THE LEAD MARKET INITIATIVE AND SUSTAINABLE CONSTRUCTION: LOT 1, SCREENING OF NATIONAL BUILDING REGULATIONS

Final report

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Bodegraven, Delft, Netherlands, 15 February 2011

COLOFON

Principal	: EC, DG Enterpise
Project name	: Screening of national building regulations, Lot 1
Project number	: Y0602.01.01
Date	: 15 February 2011
Status	: Final report
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1. INTRODUCTION

The Lead Market Initiative (LMI) for Europe is the European policy for six important sectors of high economic and societal value: eHealth, protective textiles, sustainable construction, recycling, bio-based product and renewable energies. The LMI aims to lower existing barriers to trade and innovation and to bring new products and services onto the market. Within the LMI the European Commission, member states and industry work together to carry out Action Plans.[1] These Action Plans present a list of measures to build a coherent basis for progressive step changes to regulation, standardization and public procurement. The goal is to further stimulate the market for products and services for sustainable construction in Europe. The European Commission expects that through this framework awareness will be raised and acceptance will be reached about the need to transform the way the customer decides and the supply chain operates.[2]

This report meets one of the goals of the Action Plan for the LMI area sustainable construction: a *screening of national building regulations*.

The construction sector is highly regulated at national, regional and local level. The responsibility for setting regulations and implementing these is highly fragmented amongst various authorities. Furthermore, specific aspects of the construction sector make it difficult to implement effective regulation, which is even more true for addressing aspects related to sustainability: the construction industry is highly fragmented; the supply chain is complex; building ownership is fragmented; there are split incentives between building owners and users; buildings often have high financial value; and last but not least buildings are location bound and have a very long life span.

1.1 Content of this report

This report assesses whether and how the EU-27 member states currently regulate sustainable construction. The report furthermore assesses whether and how these regulations are enforced on a day to day basis. And finally this report assesses whether and how non-public market initiatives and public-private initiatives complement the formal building regulatory systems in addressing sustainability goals. The report assesses the coherence and efficiency of the building regulatory systems, and identifies the possible needs for coordination at EU level to consolidate the regulatory framework.

Chapter two provides the main questions addressed and the research approach taken to address these. Chapter 3 presents a brief review of the literature on sustainable construction and building regulation. Chapter 4 meets the above stated goal by presenting a screening of the EU-27's national building regulations based on five sustainability criteria – ecological

[1] For an overview of the LMI and Action Plans, see: http://ec.europa.eu/enterprise/policies/innovation/policy/lead-market-initiative/ (last visited on 22 November 2010).

[2] See: http://ec.europa.eu/enterprise/newsroom/cf/document.cfm?action=display&doc_id=3996&userservice_id=1http://ec.europa.eu/enterprise/newsroom/cf/document.cfm?action=display&doc_id=3996&userservice_id=1 (last visited on 22 November 2010).

quality, economic quality, social quality, functional quality[3]. Chapter 5 provides a discussion of this screening. Finally, chapter 6 brings together the findings of this study, presents the main conclusions, and provides recommendations for the European Commission.

[3] The original call for tender also included 'technical quality and quality of the construction process' as criterion. In this report this specific criterion is included in the other four criteria. See annex 2 for an explanation.

2. RESEARCH QUESTIONS, RESEARCH APPROACH AND DATA COLLECTION

2.1 Introduction

This chapter provides a brief overview of the main research questions posed (2.2), the research approach taken (2.3), and data collection (2.4).

2.2 Research questions and aim

The study addresses the following issues:

- How do the building regulations in the EU-27 address sustainability, and to what extent are the requirements formulated with respect to EU directives?
- What are the developments in the regulatory systems of the EU-27 with regards to sustainability in general?
- What aspects of sustainable construction have had focal attention in the EU-27's regulatory systems? And, how are these addressed?
- What is the relationship between public and private sector participation in promotion, assessment and regulation of sustainable construction?
- Whether and how do instruments such as certification schemes and assessment guidelines take account of an assessment of sustainable construction aspects of processes and products?
- Whether and how is sustainable construction regulation enforced?

The research aims at providing a broad overview of the current state of play of regulating sustainable construction in Europe.

2.3 Research approach

In order to answer these questions and meet this goal, different sets of data have been collected and analysed. First, a review of literature was carried out in order to come to a number of working definitions for the study. The literature review was carried out in January and February 2010.

Second, a series of semi-structured interviews was carried out with key stakeholder representatives – both industries and governments, to identify their perceptions of key issues, possible barriers to innovation in sustainable construction, and any comments on the scope and objectives of the study. These interviews were carried out in February, March and October 2010.

Third, a survey questionnaire was designed and sent to a range of government, industry and NGO representatives in the EU-27. The survey addressed the regulation of sustainability criteria in the EU-27, the enforcement of these regulations, and voluntary and complementary initiatives that add to the EU-27's formal regulatory systems. As the structure of the survey questionnaire is of importance in understanding the data presented in chapter 4, the questionnaire is discussed in more depth in annex 4. The survey questionnaire was operational as on-line tool between April and October 2010.

Finally, a series of round table discussions with industry representatives, government representatives and experts on sustainable construction were held in Brussels. These round table discussions aimed to present and discuss initial findings from this study. The round table discussions were held in October 2010. A summary of the discussions is included in annex 3.

2.4 Data collection

The specific data collected will be discussed in chapters 3, 4 and 5. This section provides an overview of the various sources and organizations addressed.

2.4.1 Interviews with key stakeholder organisations

Interviews have been held with key stakeholders (see annex 1 for the names of the interviewed organisations), to identify their perceptions of key issues, possible barriers to innovation in sustainable construction, and any comments on the scope and objectives of the study. Annex 2 gives a summary of these interviews.

2.4.2 Survey questionnaire (part 1 + part 2) and country reports

Number of organizations/persons invited	approx. 330
Completely filled-in questionnaires	32
Partly filled-in questionnaires	30
No response / no collaboration	268

ICLEI-questionnaire (only part 2)

Number of people invited	approx. 300
Filled-in questionnaires	3
Partly filled-in questionnaires	51
No response / no collaboration	246

Annex 1 gives an overview of the bureaux/organizations that responded to the questionnaire.

Fully or partly filled out questionnaires were received from 23 countries. Where possible the data from the questionnaire was completed based on desk research (literature/internet review). The quality of the data collected differs amongst the member states. Partly this has to do with respondents' difficulty in understanding terms and definitions. In the questionnaire a range of definitions and explanations for terminology was provided – see annex 5.

However, it appeared that many terms are contested between the various respondents[4]. Another reason for differences in the quality of data may be found in the fact that not all questionnaires are filled out by experts, or by respondents who took the planned time to fill out the questionnaire.

[4] Much discussion related to what should be considered 'regulation'. As the definitions show, see Annex 5, regulation was addressed as regulation in a broad sense – see also 3.2. Yet, in Belgium, for instance a situation was faced where there is no national or regional set of uniform construction regulations. The set of regulations, guiding documents and ordinances that address construction do not all have a comparable legal status. Other complex regimes of construction regulation were found, for instance, in the UK and Germany.

2.4.3 Round table discussion

Number of organizations/persons invited: 110
Number of organizations/persons attending:

- industry stakeholders: 8
- experts / Green Building Councils: 14
- governmental representatives: 12

See annex 1 for the names of the organisations/persons who participated in the round table meetings, and annex 3 for a summary of the discussions.

2.4.4 Quality of data collected

The major source of original data comes from the survey questionnaire. The data collected appears to be of high quality. In the majority of the member states questionnaires were filled out and returned by at least two respondents. This provided the possibility to cross-check answers provided. Where answers were conflicting between the different questionnaires of a single country, respondents were contacted and conflicts were discussed and resolved in most cases. In the few cases where conflicts could not be resolved the answer of the respondent who was expected to be most informed (i.e. the one closest to the regulatory process) was followed.

Furthermore, the presentation and discussion of the initial findings at the round table meetings provided a valuable opportunity to check the quality and consistency of the data. No major conflicts were observed. Yet, valuable additions to the initial findings were provided by those attending the round table discussions. Where relevant these are included in the text of this report.

2.4.5 Reflection on methodology and approach

The data presented in the following chapters is predominantly based on a survey questionnaire that was filled out by experts, regulators and business representatives in the different member states. Their answers are based on their experience with and knowledge of the (sustainable) construction regulatory regime in their own countries. As a result, the discussion in the following chapters may best be understood as country snapshots based on elite experiences with sustainable construction regulation and related topics.

For most countries, the analysis presented is not based on a detailed review of the various national, regional and local acts. See annex 4 for a rationale for this[5].
Such an approach may be chosen as a follow up study of the current report. For instance, a number of countries could be selected for further in-depth analysis.

The methodology chosen does affect the representativeness of the findings: these are based mainly on expert opinions. This report does therefore not claim empirical generalizability of

[5] However, the researchers could make use of the results of a preliminary questionnaire, drawn up In 2009 by the LMI Working Group on Sustainable Construction, requesting its respondents to precisely fill out the various laws and regulations that address the defined sustainable construction criteria. Three countries (Germany, Poland and Finland) returned this questionnaire with a precise reference to applicable laws, regulations, standards, guidance documents etc. in their country.

findings. It does however present a contemporary overview of the current state of affairs on the regulation of sustainable construction in Europe, the regulatory mechanisms at play, and the difficulties encountered to improve sustainable construction through regulation. As such the conclusions presented in chapter 6 should be understood as a vector that points towards a future direction of regulatory requirements related to sustainable construction, not an end-point – and certainly not an all-inclusive or exhaustive set of possible future actions.

3. CONCEPTUAL CONSIDERATIONS

3.1 Introduction

This study brings together two complex issues: sustainable construction and building regulation. Although sustainable construction is high on many governments' political agenda and is discussed widely in the literature, there is no single definition of what sustainable construction is, or what topics it addresses. First, in section 3.2 an explanation is given on some important terms used throughout this report ('building regulations', and 'building regulatory system'). Then, section 3.3 provides an overview of the topics related to sustainable construction addressed in this report. Then, construction is an activity which has a very complex system of regulation, involving many different actors (designers, product suppliers, builders, public authorities) and various stages of control (planning, design, construction, occupation) over a long period of time, and adapted to the specific requirements of different land-use locations and different climatic regions. Section 3.4 provides a brief discussion of the literature on building regulation, the enforcement of building regulations, and complementary non-governmental initiatives that aim to reach sustainability goals.

3.2 'Building regulations', and 'building regulatory system'

The term 'building regulations' is used differently in the member states. For some it refers to the technical building regulations on construction works or construction products, as laid down in many countries in Building Codes. For others it has a more broad meaning, also including local government planning and zoning regulations, environmental regulations, regulations for safe working conditions etc.

