

Anti-Corruption Measures and Oversight:

Implement robust anti-corruption measures across all institutions and processes related to building regulation and permitting. This may involve establishing independent oversight bodies, clear ethical guidelines for officials and professionals, whistleblower protection mechanisms, and regular audits.

Rebuilding trust in the regulatory system is paramount. This requires a concerted effort to professionalise the construction sector and its oversight bodies, ensure transparency and accountability at all levels, and demonstrate a consistent political will to enforce standards without fear or favour.

6.4. Disaster Risk Reduction and Climate Adaptation

Building regulations are a critical tool for enhancing a nation's resilience to natural hazards and the impacts of climate change. For Syria, this means looking beyond immediate reconstruction needs to ensure long-term safety and sustainability.

Updated Seismic Hazard Assessment: Ensure that seismic design codes are based on the most current and comprehensive seismic hazard maps for Syria. This requires incorporating the latest geological and seismological data, utilizing probabilistic seismic hazard assessment (PSHA) methodologies, and considering local site conditions that can amplify ground shaking.

Climate Adaptation in Codes: Integrate climate adaptation measures into building codes. Given Syria's climate, which shares characteristics with Southern European countries, this should include considerations for:

- Increased ambient temperatures and heatwaves (e.g., standards for thermal comfort, passive cooling strategies, appropriate material selection).
- Water scarcity (e.g., requirements for water-efficient fixtures, promoting rainwater harvesting and greywater recycling systems).
- Potential for other climate-related hazards such as flash floods or droughts, which can affect foundation design and material durability.

Multi-Hazard Resilience: Promote construction techniques and materials that enhance resilience not just to earthquakes but to a range of potential hazards relevant to Syria.

This includes durability against extreme weather conditions and appropriate material selection for longevity.

Integration with Land-Use Planning for DRR: Critically, building codes must be linked with risk-informed land-use planning. This involves:

- Restricting or prohibiting new construction in areas identified as high-risk (e.g., zones with high probability of liquefaction, active fault rupture zones, unstable slopes, floodplains).
- Ensuring that urban planning and zoning regulations guide development away from hazardous areas and promote resilient urban forms.

A proactive approach to resilience involves anticipating future stresses. By embedding disaster risk reduction and climate adaptation principles directly into its building regulatory framework, Syria can avoid creating new vulnerabilities and ensure that its reconstructed infrastructure is better prepared for future challenges.

6.5. Championing Sustainability: Green Building and Resource Efficiency

The reconstruction of Syria presents a significant opportunity to embed principles of sustainability and resource efficiency into the built environment from the outset. This will not only reduce long-term operational costs and environmental impact but also contribute to energy security and improved living conditions.

Mandate Minimum Energy Performance Standards: Implement mandatory minimum energy performance standards for all new buildings and major renovations. These standards should prioritise:

Passive Design Strategies: Orienting buildings to optimise solar gain in winter and minimise it in summer, utilizing natural ventilation, and incorporating shading elements.

Building Envelope Efficiency: Setting stringent requirements for the thermal insulation of walls, roofs, and floors, and for the performance of windows and doors to reduce heating and cooling loads. (Learning from EU EPBD implementation).

Efficient Systems: Mandating the use of energy-efficient HVAC (heating, ventilation, and air conditioning) systems, lighting, and appliances.

Promote Solar Energy Utilization: Given Syria's abundant solar resources, actively promote and incentivise (or mandate, where appropriate) the use of solar energy technologies.

Solar Thermal for DHW: Consider adopting a requirement similar to Spain's CTE, which mandates solar thermal systems to cover a significant portion of domestic hot water demand.[9] This is a highly cost-effective measure in sunny climates.

Solar Photovoltaics (PV): Facilitate the integration of solar PV systems for electricity generation in new buildings and explore incentives for retrofitting existing ones.

Water Conservation Measures: Incorporate requirements for water conservation in buildings, including the use of water-efficient plumbing fixtures (taps, showers, toilets) and promoting systems for rainwater harvesting and greywater recycling, particularly in water-scarce regions.

Sustainable and Local Materials: Encourage and, where feasible, prioritise the use of locally sourced, sustainable, and durable construction materials. This reduces transportation emissions, supports local economies, and can ensure materials are appropriate for the local climate. Develop standards and quality control mechanisms for these materials. This includes exploring safe and effective ways to recycle and reuse construction and demolition waste.