Secondly the term 'regulation' has a different meaning to different people. In a strict sense 'regulation' means a legally binding provision. Yet, in practice much construction is not 'regulated' through legal binding provisions: many provisional requirements, quasi-mandatory regulations, and informal advisory documentation on accepted solutions under the formal regulations exist. As such a strict legalistic view on the topic would only provide partial answers to the questions posed. Furthermore, legally binding provisions are drawn up differently in the different EU member states and regions – and are understood differently in the various member states and regions. In order to gain an overview of the current state of play on regulating sustainable construction in Europe and in order to provide wide-ranging answers to the questions posed it was therefore decided to use a broad definition for the term 'regulation'. Within this report *regulations* are understood to include:

- central or state/regional laws, regulations, decrees, ordinances;
- requirements, either mandatory or advisory, imposed by insurance regimes, professional registration bodies etc.;
- 'quasi-mandatory' standards, codes, approved documents, guidance and other documents which have a 'deemed to satisfy' status, referred to formally or by accepted custom and use by other instruments or by the control authorities.

In this study and this report we refer to all of these as 'building regulations', meaning: all those regulations (laws, ordinances, decrees, standards, codes etc.) imposing mandatory or semi-mandatory requirements or provisions on the planning, the design, the execution, the maintenance and the use of construction works.

The focus of the report is on those building regulations that address sustainable construction – see 3.3.

Another term used throughout the report is building regulatory system. By '*building regulatory system'* we mean:

- an institutional structure of requirements that prescribe expected behaviour or outcomes of constructions and construction activities;
- benchmarks against which compliance with the requirements can be measured or determined;
- an enforcement mechanism for determining the degree of compliance with the requirements; and sanctions for failure to comply with the requirements.

As with building regulations, much vivid discussions were held on the definition of enforcement. In this report enforcement is looked upon as: all actions taken by formal authorities or third parties to assess if a building plan, work under construction or a building in use or its actual use complies with the relevant building regulations *and* the disciplinary measure that can be taken when from this assessment non-compliance is found.

Furthermore, enforcement is taken up differently in different countries. For instance, in order to show compliance with the different regulations, in some countries three different permits are needed before the building can be built: a planning permit, a building permit and an environmental permit. In several countries, the municipal authority only checks on planning and technical building issues and not on environmental issues or safe working conditions. But in other countries the applicant of the building permit should show compliance with all relevant regulations and requirements. Another example is water metering. In some countries this is compulsory, but it is not checked by the municipal authority during the building permit process, but by the water utility company before delivering water to the building owner.

See annex 5 for an explanation of some forms or regulatory systems (traditional system, private system, hybrid system, insurance based system).

3.3 Sustainable construction and regulating sustainable construction

3.3.1 Definitions of 'sustainable construction'

Only a part of the building regulations address sustainable construction – either directly or indirectly. Throughout this report the term *sustainable construction regulation* is used when referring to those building regulations that address sustainable construction. At question is: what should be understood as sustainable construction?

Sustainable construction has in recent years been a major focus of attention[6]. Governments, market parties and scientists alike undertake and write about various initiatives, experiments and approaches that aim at limiting the construction sector's impact on our natural environ-

[6] See for instance the CEN/TC350 standards under development: http://www.cen.eu/CEN/Sectors/TechnicalCommitteesWorkshops/CENTechnicalCommittees/Pages/WP.aspx?param=481830&title=CEN/TC+350

ment. 'Sustainability' is an over-used buzz-word. When reviewing literature on sustainable construction one is overwhelmed by the amount of energy put into studies, reports and memos on the topic. With this increasing attention being paid to sustainable construction the boundaries of the topic seem to stretch and definitions get blurred (cf. Pearce, 2006). Is sustainable construction about environmental friendly construction? And if so, what environment? The natural environment, the out-door urban environment, or the daily in-door living and working environment? And, what is 'environmental friendly', and even more: when is 'friendly'' friendly enough? Take for example the following definition provided by the Conseil International du Batiment (CIB), an international construction research networking organization, in 1994:
"(Sustainable construction is) creating and operating a healthy built environment based on resource efficiency and ecological design" [Kibert, 2008: 6][7].

Or a more recent definition by the European Commission from 2007:
"Sustainable construction can be defined as a dynamic of developers of new solutions, investors, the construction industry, professional services, industry suppliers and other relevant parties towards achieving sustainable development, taking into consideration environmental, socio-economic and cultural issues. It embraces a number of aspects such as design and management of buildings and constructed assets, choice of materials, building performance as well as interaction with urban and economic development and management. Different approaches may be followed according to the local socio-economic context; in some countries, priority is given to resource use (energy, materials, water, and land use), while in others social inclusion and economic cohesion are the more determining factors' (EC Task Force on Sustainable Construction, 2007:4).

In this definition there seems to be an overlap with 'sustainable (urban) development', or 'sustainable town planning' for which the European Commission has written a Communication in 2006[8].

Some find this approach to broad, and favour to link sustainable construction with the properties and performance of construction products and construction works by means of the seven Basic Requirements for construction works as defined by the Construction Products Regulation). The BR's are: 1) Mechanical resistance and stability, 2) Safety in case of fire, 3) Hygiene, health and the environment, 4) Safety and accessibility in use, 5) Protection against noise, 6) Energy economy and heat retention, 7) Sustainable use of natural resources.
Sustainable construction would then involve especially BR3, BR4, BR6 and BR7. The newly introduced BR7 'sustainable use of natural resources' in the CPR is promising with regard to sustainable construction. It is defined as: "The construction works must be designed, built and demolished in such a way that the use of natural resources is sustainable and ***in particular*** ensure the following:
(a) re-use or recyclability of the construction works, their materials and parts after demolition;
(b) durability of the construction works;

[7] The CIB has highlighted seven principles of Sustainable Construction: 1) reduce resource consumption; 2) re-use materials; 3) use recyclable resources; 4) protect nature; 5) eliminate toxins; 6) apply life-cycle economics; 7) focus on quality.
[8] http://europa.eu/legislation_summaries/environment/sustainable_development/l28171_en.htm

(c) use of environmentally compatible raw and secondary materials in the construction works."

But the range of aspects that cover sustainable construction is highly disputed in the literature. Most recurring are the criteria ecological, economical and social quality (e.g. Evans, Joas, Sundback & Thobald, 2005; Yudelson, 2009).

This research aimed to approach sustainable construction in a broad sense. A simple rationale to do so is provided in the original call for tenders[9]: the researchers were requested to focus on five sustainability criteria: ecological quality, economic quality, socio-cultural and functional quality, technical quality and location quality. A literature review was carried out to define these criteria, the literature review was supplemented with sustainable construction related topics in various documented international building regulatory systems and environmental assessment tools such as BREEAM, LEED and DGNB[10]. The literature review resulted in a topic list that was discussed in different gremials. Based on these discussions it was decided to slightly change the quality criteria in order to bring these in line with contemporary discussions on sustainable construction by various EU Working Groups.

Besides this simple rationale, it was also decided to take a broader view on sustainable construction as this is in line with the broad questions addressed and the research aim posed: to provide a broad overview of the current state of play of regulating sustainable construction in Europe. Sticking to traditional definitions of sustainable construction (e.g. the three quality criteria – ecology, economy, social) hampers to look beyond accepted and institutionalized approaches. Taking a step forward sometimes implies thinking outside the box. As such the below set of topics was addressed throughout the research – see 3.3.1 – 3.3.4.

3.3.2 Ecological quality

Ecological quality is addressed in almost any work on sustainable construction, often has major attention in formal building regulatory systems, and has focal attention in environmental assessment tools. In this report the following topics are considered to make up ecological quality:

- *Energy*, which addresses topics such as energy performance, the use of renewable energy sources, the implementation of energy efficiency techniques (e.g. low-energy light bulbs), thermal insulation, and the reduction of air permeability.
- *Water*, which addresses topics such as the implementation of water conservation techniques, the implementation of water efficiency techniques (e.g. low-water flush toilets), and water metering.
- *Waste and pollution*, which addresses topics such as the minimization of waste during construction, the registration of waste production (e.g. in site waste management plan), the separation/recycling of waste, and the limitation of the emission of CO_2 /ozone depleting gasses/ green-house gasses.
- *Protection of biodiversity and natural environment*, which addresses topics such as the conservation of flora, wildlife and natural habitats on site.

[9] See: http://ec.europa.eu/enterprise/newsroom/cf/document.cfm?action=display&doc_id=3996&userservice_id=1
[10] For an overview of the literature reviewed, see annex 4.

- *Minimization of the use of resources*, which addresses topics such as the use of recyclable and renewable materials, and the refurbishing and redeveloping of existing buildings instead of demolition and new development.

3.3.3 Economic quality

Also economic quality is addressed in many of the works on sustainable construction. Yet, it has less attention in environmental assessment tools. This may be due to the fact that such tools generally pay limited attention to managerial issues. In addition many of the topics that make up economic quality relate to zoning topics, which are generally the responsibility of local governments. In this report the following topics are considered to make up economic quality:

- *Enable businesses to be efficient and competitive*, which addresses issues such as the reduction of energy consumption, the reduction of waste production, the reduction of water use during construction and the construction of adaptable buildings.
- *Support local economic diversity*, which addresses issues such as the density of the development (e.g. minimal/maximal number of dwellings per area), mixed land use and the use of local material/goods in construction.
- *Provide employment opportunities*, which addresses topics such as the use of local labour in construction.
- *Technical execution and quality of the construction process*, which addresses topics such as technical execution (building the construction); and limitation of construction time (planning).

3.3.4 Social quality

Social quality is traditionally considered the third pillar of sustainable construction (ecological quality and economic quality being the other two). Again it appears that environmental assessment tools pay less attention to social quality than they do to ecological quality. Also this may be due to the fact that these topics relate more to traditional local planning topics. In this report the following topics are considered to make up social quality:

- *Adhere to ethical values during development*, which addresses topics such as ethical trading throughout the supply chain and the provision of a safe and healthy work environment.
- *Provide adequate local services and facilities*, which addresses topics such as the provision of information to local community during construction activities, the provision of space for training workmen, the provision of local schools, health facilities, and social facilities.
- *Provide housing that meets needs*, which addresses topics such as the development of a mix of tenure types, the provision of affordable housing, and the provision of housing for the elderly.
- *Integrate development in local context*, which addresses topics such as the rejection or discouragement of gated development, the provision of transport links to local context, and the provision of links to adjacent neighbourhoods.
- *Conserve local heritage*, which addresses topics such as the re-use of locally valued buildings.
- *Access to green space,* which addresses topics such as the provision of green space within a certain distance of people's dwellings.

3.3.5 Functional quality

Functional quality may be the most disputed topic that this research includes in its holistic view on sustainable construction. In the literature functional quality is considered a more traditional aspect of (technical) building regulation. Also during the round table discussions this aspect was discussed most. Where the above three criteria (ecologic, economic and social quality) may be considered the goals of sustainable construction regulation, functional quality may be considered the means to these ends. In this report the following topics are considered to make up functional quality[11]:

- *Design optimization*, which addresses topics such as the shape of the exterior, aesthetics, planned service life of structures, planned service life of building services, and the demand of space per occupant and/or dwelling.
- *Building envelope*, which addresses topics such as moisture protection of building envelope, wind protection of building envelope, and electro-magnetic shielding.
- *Health, comfort and user satisfaction*, which addresses topics such as indoor air-quality, thermal comfort in winter, thermal comfort in summer, acoustic comfort, in-door daylight entry, and the capability of conversion by a construction/building user.
- *Usability for disabled*, which addresses accessibility for disabled.
- *Structural safety,* which addresses structural safety of the construction, fire resistance of the construction, and safety of a construction during a fire.

3.4 Regulating sustainable construction, enforcement and non-governmental initiatives

3.4.1 Instruments

A range of policy instruments may be applied to ensure the sustainable construction of our built environment. Broadly these can be split up into regulatory, economic and information instruments (for a range of examples, see OECD, 2003). Policy instruments may act on the demand side (regulatory and related instruments which we are considering in this report) and on the supply side (e.g. subsidies, tax incentives and consumer information campaigns). Although economic and information instruments appear valuable to putting built environment and sustainable construction policy goals into practice, regulatory instruments appear necessary to set, at least, a bottom line. Drawing up and implementing regulations is however only a part of the puzzle, another part is enforcement. After all, without enforcement regulations are unlikely to have effect (e.g. Supiot, 2007). Furthermore, it is often considered that non-governmental organizations have a large role to play in self-regulating sustainable construction (e.g. van Bueren, 2009; Van der Heijden & De Jong, 2009). Such self-regulatory, or voluntary, initiatives may provide valuable additions to formal building regulation systems.

It is however difficult to regulate sustainable construction, to enforce sustainable construction regulations, and to accept voluntary initiatives as additions to formal building regulatory systems. A better understanding of these difficulties may help the European Commission in formulating strategies that are effective in reaching the LMI's goals.

[11] We are aware that we do not follow CEN/TC350 which includes 'health, comfort and user satisfaction' and 'usability for the disabled as part of *social quality*.

3.4.2 An economic rationale for regulating (sustainable) construction

Various reasons exist for regulating (sustainable) construction. Most eminent is the aim to prevent market failure (Parkin et.al., 2005; Witzum, 2005). From an economics point of view four forms of market failure may be distinguished:

- To prevent monopolies. When competition fails or lacks certain companies may become too powerful, which provides them the opportunity to set prices and levels of service in an unwanted way. For instance, it may be unwanted that a single organization dominates the market for solar panels a this would not provide this organization an incentive to innovate its products.
- To solve information asymmetries. If one party holds more information than another there is a danger of opportunistic behaviour and sub-optimal choice. Information asymmetries may consider information on the content, development process, or price of a building product.
- To address unwanted external effects. Some aspects of production and consumption affect the general welfare, but cannot, or only by using complex formulas, be expressed in a price. For instance clean air or a healthy biosphere for flora and fauna nearby a construction site. Unwanted negative effects are often not addressed by producers and consumers themselves.
- To provide for public goods. This are goods that serve all (on-exclusivity) and which use cannot be charged to individual users (non-rivalry). A typical example is defence (both the army, but also technical defence measures such as dikes), but also research into more sustainable construction practice may be considered as such.

3.4.3 The difficulty of regulating (sustainable) construction

Rules may be understood as guidelines for the course of social action and interaction – to make it predictable (Burns & Flam, 1987). Technical building regulation, for instance, stipulates how buildings are supposed to be constructed in order to guarantee a certain level of safety, health and amenability of our built environment. Rules are formulated to make this action and interaction predictable over time and space. Rules are only useful and effective when applied in a certain institutional context by certain actors. It is this institutional context and those actors that together with the rules make up a rule system (e.g. May, 2007).

A range of characteristics of constructions and the construction sector complicate building regulation. First, buildings are location-bound, but are constructed by actors and with materials that travel. The fixed location of buildings means that they have a large impact on their local environment and vice versa. A most optimal building regulatory system would address this issue by crafting regulations that would fully suit this local context. However, such local building regulations would be of less use for a building that is to be constructed elsewhere. On the one hand such crafting of local optimal building regulation would be a resources consuming activity, providing a rational for more generic framework regulation on a regional or national level. On the other hand locally optimised building regulations would result in a patchwork of building regulatory systems that would hamper the free travelling of labour and building products, providing again a rational for regulations on a higher level. This may be considered a problem of scaling.

Second, buildings have a long lifespan. Inevitably this will result in situations in which the current state of knowledge on sustainability will be outdated in some years from now. In other

words, buildings that are considered sustainable today may not be considered as such in ten, twenty or fifty years from now. On the one hand it is difficult (if not impossible) to include future knowledge on sustainability in contemporary building regulation. On the other hand it is difficult to upgrade the current building stock by formal regulation because of existing property rights. Given all interests involved it will be very hard for policy makers to introduce and enforce demand-side statutory requirements on the improvement of the current building stock. This may be considered a problem of on-going history.

Third, the construction sector is a highly fragmented industry, both vertically and horizontally. The construction industry consists of a wide range of trades and professions – e.g. architects, engineers, builders, installation specialists (vertical fragmentation). Furthermore, each of these trades and professions is made up of a wide range of organizations, businesses and individuals. There are many large players (multi-million Euro companies) and many small players (one man businesses) in the field, which often specialize in a certain niche market (horizontal fragmentation). This wide range of actors, interests and involvements makes it difficult to implement regulation that addresses all involved. Again this may be considered a problem of scaling, which results in specific problems of targeting regulations at the appropriate actors.

Fourth, and related, the construction sector's supply chain is highly fragmented. To construct a single building many businesses and individuals are involved. As a result responsibilities are scattered amongst these. The major issue with scattered responsibilities is that no-one may feel responsible for the final product. This is sometimes referred to as the problem of many hands (e.g. Thompson, 1980).

Fifth, like the construction industry, building ownership is highly fragmented. This results in comparable scaling problems when designing regulations as related to the fragmentation of the construction industry. Furthermore, targeting building owners is further complicated as split incentives exist between those owning and those occupying buildings (i.e. split incentives between landlord and tenants).

To conclude, given the specific characteristics of buildings (fixed location and long lifespan) and the highly fragmented nature of both the construction industry and building ownership, governments face severe difficulties in implementing regulations that address all levels and actors involved, without hampering the free flow of services and products.

3.4.4 The difficulty of enforcing (sustainable) construction regulation

Compliance is generally considered to come from the regulatee's fear of the consequences of non-compliance, the regulatee's insight that compliance serves the personal interest, and the regulatee's insight that regulations are legitimate and therefore have to be complied with (Burgstaller, 2005; Kagan & Scholtz, 1984). But specific aspects of the construction industry and (sustainable) construction regulation hinder enforcement.

A first difficulty with the enforcement of (sustainable) construction regulation is that it is difficult to detect rule breaking (cf. Gunningham and Grabosky, 1998; Kagan, 1994). Controlling building regulation often demands specific technical knowledge or the right timing for inspections as much construction work is 'covered up' behind walls, floors and ceilings. How for in-

stance should one measure if a concrete floor really holds re-used granulate when the floor has been poured and is cured?

A second difficulty with enforcing of (sustainable) construction regulation is that some goals are not aiming at making things happen, but at making things not to happen. Structural and fire safety requirements, for example, often aim at incident prevention. Yet, how can one measure incidents that do not occur? This is a general issue with regulation that aims at prevention of harms (Sparrow, 2008: chapter 6). A consequence might be that regulatory agencies are being accused of costing too much, whilst not producing much measurable output (ibid.).

A third difficulty with enforcement of (sustainable) construction regulation, especially technical building regulations, arises when the regulatory requirements are expressed in functional or performance-based terms. It is expected that such functional or performance-based regulation challenges regulatees to come up with innovative solutions. The danger in this type of regulation however lies in its highly complex nature, and an often missing link between regulation and methods to test compliance, or unclearness to regulatees on how to reach compliance. In the Netherlands, for instance, buildings have to comply with an energy performance norm (EPN). This norm is an index, a non-dimensional figure, representing the energetic efficiency of new construction. A main issue with the EPN value, however, is a lack of experience at municipal building inspectorates to actually assess EPN documentation. A further issue is that the EPN value often is only a paper construct. Much energy saving is to be realized on the construction site – e.g. by preventing chinks between insulation panels (Harmsen, 2009).

3.4.5 Voluntary and complementary initiatives

Besides formal regulatory systems a range of non-state centred regulatory initiatives exists. Often these are developed and introduced by market organizations, sometimes in collaboration with governmental agencies. Such voluntary initiatives may be understood as self-organized non-statutory regulations that actors (people, communities, businesses) pledge to apply to their internal operations. Voluntary initiatives are understood to hold the potential for addressing environmental risks more effectively than state centred governance can. This is because voluntary initiatives target and bring together the interests of specific groups of regulatees, have the assent of those regulated and address issues of scale and context in a way that traditional public policy programs are unable to do. Current literature holds that such voluntary initiatives are effective alternatives, which supplement and complement existing state centred environmental policy (e.g. Cashore, Auld, & Newsom, 2004; Potoski & Prakash, 2009).

Yet, current literature is also critical of such initiatives (Van der Heijden & De Jong, 2009). First, the introduction of individuals or organisations that have no democratic legitimacy with which to exercise enforcement makes it hard to justify that the public interest is being served. This may result in situations in which the general public's belief in the particular initiative. Second, the risk of 'capture' may weaken the model - i.e. the private initiative may pre-empt or neutralise government initiatives. Voluntary initiatives may for instance be proposed to postpone or delay future governmental regulation. Third, voluntary initiatives may be introduced to secure certain areas of the market. Especially when the initiatives' initiators set high entry criteria (e.g. level of education and experience, or the financial cost to become a mem-

ber) it may be difficult for newcomers to enter the initiative. Finally, the economic circumstances that might stimulate companies to design and implement voluntary initiatives and the knowledge and willingness within an organisation to implement voluntary initiatives might be lacking.

Such issues may be overcome in voluntary programs initiated or facilitated by governmental agencies. When governmental agencies are involved in the design of a voluntary program or oversight on its actual functioning, some of these problems may be addressed and resolved in an early stage of the program.

3.5 Summary of terms used in this report

As a summary of the terms given in 3.3 and 3.4 the following definitions are used throughout this report:

'*construction works'*: buildings, houses, bridges, tunnels, etc.

'*building regulations':* all those regulations (laws, ordinances, decrees, standards, codes guidance documents, etc.) imposing mandatory or semi-mandatory requirements or provisions on the planning, the design, the execution, the maintenance and the use of construction works.

'sustainable construction': the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a construction works' life-cycle from initial planning approval to design, construction, operation, maintenance, renovation and deconstruction. Sustainable construction aspects are divided in this report in ecological quality, economic quality, social quality, and functional quality.

'sustainable construction regulation': those *building regulations* that address *sustainable construction*.

'building regulatory system': an institutional structure of requirements that prescribe expected behaviour or outcomes of constructions and construction activities + benchmarks against which compliance with the requirements can be measured + an enforcement mechanism for determining the degree of compliance with the requirements + sanctions for failure to comply with the requirements.

'enforcement': all actions and mechanisms for determining the degree of compliance with the requirements related to sustainability aspects.

See annex 5 for a further explanation.