Develop a Syrian Green Building Framework: Explore the development of a national Green Building Rating System or set of guidelines. This could be adapted from successful regional models like Jordan's JGBG or the UAE's Al Sa'fat system [6], or from internationally recognised systems, tailoring it to Syria's specific environmental priorities, available technologies, and construction practices. The proposed "SBC-GB" could form the basis for this.

By championing sustainability in its building regulations, Syria can ensure that its reconstruction efforts contribute to a more resource-efficient, environmentally responsible, and economically sound future.

6.6. Addressing Legacies: Housing, Land, and Property (HLP) Rights in the New Framework

The success and equity of Syria's reconstruction, including the application of new building regulations, are inextricably linked to the just resolution of Housing, Land, and Property (HLP) rights issues stemming from over a decade of conflict and displacement. Failure to address these complex legacies could undermine the entire rebuilding effort, leading to further grievances and instability.

Establish a Fair HLP Resolution Mechanism: It is imperative to establish a clear, fair, accessible, and effective national mechanism for resolving HLP disputes, restoring property rights to legitimate owners (including displaced persons and refugees), and providing appropriate compensation where restitution is not possible. This recommendation aligns with calls from international organisations.[3] This mechanism

must be operational *before* or, at the very least, in close parallel with, the large-scale application of new building codes and urban redevelopment plans (such as those potentially enacted under Law No. 23/2015 or Law 10/2018). This is to prevent new construction from occurring on land with contested ownership or where rights have been unjustly extinguished.

Regularise and Upgrade Informal Settlements Equitably: Informal settlements, which house a significant portion of Syria's urban population, require a nuanced approach. Instead of wholesale demolition and eviction (which Law 23/2015 has been criticised for enabling), strategies should focus on:

- Providing pathways for tenure regularization where feasible.
- Developing simplified, subsidised, and technically assisted programs for residents to upgrade their dwellings to meet minimum safety standards under the new codes.
- Ensuring that if relocation is unavoidable for safety or essential public works, it is conducted with full due process, adequate consultation, and the provision of genuinely adequate alternative housing and livelihood support.

Ensure New Regulations Do Not Create New Barriers: New building regulations, while aiming for higher safety and quality standards, must be designed and implemented in a way that does not inadvertently create new economic or bureaucratic barriers for the return and reintegration of displaced persons, or for low-income families seeking to build or repair their homes. This may involve considerations for cost-effective compliance pathways and targeted support programs.

Addressing HLP rights is not peripheral to building code reform; it is central to ensuring that the reconstruction process is just, sustainable, and contributes to social cohesion. Building safer structures on a foundation of unresolved HLP disputes will only sow seeds for future conflict.

6.7. Investing in People: Capacity Building and Professional Development

The successful implementation of modernised building regulations hinges on the knowledge, skills, and competence of all individuals involved in the construction sector. Syria faces a significant challenge in rebuilding this human capacity after years of conflict, displacement, and disruption to education and professional development.

Comprehensive Training Programs: Launch extensive and sustained training programs targeting all levels of the construction industry:

- Engineers, Architects, and Planners: Training on new codes and standards, modern design techniques (especially for seismic resistance and energy efficiency), use of new materials, and ethical responsibilities.

- Building Inspectors and Code Enforcement Officials: Intensive training on the technical provisions of the new codes, inspection procedures, documentation, legal aspects of enforcement, and ethical conduct.
- Construction Workers and Tradespeople: Vocational training and certification programs focusing on quality construction practices, correct application of materials, and understanding of basic safety requirements relevant to their trades (e.g., masons, carpenters, electricians, plumbers).

Strengthening Educational Curricula: Work with Syrian universities and vocational training institutes to update and strengthen curricula for engineering, architecture, urban planning, and construction trades to align with the new codes and modern best practices.

Supporting Professional Associations: Support the revitalization or establishment of professional associations for engineers, architects, and contractors. These associations can play a crucial role in promoting professional standards, providing continuing education, fostering ethical conduct, and contributing to the code development process. (The aims of SAEA could be a model for such engagement).

International Collaboration and Knowledge Transfer: Actively seek international technical assistance and partnerships for capacity building, including train-the-trainer programs, exchange visits, and access to international expertise and learning resources.

A long-term commitment to investing in people is essential for creating a skilled workforce and a cadre of competent professionals capable of designing, building, and overseeing a resilient and high-quality built environment in Syria. Codes are merely documents; it is people who bring them to life.