4. SCREENING OF NATIONAL BUILDING REGULATIONS, ENFORCEMENT, AND VOLUNTARY AND COMPLEMENTARY INITIATIVES.

4.1 Introduction

This chapter presents an overview of the data collected from the questionnaires, supplemented by secondary data[12]. The chapter starts with a discussion of findings on the different sustainability topics in the EU-27's building regulatory regimes (4.2). Next it presents the approaches to enforcement of these regulations (4.3). The chapter concludes with an overview of voluntary regulatory regimes as traced in the study (4.4).

4.2 Sustainable construction criteria and topics addressed in EU-27

4.2.1 Ecological quality

Within the data collected we find that ecological quality is taken up by all countries that filled out questionnaires. Yet, differences exist in the attention given to the different criteria.

Energy

When looking at the topic energy it can be concluded that all countries[13] have introduced regulations related to energy performance of buildings. With the exception of Denmark, Malta, the Netherlands and Slovakia all countries have introduced requirements on the use of renewable energy sources, or have planned to introduce these as in France, Hungry, Luxembourg and Sweden. With the exception of Cyprus, the Czech Republic, France, Italy, the Netherlands, Slovakia and Sweden all countries have introduced requirements on the implementation of energy efficiency techniques, or have planned to introduce these as in Estonia. With the exception of Hungary all countries have introduced regulations on thermal insulation of buildings. With the exception of Belgium, Cyprus, Hungary and Slovakia all countries have introduced regulations to reduce air permeability of buildings, or have planned to introduce these as in France.

Respondents indicated that many of the building regulations related to energy were perceived by the respondents to have a background in EU directives. Furthermore, in most countries these regulations are drawn up by the federal government. Only in Belgium and the UK these regulations are drawn up on a regional level, and in Germany and Italy the regulations are drawn up on the national level and adopted on the regional level. These exceptions have to do with the particular government systems of these countries. Table 4.2.1a provides an overview of the topic energy.

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[12] Main alternative sources used: CEBC (2006) Building Control Systems in Europe, Ipswich, Consortium of European Building Control; Pedro, J. B., Meijer, F. & Visscher, H. (2010) Building control systems of European Communion Countries. International Journal of Law in the Built Environment, 2, 45-59.

[13] Note that in some member states regional variance may exist to sustainable construction regulation – for instance in Belgium, Germany, Austria, Italy and the UK. Note furthermore that the data as provided by our Norwegian respondent are presented in the different tables, but that this data is not discussed throughout the text – this as Norway is not a member of the European Union.

Table 4.2.1a – overview of energy as sustainable construction topic in EU-27 building regulatory frameworks

Topics		AT	BE	BG	CY	CZ	DK	EE	FI	FR	DE	HU	IE	IT	LU	MT	NL	PL	RO	SK	SL	ES	SE	UK	NO
Energy	For energy performance	2/3	2	1	1	1	1	2	1	1	1/2	1	1	1/2	1	1	1	1	1	1	1	1	1	2/3	1
	To use renewable energy sources	X	2	1	1	Q	X	2	1	F	1/2	F	1	1/2	F	X	X	1	F	X	1	1/3	F	2/3	1
	To implement energy efficiency techniques (e.g. low-energy light bulbs)	1	2	1	X	X	1	F		X	1/2		1	X	1	1	X	1	1	X	1	1	X	1/2/3	X
	To thermal insulation	2/3	2	1	1	1	1	Q		1	1/2	X	1	1/2	1	1	1	1	1	1	1	1	1	2/3	1
	To reduce air permeability	2	X		X	1	1			F	1/2	X	1	2	1	1	1	1	1	X	1	1	1	2/3	1

Symbols: 1=national level, 2=regional level, 3=local level, Q=quasi-mandatory, F= will be regulated in future, X=not regulated

Colours: grey = regulated, green= regulated with background in EU directives, orange=future regulations, red=not regulated

In most countries regulations related to energy apply to all new construction work. Only in Denmark and Germany these regulations do not apply to industrial buildings. Only in Belgium, Denmark, and Romania these regulations apply to both new construction work and existing buildings; in Germany, Luxembourg, the Netherlands, Slovakia, Slovenia and Sweden a lower level of regulations applies to existing buildings. The regulations do apply to renovation in all countries analysed, with the exception of France, Hungary, Malta and Sweden; whereas in Belgium, Cyprus, the Czech Republic, Estonia, Germany and Romania these regulations only apply to certain renovation works, often based on size.

Regulations related to energy are set up as performance-based or goal-based regulations in all countries analyzed – Austria being the only exception. With the exception of Austria, the Czech Republic, Hungary, Luxembourg, Malta and Poland all countries analyzed have introduced documentation on accepted or deemed-to-satisfy solutions. Finally, when we look at the process of designing these regulations we see a top-down process in most countries, with the exception of Austria, Belgium, France, Germany and the Netherlands where this process was understood as a cooperative government and industry initiative; and in the Czech Republic, Hungary, and Romania the process was understood to be a bottom-up process led by the construction industry. Table 4.2.11b provides an overview of these issues.

Table 4.2.1b – Energy: overview of application of regulations to existing buildings and renovation; the format of the regulations and presence of accepted solutions or DTS; and the process of implementation of regulations

Topics		AT	BE	BG	CY	CZ	DK	EE	FI	FR	DE	HU	IE	IT	LU	MT	NL	PL	RO	SK	SL	ES	SE	UK	NO
Energy	Applying to existing buildings	Y	Y	N	N	N	Y	N		N	L	N			L	N	L	N	Y	L	L		L		N
	Applying to renovation	P	P	Y	P	P	Y	P		N	P	N			Y	N	Y	Y	P	Y	Y		N		P
	Formulation of regulations	Pr	Pe	Pe	Pe	Pe	Pe	Pe		Pe	Pe				Pe	Pe	Pe	Pe	Pe	Pe	Pe		Pe		Pe
	Accepted solutions or DTS	N	Y	Y	Y	N				Y	Y	N			N	N	Y	N			Y		Y		Y
	Process of implementation	G&I	G&I	T	T	B	T	T		G&I	G&I	B			T	T	G&I	T	B	T	T		T		T

Symbols: Y=yes, N=no, L=lower level applies, P=partly (regulations only apply to some renovation), Pe=performance based/goal based regulation, Pr=prescriptive regulation, G&I=government and industry cooperation, T= top-down, B=bottom-up

Water

The topic water receives considerably less attention than energy. Regulations on the implementation of water conservation techniques only apply in Belgium, Bulgaria, France, Malta, Italy, Poland, Spain and Sweden; Germany and France have planned to introduce such regulation. Regulations on the implementation of water efficiency techniques only apply in Bulgaria, France, Ireland, Italy, and Sweden. Poland and the UK have planned to introduce such regulation. Regulation on water metering apply in all countries analyzed, with the exception of Austria, Estonia, Luxembourg, Sweden and the UK.

Respondents indicated that little of the regulation related to water has a background in EU directives. Then, if regulations are drawn up, this is mostly done on a national level, except for Belgium, Germany and Italy – for reasons specified before. Table 4.2.1c provides an overview of the topic water.

Table 4.2.1c – overview of water as sustainable construction topic in EU-27 building regulatory frameworks

Topics		AT	BE	BG	CY	CZ	DK	EE	FI	FR	DE	HU	IE	IT	LU	MT	NL	PL	RO	SK	SL	ES	SE	UK	NO
Water	To implement water conservation techniques	X	2	1	X	X				1/2	F	X	X	2	X	1	X	1	X	X	X	1/2	1	F	X
	To implement water efficiency techniques (e.g. low-water flush toilets)	X	X	1	X	X		X		1/2	X	X	1	2	X	X	X	F	X	X	X	F	1	2/3/Q	X
	For water metering	X	1	1	1	1	1	X		1/2	1/2	1	1	2	X	1	Q	1	1	1	1	1	X	X	3

Symbols: 1=national level, 2=regional level, 3=local level, Q=quasi-mandatory, F= will be regulated in future, X=not regulated
Colours: grey = regulated, green= regulated with background in EU directives, orange=future regulations, red=not regulated

In the countries that do address water as a sustainable construction topic in their building regulation, they do so for all new construction work. The exceptions are Germany where the regulations do not apply to industrial constructions. Only in Belgium, the Netherlands, Slovakia and Sweden the regulations apply to existing buildings, whereas in Germany a lower level applies to existing buildings. Only in Bulgaria, the Netherlands and Slovakia these regulations apply to renovations; and, in the Czech Republic and Sweden these regulations apply to some renovations.

With the exception of Belgium, the Netherlands and Poland, all country respondents state these regulations in goal or performance based terms. In all countries analyzed accepted or deemed-to-satisfy solutions are introduced, with the exception of Cyprus, the Czech Republic, Hungary, Malta, Poland and Romania.

Finally, respondents considered the process of designing these regulations as top-down in all countries, except from Belgium, the Czech Republic and Hungary where this process was considered a bottom-up process led by the construction industry, and in France, Germany and the Netherlands where this process was understood to be a cooperative government and industry initiative. Table 4.2.1d provides an overview of these issues.

Table 4.2.1d – Water: overview of application of regulations to existing buildings and renovation; the format of the regulations and presence of accepted solutions or DTS; and, the process of implementation of regulations

Topics		AT	BE	BG	CY	CZ	DK	EE	FI	FR	DE	HU	IE	IT	LU	MT	NL	PL	RO	SK	SL	ES	SE	UK	NO
Water	Applying to existing buildings		Y	N	N	N				N	L	N				N	Y	N	N	Y	N		Y		N
	Applying to renovation		N	Y	N	P				N	N	N				N	Y	N	N	Y	N		P		P
	Formulation of regulations		Pr	Pe	Pe	Pe				Pe	Pe					Pe	Pr	Pr		Pe	Pe		Pe		Pe
	Accepted solutions or DTS		Y	Y	N	N				Y	Y	N				N	Y	N	N				Y		Y
	Process of implementation		B	T	T	B				G&I	G&I	B				T	G&I	T		T	T		T		T

Symbols: Y=yes, N=no, L=lower level applies, P=partly (regulations only apply to some renovation), Pe=performance based/goal based regulation, Pr=prescriptive regulation, G&I=government and industry cooperation, T= top-down, B=bottom-up

Waste

Most countries analysed have introduced regulations to address the production of waste. With the exception of Estonia, France, Malta, Slovenia, Spain and Sweden regulations are introduced to minimize waste during construction apply in all countries analysed, or are planned to be introduced as in the Czech Republic, Poland and Romania. Regulation on the registration of waste production, for instance in site waste management plans, apply in all countries analysed, with the exception of France, Italy, Luxembourg the Netherlands and Sweden. Regulation on the separation or recycling of waste apply in all countries analyzed, with the exception of France, Spain and Slovenia.

Respondents indicated that regulations on the minimization of waste were perceived to have a background in EU directives in Belgium, Cyprus, Ireland, the Netherlands, Slovakia and the UK. Regulation on register waste production was perceived to have a background in EU directives in Cyprus, the Czech Republic, Germany, Ireland, Poland, Slovakia, Slovenia, Spain and the UK. Regulations on the separation of waste was perceived to have a background in EU directives in Cyprus, Germany, Hungary, Ireland, Malta, the Netherlands, Romania, Slovakia and the UK. Table 4.2.1e provides an overview of the topic waste.

Table 4.2.1e – waste as sustainable construction topic in EU-27 building regulatory frameworks

Topics		AT	BE	BG	CY	CZ	DK	EE	FI	FR	DE	HU	IE	IT	LU	MT	NL	PL	RO	SK	SL	ES	SE	UK	NO
Waste	To minimize waste during construction	1/2/3	2	1	1	F	1	X	1	X	1/2	1	3/Q	1	1	X	3	F	F	1	X	X	X	2/3/C	3
	To register waste production (e.g. in site waste management plan)	1/2/3	2	1	1	1	1	2		X	1	1	Q	X	X		X	1		1	1	1	X	2/3/C	1
	To separate/recycle waste	1/2	2	1	1	3	1	2	1	X	1/2/3	3	Q	1/2	3	1	3	3	1	1	3	X	X	2/3	3

Symbols: 1=national level, 2=regional level, 3=local level, Q=quasi-mandatory, F= will be regulated in future, X=not regulated

Colours: grey = regulated, green= regulated with background in EU directives, orange=future regulations, red=not regulated

Regulations related to waste production do apply for all building types in the countries analyzed, with the exception of Germany where these regulations only apply to commercial buildings, and Luxembourg were these regulations only apply to commercial and industrial buildings. In Belgium, Bulgaria, Cyprus, Estonia, Romania and Slovakia these regulations apply to both new development and existing buildings; and in France a lower level applies to existing buildings.

In Austria, Bulgaria, Cyprus, Denmark, and Slovakia these regulations apply to all renovation. In the Czech Republic, France, and Sweden these regulations apply to some renovation work. In the other countries analyzed the regulations do not apply to renovation.

In all countries analyzed these regulations are drawn up as goal based or performance based regulations, with the exception of Cyprus and Poland where these regulations are drawn up in prescriptive terms. In Belgium, Bulgaria, France the Netherlands, and Sweden respondents referred to the availability of accepted or deemed-to-satisfy documentation is available.

Finally, respondents from France, Germany and the Netherlands considered the process of implementation of these regulations as a cooperative government and industry initiative. In Belgium and Hungary it was considered a bottom-up process by the industry. In the other countries it was considered a top-down governmental process. Table 4.2.1f provides an overview of these issues.

Table 4.2.1f – Waste: overview of application of regulations to existing buildings and renovation; the format of the regulations and presence of accepted solutions or DTS; and, the process of implementation of regulations

Topics		AT	BE	BG	CY	CZ	DK	EE	FI	FR	DE	HU	IE	IT	LU	MT	NL	PL	RO	SK	SL	ES	SE	UK	NO
Waste	Applying to existing buildings	Y	Y	Y	Y	N		Y		L	N				N	N		N	Y	Y	N		N		N
	Applying to renovation	Y	N	Y	Y	P	Y			P	N				N	N		N		Y	N		P		P
	Formulation of regulations	Pe	Pe	Pe	Pr	Pe		Pe		Pe	Pe					Pe		Pr	Pe	Pe			Pe		Pe
	Accepted solutions or DTS	N	Y		Y	N		X		Y	N				N	N	Y	N					Y		Y
	Process of implementation	G&I	B	T	T	B	T	T		G&I	G&I					T	G&I	T		T	T		T		T

Symbols: Y=yes, N=no, L=lower level applies, P=partly (regulations only apply to some renovation), Pe=performance based/goal based regulation, Pr=prescriptive regulation, G&I=government and industry cooperation, T= top-down, B=bottom-up

Other aspects of ecological quality: pollution, protection of biodiversity and the minimization of using resources

Pollution receives considerable attention in the EU-27 building regulatory frameworks. With the exception of the Netherlands, Romania and Sweden all countries have introduced regulations to limit the emission of CO_2, or have planned to introduce such regulation as in France and Poland. With the exception of France, Italy, Spain and the UK all countries have introduced regulations to limit the emission of ozone depleting gasses. And, with the exception of the Netherlands, Spain and the UK all countries have introduced regulations to limit the emission of green-house gasses, or have planned to introduce these as in France.

Respondents from most countries analysed indicated that these regulations have a background in EU directives. Table 4.2.1g provides an overview of the topic pollution.

Table 4.2.1g – pollution as sustainable construction topic in EU-27 building regulatory frameworks

Topics		AT	BE	BG	CY	CZ	DK	EE	FI	FR	DE	HU	IE	IT	LU	MT	NL	PL	RO	SK	SL	ES	SE	UK	NO
Pollution	To limit emission of CO2	1/2	2	1	1	1	1	2		F	1/2	1	1	2	1	1	X	F	X	1	1	1	X	2/3/C	X
	To limit ozone depleting gasses	1/2	1/2	1	1	1	1	2	1	X	1	1	1	X	1	1	1	1		1	1	X	1	X	1
	To limit green house gasses	1/2	1/2	1	1	1	1			F	1	1	1	1/2	1	1	X	1	1	1	1	X		X	X

Symbols: 1=national level, 2=regional level, 3=local level, Q=quasi-mandatory, F= will be regulated in future, X=not regulated

Colours: grey = regulated, green= regulated with background in EU directives, orange=future regulations, red=not regulated

Like pollution, the protection of biodiversity is included in the building regulatory frameworks of most countries analyzed. Regulation on conserve flora on sites applies in all countries analyzes, with the exception of Belgium, Cyprus and Denmark. Regulation to conserve wildlife and regulation to conserve natural habitats on site apply in all countries analysed, with the exception of Cyprus and Estonia.

Respondents from Austria, Belgium, Cyprus, France, Hungary, Ireland, the Netherlands, Slovenia and the UK indicated that these regulations have a background in EU directives. Table 4.2.1h provides an overview of the topic protection of biodiversity.

Table 4.2.1h – protection of biodiversity as sustainable construction topic in EU-27 building regulatory frameworks

Topics		AT	BE	BG	CY	CZ	DK	EE	FI	FR	DE	HU	IE	IT	LU	MT	NL	PL	RO	SK	SL	ES	SE	UK	NO
Protect	To conserve flora on sites	1/2	X	1	X	1	X		1	1/2	1	1	1	1/2	1		1	1	1	1	1	1	2/3	2/3/Q	3
biodiversity	To conserve wildlife on site	1/2	2	1	X	1	3	X	1	1/2	1	1	1/2/3	1/2	1		1	1	1	1	1	1	2/3	2/3/Q	3
	To conserve natural habitats on site	1/2	2	1	X	1	3	X	1	1/2	1	1	1/2/3	1/2	1		1	1	1	1	1	1	1/2/3	2/3/Q	1

Symbols: 1=national level, 2=regional level, 3=local level, Q=quasi-mandatory, F= will be regulated in future, X=not regulated
Colours: grey = regulated, green= regulated with background in EU directives, orange=future regulations, red=not regulated

The minimization of using resources has considerably less attention in the construction regulatory frameworks of the countries analyzed. Currently only in Italy and Slovakia do regulations apply to the use of recyclable materials; in Cyprus, the Netherlands, Poland, Romania and Slovenia these regulations are planned to be introduced. And, in the UK quasi-mandatory requirements apply. Regulations on the use of renewable materials apply only in Germany and Italy. In Cyprus, the Netherlands, Poland and Romania these regulations are planned to be introduced; and in the UK quasi-mandatory requirements apply. Regulations set to refurbish and redevelop existing buildings instead of demolition and new development only apply in Austria, Cyprus, Italy and Slovenia. In Germany and the Netherlands these regulations are planned to be introduced; and, in the Denmark and the UK quasi-mandatory requirements apply.

Respondents from most countries analysed indicated that these regulations do not have a background in EU directives. Table 4.2.1i provides an overview of the topic minimization of using resources.

Table 4.2.1i – minimization of using resources as sustainable construction topic in EU-27 building regulatory frameworks

Topics		AT	BE	BG	CY	CZ	DK	EE	FI	FR	DE	HU	IE	IT	LU	MT	NL	PL	RO	SK	SL	ES	SE	UK	NO
Minimize	To use recyclable materials	X	X	X	F	X	X	X		X	X	X	X	2	X	X	F	F	F	1	F	X	X	Q	X
use of	To use renewable materials	X	X	X	F	X	X	X		X	1	X	X	2	X	X	F	F	F	X	X	X	X	Q	X
resources	To refurbish and redevelop existing buildings in stead of demolition and new development	3	X	X	X	3	Q	X		X	F	X	X	2	X	X	F	X	X	X	1	X	X	Q	Q

Symbols: 1=national level, 2=regional level, 3=local level, Q=quasi-mandatory, F= will be regulated in future, X=not regulated
Colours: grey = regulated, green= regulated with background in EU directives, orange=future regulations, red=not regulated

Regulations related to these other aspects of ecological quality apply to all new construction work in the countries analysed, with the exception of Cyprus where these regulations apply to dwellings only. In Bulgaria, France, the Netherlands and Slovakia these regulations apply to both new and existing construction work. In Germany a lower level applies to existing construction works, whereas in all other countries analysed these regulations only apply to new development.

In Austria, Bulgaria, the Netherlands, Slovakia and Slovenia these regulations apply to all renovation work. In the Czech Republic, France and Germany these regulations apply to some renovation work, often based on size. In Poland these regulations do not apply to renovation work.

With the exception of Austria, France, Poland and Slovenia these regulations are drawn up in performance or goal based terms. In France, the Netherlands and Slovenia respondents referred to the availability of accepted solutions, or deemed-to-satisfy documentation.

Finally, respondents from France, Germany and the Netherlands considered the process of implementation of these regulations as a cooperative government and industry initiative; in the Czech Republic it was considered a bottom-up process by the industry; and, in the other countries analysed it was considered a top-down governmental process. Table 4.2.1j provides an overview of these issues.

Table 4.2.1j – Other aspects of ecological quality: overview of application of regulations to existing buildings and renovation; the format of the regulations and presence of accepted solutions or DTS; and, the process of implementation of regulations

Topics		AT	BE	BG	CY	CZ	DK	EE	FI	FR	DE	HU	IE	IT	LU	MT	NL	PL	RO	SK	SL	ES	SE	UK	NO
Other	Applying to existing buildings	N		Y		N				Y	L						Y	N		Y	N				N
aspects	Applying to renovation	Y		Y		P				P	P						Y	N		Y	Y				P
of	Formulation of regulations	Pr		Pe		Pe				Pr	Pe						Pe	Pr		Pe	Pr				Pe
ecological	Accepted solutions or DTS	Y				N				Y	N				N		Y	N			Y				Y
quality	Process of implementation	T		T		B				G&I	G&I						G&I	T		T	T				T

Symbols: Y=yes, N=no, L=lower level applies, P=partly (regulations only apply to some renovation), Pe=performance based/goal based regulation, Pr=prescriptive regulation, G&I=government and industry cooperation, T= top-down, B=bottom-up

4.2.2 Economic quality

Enable businesses to be efficient and competitive

Only in Cyprus do regulations apply to the reduction of energy consumption during the construction of buildings. In Bulgaria quasi-mandatory regulations apply. Poland has planned to introduce such regulations. In Belgium, Bulgaria, Cyprus, Denmark, Finland, France, Germany, Ireland, the Netherlands, Slovakia, Sweden and the UK regulation is set to the limitation of waste during construction. Poland and Romania have planned to introduce such regulations. In none of the countries analyzed regulations are set to minimizing water use during the construction process; only Poland has planned to introduce such regulations. In Ireland, the Netherlands, Slovenia and the UK regulations apply to the construction of adaptable buildings. In the Czech Republic respondents referred to quasi-mandatory regulations, and Italy has planned to introduce regulations related to this topic. None of these regulations have a background in EU directives.