6.8. Fostering Collaboration: Public Awareness and Stakeholder Participation

Transforming Syria's building culture requires more than top-down regulatory changes; it necessitates a broad-based effort involving all segments of society.

Public Awareness Campaigns: Launch sustained public awareness campaigns to educate citizens about the importance of building codes for their safety, health, and well-being. These campaigns should explain the risks associated with non-compliant construction and inform citizens of their rights to safe housing and how to report concerns. An informed public can create demand for better building practices.

Private Sector Engagement: Actively engage with the private sector—including developers, contractors, material manufacturers, and suppliers—throughout the reform process. This includes consultation on draft codes to ensure practicality,

providing training on new requirements, and fostering a partnership approach to achieving compliance. Industry buy-in is crucial for successful implementation.

Inter-Agency and Cross-Sectoral Collaboration: Foster strong collaboration and coordination between all relevant government agencies (e.g., NBCA, ministries responsible for housing, planning, environment, local administration, civil defence), professional bodies, academic institutions, and civil society organisations. A siloed approach will be ineffective.

International Partnerships: Continue to seek and leverage international partnerships for technical assistance, knowledge sharing, capacity building, and potentially financial support for specific initiatives related to building code reform and implementation.

Building a resilient and safe built environment is a shared responsibility. By fostering a collaborative environment, raising public awareness, and ensuring active participation from all stakeholders, Syria can create a more deeply embedded and sustainable culture of safety and compliance.

Table 3 Prioritised Recommendations for Syrian Building Regulation Reform

Recommendation Area	Specific Action	Rationale (Key Supporting Evidence/Analysis)	Priority Level	Potential Lead/Supporting Agencies (Syrian and International)
1. Foundational Legal & Institutional Reform	Establish an independent, technically competent National Building Code Authority (NBCA).	Current institutional framework weak/fragmented; need for credible body.	Short-Term (0-2 Years)	Syrian Government (relevant Ministries), with technical support from UN agencies, World Bank, experienced international standards bodies.
	Review and reform HLP-related legislation (e.g., Law 23/2015, Law 10/2018) to ensure fairness and secure tenure.	Current laws criticised for dispossessing vulnerable groups; essential for equitable reconstruction.[1]	Short-Term (0-2 Years)	Syrian Government (Ministry of Justice, relevant committees), with expert advice from UN-Habitat, NRC, human rights organisations.
	Develop transparent, participatory code development/revision processes.	Enhances legitimacy and practicality of codes.	Short-Term (0-2 Years)	Proposed NBCA, professional associations, civil society.
2. Technical Modernization (Phased)	Phase 1: Adopt/adapt foundational seismic and fire safety codes for new construction & major repairs. Evaluate proposed "SBC" or use simplified international standards.	Urgent life-safety need demonstrated by 2023 earthquakes; current codes likely outdated/unenforced.	Short-Term (0-2 Years)	Proposed NBCA, Ministry of Public Works & Housing, Syrian Order of Engineers, international seismic/fire safety experts.

	Phase 2: Develop/integrate comprehensive codes for energy efficiency, sustainability (green building), and accessibility.	Opportunity to build sustainably and inclusively from outset; learn from EU, UAE, Spain, Italy.[9]	Medium-Term (2-5 Years)	Proposed NBCA, Ministry of Environment, Ministry of Social Affairs, energy agencies, disability advocacy groups.
	Develop specific guidelines for seismic assessment and retrofitting of existing vulnerable buildings (with HLP safeguards).	Vast existing vulnerable stock requires a strategy; learn from Cyprus, Israel (adapted).	Medium-Term (2-5 Years)	Proposed NBCA, universities, research institutions, HLP resolution bodies.
3. Enforcement & Compliance Culture	Strengthen municipal building control (training, resources, mandate).	Current enforcement is critically weak; local capacity is key.	Short to Medium-Term	Ministry of Local Administration, Municipalities, proposed NBCA, international capacity-building partners.
	Implement robust licensing/certification for professionals and contractors with clear accountability.	Essential for quality control and professional responsibility.	Medium-Term (2-5 Years)	Proposed NBCA, professional associations (e.g., Order of Engineers).
	Introduce stringent, deterrent penalties for non-compliance and strong anti-corruption measures.	Current system lacks effective deterrents; corruption undermines codes.	Short to Medium-Term	Syrian Government (Judiciary, oversight bodies), proposed NBCA.