Support local diversity

Regulations to support local diversity appear related to zoning and planning regulations. Only in Estonia, Malta and Sweden are no regulations on the density of development. And only in Estonia Italy, Poland, Spain and Sweden are no regulations to ensure mixed land use. With the exception of Italy none of the member states have introduced regulations applying to using local materials or goods in construction. Note that UK respondents referred to quasi mandatory requirements. None of these regulations has a background in EU directives. Most of these regulations are set on the local level. Note furthermore that such requirements may cause barriers to free trade.

Provide employment

In none of the member states analysed respondents referred to existing regulation requiring the use of local labour in construction activities. Again, such regulations may cause barriers to free trade.

Technical execution/quality of the construction process

Regulations to limit construction time only apply in Austria, Cyprus, the Netherlands and Slovakia. Regulations on construction management apply in Austria, Cyprus, the Czech Republic, Estonia, Germany, Hungary, Italy, Malta, Poland, Slovenia and Sweden. Generally these regulations are set on a national level. Regulations about keeping records on the construction process apply in all countries analysed, with the exception of France, Ireland, Italy, Luxembourg, the Netherlands and Spain. Generally these regulations are set on a national level, with quasi-mandatory requirements in Belgium and Germany. In the Czech Republic and the UK regulations related to this topic were perceived by the respondents to have a background in EU directives. Regulation on the level of education and/or experience of builders apply in all countries analysed, with the exception of France, Ireland, Luxembourg, the Netherlands, Spain, and Sweden. Generally these regulations are set on a national level.

Table 4.2.2a provides an overview of the different topics that together make up the criterion economic quality.

Table 4.2.2a – economic quality as sustainable construction criterion in EU-27 building regulatory frameworks

Topics		AT	BE	BG	CY	CZ	DK	EE	FI	FR	DE	HU	IE	IT	LU	MT	NL	PL	RO	SK	SL	ES	SE	UK	NO
Enable businesses to be	To reduce energy consumption during the construction	X	X	Q	1	X	X	X		X	X	X	X	X	X	X	X	F		X	X	X	X	X	X
efficient & competitve	To reduce waste during the construction process	X	2	1	1		1	X	1	X	1/2	X	1/3	X	X	X	1	F	F	1	X	X	1	2/3/Q	
	To keep water use to a minimum during the construction process	X	X	X	X		X	X		X	X	X	X	X	X	X	X	F		X	X	X	X	X	X
	To construct adaptable buildings	X	X	X	X	Q	X	X		X	X	X	3	F	X	X	1	X	X	X	1	X	X	2/3	X
Support local diversity	To the density of the development (e.g. minimal number of dwellings per area)	2/3	2/3	1	1	1	3	X	1	3	1/2/3	3	1/3	3	3	X	1/3	3	3	3	3	2/3	X	2/3/C	3
	To mixed land use	2/3	2/3	1	1		3	X	1	3	1/2/3	3	1/3	X	3		3	X	3	3	3	X	X	3	3
	To use local material/goods in construction	X	X	X	X	F	X	X		X	X	X	X	2/Q	X	X	X	X	X	X	X	X	X	Q	X
Provide employment	To use local labor in construction	1	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Technical execution /	To limit construction time (planning)	1/2/3	X	X	1	X		X		X	X	X	X	X	X	X	1	X		3	X	X	X	X	X
quality of the constructio	To construction management	1/2	X	X	1	1		2		X	1/Q	1	X	1		1	X	1		X	1	X	1	1/2/3	1/3
process	To keeping records on construction progress	1/2	Q	1	1	1		2		X	Q	1	X	X	X	X	X	1		1	1	1/2	1	1/2/3	X

Symbols: 1=national level, 2=regional level, 3=local level, Q=quasi-mandatory, F= will be regulated in future, X=not regulated

Colours: grey = regulated, green= regulated with background in EU directives, orange=future regulations, red=not regulated

If economic quality, as criterion for sustainable construction, is taken up in the analysed countries' regulatory frameworks, regulations apply to all building types. The exception is Belgium where these regulations apply to dwellings only. If topics are regulated, they do not apply to existing buildings, with the exception of Cyprus, Germany and Romania where these regulations apply to both new development and existing buildings. Only in Cyprus, France these regulations apply to renovation, and in Sweden these regulations apply to some renovation. Generally these regulations are drawn up in goal based or performance based terms, with the exception of Cyprus, Germany and Poland where these regulations are drawn up in prescriptive terms. Only in Bulgaria, the Netherlands and Sweden documentation on accepted or deemed-to-satisfy solutions is available. Finally, respondents from Austria, France, Poland, Slovenia and Sweden referred to the implementation of these regulations as a top-down initiative; respondents from Cyprus and the Netherlands as a combined government and industry initiative; and respondents from Belgium, Bulgaria, the Czech Republic, Denmark and

Germany as a bottom-up initiative led by the construction industry. Table 4.2.2b provides an overview of these issues.

Table 4.2.2b – Economic quality: overview of application of regulations to existing buildings and renovation; the format of the regulations and presence of accepted solutions or DTS; and, the process of implementation of regulations

Economic quality		AT	BE	BG	CY	CZ	DK	EE	FI	FR	DE	HU	IE	IT	LU	MT	NL	PL	RO	SK	SL	ES	SE	UK	NO
	Applying to existing buildings	N	N	N	Y	N				N	Y	N					N	N	Y				N		N
	Applying to renovation		N		Y	N				Y	N	N						N					P		P
	Formulation of regulations		Pe		Pr					Pe	Pr							Pr	Pe				Pe		Pe
	Accepted solutions or DTS		N		Y	N				N	N	N					Y	N					Y		Y
	Process of implementation	G&I	B	B	G&I	B				T	B						G&I	T			T		T		T

Symbols: Y=yes, N=no, L=lower level applies, P=partly (regulations only apply to some renovation), Pe=performance based/goal based regulation, Pr=prescriptive regulation, G&I=government and industry cooperation, T= top-down, B=bottom-up

4.2.3 Social quality

The different aspects that together make up the criterion social quality appear to receive different attention in the EU-27 building regulatory frameworks. Some topics are addressed in almost all countries analysed, whilst other topics are sparsely taken up.

Adhere to ethical values during development

Regulations to ensure ethical trading throughout the supply chain only apply in Cyprus, Germany and the Netherlands; these are set at the national level. In Cyprus these regulations were considered to have a background in EU directives. Regulation to provide safe and healthy work environment apply in all countries analysed, with the exception of the Czech Republic. These regulations are set on a national or regional level. In Austria, France, Slovenia and the UK these regulations were perceived by the respondents to have a background in EU directives.

Provide adequate local services and facilities

Regulation to ensure the provision of information to the local community during construction work applies in all countries analysed, with the exception of Ireland and Spain. In most countries these regulations are set on a national or regional level. Exceptions are the Czech Republic and the Netherlands, where these regulations are solely set by local governments, and Belgium and the UK (as planning guidance) where these regulations are set by different levels of government, including the local level. In Austria, Belgium and Bulgaria these requirements were perceived by the respondents to have a background in EU directives. Only in Italy and Luxembourg are regulations set to ensure the provision of space for the training of workmen. In the Netherlands quasi-mandatory requirements apply. Finally, with the exception of Belgium, the Czech Republic, France, Italy and Spain, all countries analysed have introduced regulation to ensure the construction of local schools, health facilities, and social facilities. These regulations are generally set at a national or provincial level, with the exception of Sweden where these regulations are set on a local level.

Provide housing that meets needs

Regulation to ensure the development of a mixture of tenure types applies in Belgium, Denmark, France, Ireland, Italy, Luxembourg and the Netherlands. In most countries analysed these regulations are set on a national or regional level. The Netherlands are the exception here as local governments set these requirements. In addition, in Belgium and Ireland municipalities also have authority to set these requirements. With the exception of Bulgaria, Estonia, Malta and Slovakia, regulation to ensure the provision of affordable housing applies in all countries analysed. Again these regulations are drawn up on a national or regional level mostly. Finally, regulation to ensure the provision of housing for the elderly applies in all countries analysed, with exception of Austria, Belgium, the Czech Republic, Estonia, Luxembourg, Malta and the UK. In Hungary, Ireland and Sweden these regulations are drawn up by local governments only, in all other countries analysed these regulations are drawn up on a national or regional level. None of the regulations that aim for the provision of housing that meets needs has a background in EU directives.

Integrate development in local context

Regulation to reject or discourage gated development only applies in France, Ireland and Sweden. Here local governments have authority to set such regulation. Regulation set to provide transport links to local content apply in all countries analysed. Regulation applied to ensure the provision to local transport links also apply in all countries with Italy, Luxembourg, Malta, Spain and the UK being exceptions. When regulated, these regulations are generally drawn up at the local level. Finally, regulation set to ensure the provision of links to adjacent neighbourhoods applies in Bulgaria, Cyprus, Denmark, France, Germany, Ireland, Slovakia and Sweden. There is no general rule to what level of government these regulations are set. None of these regulations has a background in EU directives.

Conserve local heritage

Regulations set to ensure the reuse of locally valued buildings apply in Austria, Belgium, Bulgaria, Denmark, France, Germany, Hungary, Italy, Romania, Sweden and the UK. Generally these regulations are set on a national or regional level. These regulations are not perceived by the respondents to have a background in EU directives.

Provide access to green space

Regulations set to ensure green space within a certain distance apply in all countries analysed, with Belgium, Estonia, Malta, Slovakia and Spain being the exceptions. These regulations are generally drawn up on a local level. These regulations were not perceived to have a background in EU directives.

Table 4.2.3a provides an overview of the different topics that together make up the criterion social quality.

Table 4.2.3a – social quality as sustainable construction criterion in EU-27 building regulatory frameworks

Topics		AT	BE	BG	CY	CZ	DK	EE	FI	FR	DE	HU	IE	IT	LU	MT	NL	PL	RO	SK	SL	ES	SE	UK	NO
Adhere to ethical standards	To ensure ethical trading throughout supply chain	X	X	X	1	X	X			X	1	X	X	X	X	X	1	X	X	X		X	X	X	X
during development	To provide safe and healthy work environment	1/2	1/2	1	1	X	1	2		1	1/2	1	1	1	1	1	1/Q	1	1/Q	1	1	1	1	1/2/3	1
Provide adequate	To provicde information to local community during construction activities	1/2/3	1/2/3	1	1	3	1	2	1	1	1/2	3	X	1	1	1	3	1	1	1	1	X	1	1/2/3	3
local services and facilities	To provide space for training workmen	X	X	X	X	X		X		X	X		X	2	1	X	Q	X		X		X	X	X	X
	To provide local schools, health, social facilities	2	X	1	1	X	1	X		X	1/2	1	1/3	X	1		1/3	1	X	1	1	X	3	2/3	3
Provide housing that	To develop a mix of tenure types	X	2/3	X	X	X	2			1	X		1/3	1/2	1	X	3/Q	X	X	X	X	X	X	X	3
meets needs	To provide affordable housing	2	1/2/3	X	1	1	2	X		1	1	3	1	1/2/3	1	X	1	1	1/3	X	Q	1/2/3	1	2/3/Q	X
	To provide housing for the elderly	X	X	1	1	X	1	X		1	1	3	3	1/2	X	X	1	1	1	1	1	1/2/3	3	X	1
Integrate development	To reject or discourage gated development	X	X	X	X	X		X		1/3	X	X	3	X		X	X	X			X	X	3	X	X
in local context	To provide transport links to local context	X	2/3	Q	1	3	1			1/3	2/3	3	1/3	X	X	X	3	1	X	1		X	3	X	X
	To provide links to adjacent neighborhoods	X	X	1	1	X	1	X		1/3	2/3		1/3	X	X	X	X	X	X	1		X	3	2/3	X
Conserve local heritage	To reuse locally valued buildings	2/3	2/3	1	X	X	1	X		1/3	2	3	X	1/2/3		X	1/3	X	X	X	X	X	1	2/3	3
Access to green space	To have green space within a certain distance	2/3	X	1	1	3	3	X		1/3	1/2/3	3	1/3	1/2/3	3	X	3	1	3	X	3	X	3	2/3	3

Symbols: 1=national level, 2=regional level, 3=local level, Q=quasi-mandatory, F= will be regulated in future, X=not regulated

Colours: grey = regulated, green= regulated with background in EU directives, orange=future regulations, red=not regulated

If social quality, as criterion for sustainable construction, is taken up in the analysed countries' regulatory frameworks, regulations apply to all building types, except for Luxembourg where these regulations apply to dwellings only. Only in Belgium these regulations apply to both new and existing buildings. In Austria, Cyprus, Estonia and Germany a lower level applies for existing buildings. In all other countries analysed these regulations do not apply to existing buildings. If regulations apply, these apply to all renovation in Belgium, Bulgaria, France, Germany, Poland and Slovenia. In the Czech Republic these regulations only apply to certain renovation work. In all countries analysed these regulations are drawn up in goal based or performance based terms, with the exception of Austria, Belgium and Poland where these regulations are drawn up in prescriptive terms. In Belgium, Bulgaria, the Netherlands and Slovenia documentation on accepted or deemed-to-satisfy solutions is available. Finally, respondents from all countries analysed referred to the implementation of these regulations as a top-down initiative, with the exception of Germany and the Netherlands were the implementation was considered a combined government and industry initiative, and the Czech Republic where the implementation was considered a private sector led bottom-up initiative. Table 4.2.3b provides an overview of these issues.

Table 4.2.3b – Social quality: overview of application of regulations to existing buildings and renovation; the format of the regulations and presence of accepted solutions or DTS; and, the process of implementation of regulations

Social quality		AT	BE	BG	CY	CZ	DK	EE	FI	FR	DE	HU	IE	IT	LU	MT	NL	PL	RO	SK	SL	ES	SE	UK	NO
	Applying to existing buildings	L	Y	N	L	N		L		N	L	N				N	N	N	N		N		N		Y
	Applying to renovation	Y	Y	Y	N	P				Y	Y	N				N		Y	N		Y		N		P
	Formulation of regulations	Pr	Pr	Pe	Pe			Pe		Pe	Pe					Pe		Pr	Pe	Pe	Pe				Pe
	Accepted solutions or DTS	Y	Y	Y	N	N		N		N	N					N	Y	N			Y				Y
	Process of implementation	T	T	T	T	B		T		T	G&I					T	G&I	T	T		T				T

Symbols: Y=yes, N=no, L=lower level applies, P=partly (regulations only apply to some renovation), Pe=performance based/goal based regulation, Pr=prescriptive regulation, G&I=government and industry cooperation, T= top-down, B=bottom-up

4.2.4 Functional quality

Most topics that make up the criterion functional quality are regulated throughout the countries analysed. As with the other criteria discussed, major differences exist amongst countries.

Design optimization

Regulations on the shape of the exterior of building, and regulations related to aesthetics apply in all countries, except for Estonia, Italy, Luxembourg, Poland, Slovakia and Estonia. Generally these regulations are drawn up by local governments. Regulations set to ensure the planned service life of structures apply in Cyprus, Estonia, France, Germany, Italy, Spain and Sweden. Generally these regulations are set on a national level. In Ireland respondents referred to quasi mandatory requirements related to this topic. Regulations set to ensure the planned service life of building services only apply in Cyprus and France. In Bulgaria respondents referred to quasi-mandatory requirements. Regulations on the demand of space per occupant and/or dwelling apply in all countries analysed, with the exception of Belgium, Estonia and the UK. These regulations are generally set on a national level. None of the regulations that make up the topic design optimization were perceived to have a background in EU directives.

Building envelope

Regulations on moisture protection of the building envelope apply in all countries analysed, except for Belgium, Hungary, Italy and Luxembourg. In Belgium and Estonia respondents referred to quasi mandatory requirements. In Cyprus, the Czech Republic, Poland, Romania and Sweden these regulations were perceived by the respondents to have a background in EU directives. Regulations on wind protection of the building envelope apply in all countries analysed, except for Belgium, Hungary, Italy, Luxembourg, Malta, Slovakia and Spain. In all countries these regulations are set on a national level. In Cyprus, the Czech Republic, the Netherlands and Romania these regulations were perceived by the respondents to have a background in EU directives. Regulations on electric magnetic shielding apply in Belgium, Bulgaria, Cyprus, Italy, Malta, Poland and Romania. Here these regulations are set on a national level. In Italy and Poland these regulations have a background in EU directives.

Health, comfort and user satisfaction

In all countries analysed regulation applies to indoor air quality, except for France. Generally these regulations are set on a national level, with respondents from Estonia referring to quasi mandatory requirements. In Belgium, Cyprus, the Czech Republic, Luxembourg, Malta, Romania and Sweden these regulations were perceived by the respondents to have a background in EU directives (such as the Construction Products Directive – CPD). In all countries analysed regulation applies to thermal comfort in winter and summer, with the exception of Belgium, the Czech Republic, Luxembourg and the Netherlands. If regulations are set this is generally done on a national level. In Bulgaria, Cyprus, the Czech Republic, Germany, Italy, Malta, the Netherlands, Romania and Sweden these regulations were perceived by the respondents to have a background in EU directives. In all countries analysed regulation applies to acoustic comfort, with the exception of Belgium. If regulations are set this is generally done on a national level. In Cyprus, the Czech Republic, Italy, Malta, the Netherlands, Poland, Romania, Spain and Sweden these regulations were perceived by the respondents to have a background in EU directives. In all countries analysed regulation applies to in-door daylight

entry, with the exception of Belgium, France, Hungary, Ireland and the UK. If regulations are set this is generally done on a national level. In Cyprus, the Czech Republic, Malta, Romania and Sweden these regulations were perceived by the respondents to have a background in EU directives. Only in Bulgaria, Poland and Romania regulations are set to ensure the capacity of conversion of a building by its users.

Usability for disabled

In all countries analysed regulation applies to the accessibility of buildings for disabled. Generally these regulations are set on a national level. In Austria, Bulgaria, the Czech Republic, France, and Italy these regulations were perceived by the respondents to have a background in EU directives.

Safety

Safety is one of the more traditional aspects of building regulations. The different topics related to safety as addressed in the questionnaire were considered to be regulated in all countries analysed.

Table 4.2.4a provides an overview of the different topics that together make up the criterion functional quality.

Table 4.2.4a – Functional quality as sustainable construction criterion in EU-27 building regulatory frameworks

Topics		AT	BE	BG	CY	CZ	DK	EE	FI	FR	DE	HU	IE	IT	LU	MT	NL	PL	RO	SK	SL	ES	SE	UK	NO
Design optimalization	To the shape of the exterior	2/3	2/3	1/Q	1	2	3	X		1/3	1/2/3	3	1/3	X	X	1	1/3	X	1/3	X	3	X	3	2/3	3
	For aesthetics	2/3	2/3	1	1	2	3	3	1	3	1/2/3	3	1/3	X	X		3	1	3	X	3	3	1	2/3	1/3
	To planned service life of structures	X	X	X	1	X	X	3		1	1		Q	1/2/3	X	X	X	X	X	X	X	1	1	X	X
	To planned service life of building services	X	X	Q	1	X	X	X		1			X	X	X	X	X	X	X	X	X	X	X	X	1
	To the demand of space per occupant and/or dwelling	2/3	X	1	1	1	1	X		1	2	1	1	1/2/3	1	1	1	1	3	1	1	2/3	1	X	X
Building envelope	To moisture protection of the building envelope	2/3	X	Q	1	1	1	Q	1	1	1/2	X	1	X	X	1	1	1	1/Q	1	1	1	1	1/3	1
	To wind protection of the building envelope	2/3	X	1	1	1		Q		1		X	1	X	X	X	1	1	1/3/Q	X	1	X	1	3	1
	For electric-magnetic shielding	X	1	1	1					X	X	X		1	X	1	X	1	1/3/Q	X	X	X	X		X
Health, comfort and user satisfaction	For indoor air-quality	2/3	2	1	1	1	1	Q	1	X	1	1	1	1/2	1	1	1	1	1/Q	1	1	1	1	2/3	1
	To thermal comfort in winter	2/3	X	1	1	1	1	Q	1	1	1	1	1	1/2	1	1	1	1	1/Q	1	1	1	1	2/3	X
	To thermal comfort in summer	2/3	X	1	1	X	1	Q	1	1	1	1	1	1/2	X	1	X	1	1/Q	1	1	1	1	2/3	X
	To acoustic comfort	2/3	X	1	1	1	1	Q	1	1	1	1	1	1/2	1	1	1	1	1/Q	1	1	1/2/3	1	2/3	1
	To in-door daylight entry	2/3	X	1	1	1	1	Q		X	1	X	X	1/2	F	1	1	1	1/Q	1	1	1/2/3	1	X	1
	To the capability of conversion by a construction/building user	X	X	1	X	X	X	X		X			X	X	X	X	X	1	3	X	X	X	X	X	X
Usability for disabled	To accessibility for disabled	1/2	1/2	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1/Q	1	1	1/2/3	1	2/3/Q	1
Safety	To the structural safety of the construction	1/2/3	Q	1	1	1	1	2		1	1/2		1	1	1	1	1	1	1/3/Q	1	1	1	1	1/2/3	1
	To fire resistance of the construction	1/2	1	1	1	1	1	2		1	1	1	1	1	1	1	1	1	1/3/Q	1	1	1/3	1	1/2/3	1
	To the safety of a construction during a fire	1/2	1	1	1	1	1	2		1	2		1	1	1	1	1	1	1/3/Q	1	1	1/3	1	1/2/3	1