4. Embedding Resilience (DRR & Climate)	Update seismic codes based on current hazard assessments; integrate climate adaptation measures.	Ensures codes reflect actual risks and future climate stresses.	Medium-Term (2-5 Years)	Proposed NBCA, meteorological/geological surveys, climate change experts.
	Link building codes with risk-informed land-use planning.	Prevents construction in high-risk zones; holistic DRR.	Medium-Term (2-5 Years)	Proposed NBCA, Ministry of Local Administration/Planning, environmental agencies.
5. Championing Sustainability	Mandate minimum energy performance (passive design, insulation, efficient systems); promote/mandate solar energy.	High solar potential; reduces operational costs & environmental impact; learn from Spain.[9]	Medium-Term (2-5 Years)	Proposed NBCA, Ministry of Energy, Ministry of Environment.
6. Investing in People (Capacity Building)	Launch comprehensive training programs for all construction sector stakeholders (professionals, inspectors, workers).	Codes are ineffective without skilled personnel to apply them.	Short to Long-Term	Proposed NBCA, universities, vocational training centers, professional associations, international development partners.
7. Fostering Collaboration & Awareness	Conduct public awareness campaigns on building safety; engage private sector and international partners.	Builds demand for compliance and leverages diverse expertise/resources.	Short to Long-Term	Proposed NBCA, relevant Ministries, media, NGOs, international community.

7. A Roadmap for Transformation: Implementation Pathways and Future Directions

The reform of Syrian building regulations is not a singular event but a sustained process requiring strategic planning, phased implementation, and continuous adaptation. This section outlines a potential roadmap for this transformation, emphasizing prioritised actions and the establishment of a framework for ongoing improvement.

7.1. Prioritised Action Plan: Short, Medium, and Long-Term Initiatives

A phased approach is essential to manage the complexity of reform and build capacity incrementally.

Short-Term Initiatives (0-2 Years): Laying the Groundwork for Safety and Justice

- Institutional Setup: Prioritise the legal establishment and initial operationalization of the National Building Code Authority (NBCA) with a clear mandate and core technical staff. Secure initial funding and technical assistance.
- HLP Framework: Urgently establish a transparent and accessible Housing, Land, and Property (HLP) rights resolution framework. This is a critical parallel process to ensure equitable reconstruction. No new code application in contested areas should proceed without clear HLP determination.
- Emergency Life-Safety Codes: Conduct a rapid technical evaluation of the proposed "Syrian Building Code (SBC)", particularly its seismic (SBC-SE) and fire (SBC-FC) components. If deemed technically sound and adaptable, fast-track its official adoption for immediate application to all new construction and critical repair/retrofitting projects. If not, adopt a simplified, prescriptive interim seismic and fire safety code based on proven international models, tailored for common Syrian building types.
- Initial Capacity Building: Launch intensive "train-the-trainer" programs for a core group of engineers, architects, and potential building inspectors on the new emergency life-safety codes. Begin developing updated curricula for universities and vocational centres.
- International Technical Assistance: Actively secure partnerships with international organisations and countries with relevant expertise for technical guidance on code development, HLP resolution, and capacity building.

Medium-Term Initiatives (2-5 Years): Building Comprehensive Standards and Enforcement Capacity

- Comprehensive Code Development: Task the NBCA with developing or adapting comprehensive national building codes covering energy efficiency, sustainability (green building principles), and accessibility, drawing from the comparative analysis and best

practices identified in this report (e.g., Spain's solar thermal and accessibility provisions [9], EU energy standards).

- Strengthening Enforcement Systems: Roll out a revamped building control and inspection system at the municipal level, supported by the NBCA. This includes standardised inspection protocols, training for a larger cadre of inspectors, and clear procedures for permits and occupancy certificates.
- Professional Licensing and Material Certification: Develop and implement systems for the licensing of construction professionals and for the testing and certification of key construction materials. Establish or upgrade material testing laboratories.
- Retrofitting Strategy: Finalise and begin implementing a national strategy for the assessment and seismic retrofitting of existing vulnerable buildings, prioritizing critical public facilities (hospitals, schools) and high-occupancy residential buildings, always integrated with HLP resolution processes.
- Integration with Urban Planning: Ensure new building codes are harmonised with revised urban planning regulations that incorporate risk sensitivity and HLP justice.

Long-Term Initiatives (5+ Years): Sustaining Improvement and Fostering Innovation

- Regular Code Review Cycles: Embed a formal process for the regular review and updating of all national building codes (e.g., every 5-7 years) by the NBCA, ensuring they remain current with international advancements, local research, and lessons learned from their implementation.
- Advanced Code Adoption: As national capacity grows, consider the introduction of more performance-based elements within the codes, allowing for greater design flexibility and innovation while maintaining safety standards.
- Research and Development: Foster national research and development in construction materials, technologies, and building performance relevant to Syrian conditions.
- Culture of Safety: Continuously promote a culture of safety and compliance through ongoing public awareness, professional development, and strong institutional oversight.

7.2. Framework for Monitoring, Evaluation, and Continuous Improvement

To ensure that the reformed building regulatory system is effective and adapts over time, a robust framework for monitoring, evaluation, and learning (MEL) is essential.

Performance Indicators: The NBCA, in collaboration with relevant ministries and statistical bodies, should develop a set of key performance indicators (KPIs) to track the impact of the new regulations. These could include:

- Rates of compliance with new codes in permitted construction.
- Data on building performance during hazard events (e.g., reduction in damage and casualties in future earthquakes in areas built/retrofitted to new standards).
- Measured energy and water savings in new and retrofitted buildings.

- Number of professionals and workers trained and certified.
- Efficiency and transparency of the permitting and inspection process.
- Public and industry satisfaction with the regulatory system.

Data Collection and Analysis: Establish systems for collecting reliable data related to these KPIs. This may involve digitizing permit and inspection records, conducting post-occupancy evaluations of buildings, and undertaking periodic surveys.

Periodic Reviews: The NBCA should conduct periodic comprehensive reviews of the effectiveness of the building codes and the enforcement system (e.g., every 3-5 years). These reviews should involve stakeholder consultations and lead to recommendations for further improvements or adjustments to the codes or their implementation.

Feedback Mechanisms: Create accessible channels for professionals, the construction industry, and the public to provide feedback on the codes and their enforcement, and to report issues or suggest improvements.

Learning from Disasters and Incidents: Implement a formal process for investigating building failures or significant safety incidents to identify lessons learned and incorporate them into future code revisions or enforcement practices. This was a critical failing evident from the 2023 earthquakes, where systemic issues persisted despite previous seismic events in the broader region.

The journey to transform Syria's building regulatory landscape will be long and complex. However, by adopting a strategic, phased approach, prioritizing foundational reforms, investing in human capacity, and committing to continuous improvement, Syria can build a safer, more resilient, and sustainable future for its citizens. This endeavour is not merely technical; it is fundamental to the nation's recovery and long-term stability.

References

1. Enab Baladi. Legislative decrees and laws of property rights in Syria. 2020 Jun 30; Available from: https://english.enabbaladi.net/archives/2020/06/legislative-decrees-and-laws-of-property-rights-in-syria/

2. Syrian Engineering Association Publications. SYRIAN SEISMIC CODE 2004 [Internet]. 2004. Available from: https://iisee.kenken.go.jp/net/seismic_design_code/syria/seismic_building_code_2004.pdf

3. Lang H, Marks J. Beyond the Fall: Rebuilding Syria After Assad [Internet]. Refugees International; 2025 May. Available from: https://www.refugeesinternational.org/reports-briefs/beyond-the-fall-rebuilding-syria-after-assad/

4. 2025. وزارة الاشغال العامة والاسكان May 17; Available from: https://www.mpwh.gov.jo/

5. The Standards Institution of Israel. The Standards Institution of Israel. 2025 May 18; Available from: https://www.sii.org.il/en/

6. Government of Dubai. Dubai Building Code [Internet]. 2021. Available from: https://dm.gov.ae/wp-content/uploads/2021/12/Dubai%20Building%20Code_English_2021%20Edition_compressed.pdf

7. Government of Abu Dhabi. Abu Dhabi International Building Code [Internet]. 2013. Available from: https://www.dmt.gov.ae/-/media/Project/DMT/DMT/Codes/ADIBC_2013_bookmarked.pdf

8. Organisation for Earthquake Resistanct Planning and Protection. Greek Code For Seismic Resistant Structures - EAK2000 [Internet]. 2000. Available from: https://www.scribd.com/document/555627580/Greek-Code-for-Seismic-Resistant-Structures-EAK2000

9. European Solar Thermal Industry Federation (ESTIF). The Spanish Technical Building Code [Internet]. 2006. Available from: http://www.estif.org/fileadmin/estif/content/policies/downloads/CTE_solar_thermal_sections_ENGLISH.pdf

10. MINISTERO DELLE INFRASTRUTTURE E DEI TRASPORTI. NTC 2018: Norme tecniche per le costruzioni 2018 [Internet]. 2018. Available from: https://biblus.acca.it/download/norme-tecniche-per-le-costruzioni-2018-ntc-2018-pdf/

11. Dipartimento Unità per l'Efficienza Energetica. Che cos'è l'Attestato di Prestazione Energetica (APE) [Internet]. 2019. Available from:

https://www.efficienzaenergetica.enea.it/servizi-per/cittadini/gli-incentivi-per-chi-realizza-gli-interventi-2.html#:~:text=L'Attestato%20di%20Prestazione%20Energetica%20(APE%2C%20o%20anche%2C,gli%20interventi%20migliorativi%20pi%C3%B9%20convenienti.

12. Department of Energy and Climate Change D. United Kingdom's housing energy fact file Tables and graphs. 2012.

13. Saffarini HS. A review of seismic design recommendations in Jordan. Structural Engineering and Mechanics. 2000 Mar 25;9(3):257–68.

14. UK Government. Approved Documents [Internet]. 2024. Available from: https://www.gov.uk/government/collections/approved-documents

15. Government of Dubai. Building & Planning Circulars. 2025 Jun 3; Available from: https://www.dm.gov.ae/building-planning-circulars-2/

16. The Confederation of Fire Protection Associations Europe (CFPA-Europe). Description of the national fire regulation framework for buildings. 2021; Available from: https://cfpa-e.eu/national-regulations/

17. Luxembourg Institutes for Socio-economic Research, Machline E, Pearlmutter D, Ben Gurion University of the Negev. 'Green' Building as an Urban Branding Tool: The Israeli Example. J Ear Environ Sci Res. 2020 Sep 30;1–13.

18. Gamal M. Heritage in Syria: Independent Groups Documenting the Country's Historic Architecture. 2025 Jan 7; Available from: https://www.archdaily.com/1025348/heritage-in-syria-independent-groups-documenting-the-countrys-historic-architecture

19. Cancelliere P, Lombardi M, Ponticelli L, Gissi E, Gai G, Caciolai M. ITALIAN HYBRID FIRE PREVENTION CODE. In Rome, Italy; 2017 [cited 2025 Jun 20]. p. 107–17. Available from: http://library.witpress.com/viewpaper.asp?pcode=SAFE17-010-1

20. Ahmed I. Key Building Design and Construction Lessons from the 2023 Türkiye–Syria Earthquakes. Architecture. 2023 Mar 2;3(1):104–6.

21. Hellenic Republic Government. National Register of Administrative Procedures [Internet]. 2025. Available from: https://en.mitos.gov.gr/index.php/Main_Page

22. Chrysostomou C, Kyriakides N, Kappos A, Georgiou E, Vasiliou O, Milis M. Seismic Retrofitting of School Buildings of Cyprus. 2012.

23. The Royal Scientific Society. The Royal Scientific Society. 2025; Available from: https://www.rss.jo/

24. EEFIT. Earthquake Engineering Field Investigation Team (EEFIT), Institution of Structural Engineers (IStructE). The Türkiye Earthquake Sequence of February 2023: A Longitudinal Study Report [Internet]. EEFIT. Earthquake Engineering Field Investigation Team (EEFIT), Institution of Structural Engineers (IStructE).; 2024 Feb. Available from: https://www.cam.ac.uk/research/news/new-report-into-turkey-syria-earthquakes-uncovers-deficiencies-in-building-structures-and

25. Hourani NB. This is home: Redirecting reconstruction in Syria. Human Organization. 2025 Jan 2;84(1):69–81.

26. Daher J. Three Requisites for Syria's Reconstruction Process. Carnegie Endowment for International Peace [Internet]. 2025 May 8; Available from: https://carnegieendowment.org/research/2025/05/three-requisites-for-syrias-reconstruction-process?lang=en

27. Urban Planning and Urbanisation Law in Syria no. 23/2015 [Internet]. 2021. Available from: https://www.youtube.com/watch?v=r-BTk5fITHY

28. الكود السوري للبناء [Internet]. 2025. Available from: https://sbc.codes/#