Symbols: 1=national level, 2=regional level, 3=local level, Q=quasi-mandatory, F= will be regulated in future, X=not regulated
Colours: grey = regulated, green= regulated with background in EU directives, orange=future regulations, red=not regulated

If functional quality, as criterion for sustainable construction, is taken up in the analysed countries' regulatory frameworks, regulations apply to all building types. In Belgium, Romania and Slovenia these regulations apply to both new and existing buildings. In Austria, Cyprus, Estonia, Germany and the Netherlands a lower level applies to existing buildings. In most countries analysed these regulations apply to all renovation, except for France where a lower level applies and Hungary and Malta where these regulations do not apply to renovation. Then, generally these regulations are drawn up in goal based or performance based terms, with the exception of Austria and Germany where these regulations are drawn up in prescriptive terms. In Austria, Belgium, Bulgaria, France, the Netherlands, Slovenia and Spain respondents referred to existing accepted solutions or deemed to satisfy documentation. Finally, the

process of implementation of these regulations was considered a governmental top-down initiative in all countries analysed. Except for the Czech Republic, Germany, the Netherlands and Sweden, where this process was understood to be a government-industry collaboration, and Belgium and France, where this process was understood to be industry led. Table 4.2.4b provides an overview of these issues.

Table 4.2.4b – Functional quality: overview of application of regulations to existing buildings and renovation; the format of the regulations and presence of accepted solutions or DTS; and, the process of implementation of regulations

Functional quality		AT	BE	BG	CY	CZ	DK	EE	FI	FR	DE	HU	IE	IT	LU	MT	NL	PL	RO	SK	SL	ES	SE	UK	NO
	Applying to existing buildings	L	L	N	L	L		L		Y	L	N			N	N	L	N	Y	Y	N		N		Y
	Applying to renovation	Y	Y	Y	Y	P				Y		N			N	N	Y	Y	Y	Y	Y		P		P
	Formulation of regulations	Pr	Pe	Pe	Pe	Pe		Pe		Pe	Pe						Pe	Pe	Pe	Pe	Pe		Pe		Pe
	Accepted solutions or DTS	Y	Y	Y	N	N				Y		N			N	N	Y	N			Y		Y		Y
	Process of implementation	T	G&I	T	T	T		T		G&I	T					T	G&I	T	T	T	T		T		T

Symbols: Y=yes, N=no, L=lower level applies, P=partly (regulations only apply to some renovation), Pe=performance based/goal based regulation, Pr=prescriptive regulation, G&I=government and industry cooperation, T= top-down, B=bottom-up

4.3 Enforcement of sustainable construction regulation

As with the regulation of different sustainable construction related topics, the EU member states show a variation in approaches to the enforcement of such regulation.

4.3.1 Monitoring of building plans and issuance of building permits

In line with earlier research on the topic, different approaches to the enforcement of building regulation exist in the EU-27 – see also the previous section. When focussing on the enforcement of sustainable construction regulation it becomes clear that the enforcement of the regulated topics has limited attention in most countries analysed. For instance, in most countries analysed many topics related to sustainable construction were said to be regulated, though respondents experienced that topics related to water conservation, waste limitation, and economic quality are in practice not enforced. Only energy and more traditional regulatory topics of structural and fire safety were experienced to be enforced. Table 4.3.1 provides a general overview of sustainable construction topic that were experienced to be enforced in the different member states.

Table 4.3.1 - Enforcement of building plans per topic[14]

Building plan assessment		AT	BE	BG	CY	CZ	EE	FR	HU	LU	MT	NL	PL	RO	SK	SL	SE
Ecological quality	Energy	X		X		X		X	X	X		X	X	X	X	X	
	Water		X	X				X	X		X				X		
	Waste	X													X		
	Other	X													X		
Economic quality																	
Social quality			X	X	X	X	X			X		X	X	X		X	X
Functional quality		X	X	X	X	X		X	X			X	X	X	X	X	

[14] Please note that we have not received information on enforcement aspects from all 27 member states.

Looking at the actual process of monitoring building plans it becomes clear that in most countries analysed this is a visual check only. Only in a few member states the enforcement process was said to be based on a paper checklist. In the majority of countries respondents furthermore looked upon the process of enforcement as a superficial check. Nevertheless, if non-compliance with sustainable construction regulation is found, in general the building permit will not be issued. In all countries addressed compliance results in a building permit.

4.3.2 Monitoring of work under construction and issuance of occupancy permits

What holds for the monitoring of building plans, also holds for the monitoring of work under construction: although many respondents refer to various regulated topics considering sustainable construction, the enforcement of these regulations during the construction of a building appears largely absent. Again respondents from many countries report that they experience little to no monitoring of sustainability topics and criteria such as water conservation, social quality and economic quality. Only energy and functional quality were experienced to face, to some extent, actual enforcement – note furthermore that in some countries waste reduction has emphasis in the enforcement process of work under construction, although such monitoring of compliance with sustainable construction regulation generally is typified as 'a visual check' and 'superficial'.

In most of the countries analysed construction work may continue when non-compliance is found, but under the condition that the breach with sustainable construction regulation is resolved during the construction process. Exceptions to this rule are Bulgaria and Hungary, where non-compliance faces a fine; and Luxembourg, the Netherlands and Poland where work is halted until the breach is resolved. Table 4.3.2a provides a general overview of sustainable construction topics that were experienced to be enforced in the different member states.

Table 4.3.2a - Enforcement of work under construction per topic

Assessment of work under construction		AT	BE	BG	CY	CZ	EE	FR	HU	LU	MT	NL	PL	RO	SK	SL	SE
Ecological quality	Energy		X		X					X			X			X	
	Water										X						
	Waste	X		X	X					X					X		
	Other	X		X		X						X			X	X	
Economic quality					X												
Social quality				X	X											X	
Functional quality		X	X	X	X		X		X			X	X	X	X	X	

When it comes to the pre-occupation check a somewhat different picture can be painted. In most countries analysed respondents experienced little to no actual pre-occupation checks in the field – energy regulation being again the major exception to this rule. However, in Bulgaria, Cyprus Slovakia and Slovenia respondents experienced that almost, if not all aspects of sustainable construction were checked prior to occupation of a construction. Table 4.3.2b provides a general overview of sustainable construction topics that were experienced to be enforced in the different member states.

Table 4.3.2b - Final assessment of constructions prior to occupation per topic

Pre-occupation assessment		AT	BE	BG	CY	CZ	EE	FR	HU	LU	MT	NL	PL	RO	SK	SL	SE
Ecological quality	Energy	X	X	X			X	X	X	X			X	X	X	X	
	Water	X		X									X		X		
	Waste	X		X	X												
	Other	X		X					X						X	X	
Economic quality					X												
Social quality		X		X	X		X									X	
Functional quality		X		X	X		X		X				X		X	X	X

If from such final inspections non-compliance is found respondents experienced this resulted either in no follow up action (Bulgaria, Estonia, France, Hungary, Poland and Slovenia) or in the acceptance of the usage of the construction work under the condition that the breach will be fixed (Belgium, Cyprus, Czech Republic, Luxembourg, Romania, Slovakia and Sweden).

4.3.3 Monitoring of occupied construction works/construction works in use

The monitoring of occupied constructions on compliance with sustainable construction regulation appears to have limited attention in the countries analysed. Table 4.3.3 provides a general overview of sustainable construction topics that were experienced to be enforced in the different member states.

Table 4.3.3- Monitoring of occupied construction work/construction work in use per topic

Assessment of constructions in use		AT	BE	BG	CY	CZ	EE	FR	HU	LU	MT	NL	PL	RO	SK	SL	SE
Ecological quality	Energy		X	X					X				X		X		X
	Water				X												
	Waste												X				
	Other											X	X				
Economic quality																	
Social quality							X										
Functional quality		X											X			X	X

Notably, since 2000 in Finland a maintenance report is compulsory for all housing. This is a report which covers the repair history of a building. In the UK a 'HIP' (house information pack) was introduced by the last government, for all houses offered for sale. This gave construction details and energy performance, refurbishment history, etc. It has been abandoned for now under pressure from house agents. In the Netherlands a comparable initiative (HIP) was instigated in the late 1990s, but did not make it into formal policy as members of parliament feared this would put too much financial and administrative burden onto home owners.

4.4 Voluntary and complementary initiatives

Respondents described a range of voluntary and complementary initiatives. Voluntary and complementary initiatives are in practice related to the formal legal regulatory frameworks as discussed in 4.2, but they do not have a legal basis. From the information received it is not always fully clear how and where the initiatives provided by the respondents add to formal frameworks. We do however wish to share some of the initiatives provided by respondents as this provides a brief insight into how and where non-government actors take action in addressing sustainable construction.

Three groups of initiatives can be distinguished: facilitating and promotional initiatives, self-regulatory initiatives, and locally driven voluntary or complementary initiatives. Note that the boundaries of these groups overlap. Note furthermore that the examples provided are snap-shots only. They are included to give some insight in the range and variance of voluntary and complementary regimes on sustainable construction in the EU-27.

4.4.1 Facilitating and promotional initiatives

The first group consists of initiatives that are often initiated by governmental agencies to facilitate and promote a more sustainable construction process. Often this is done by actively supporting a (pilot) project and dissemination of the project's results.

- Estonia: Tartu and Tallinn pilot and model projects.
  - In the region of Tartu the district central heating areas were determined in a general map in 1999 and legalized in a Law on District Central Heating. As our respondents explained, this helped to end the process of building many small gas-operated boiler houses for multi-storey apartment buildings. Now the use of central heating systems based on local energy resources is developing and the use of local energy resources is increasing.
  - In Estonia, the city of Tallinn area is known as the largest producer of building waste material. In 2002 the City Council passed a Local Act legislating the re-use of building and demolition material. The Act states that if building waste volumes for a construction site will be over 1 m3 per day or over 20 m3 during the whole building period, the project company must provide the City authorities with a plan on how re-use is addressed. If waste is expected to rise to over 100 m3 a day, the company must address the waste problem at the project blueprint stage. Waste building materials from Tallinn is re-used locally or in locations near the city, or delivered for processing to a certified company.
- Germany: *kfW-Förderprogramme für energieeffizentes Bauen und Sanieren/ altersgerechtes Umbauen*, a promotional programme in the field of environmental protection by the kfW Bank. The program links the addressing of energy efficiency construction and renovation, renewable energies, and age-based retrofitting to loans and the interest paid for loans.
- Italy: *ITACA Protocol*, a 'Protocol for evaluation of environmental sustainability', drawn up by a central government body (ITACA - Istituto per la Trasparenza L'aggiornamento e la Certificazione degli Appalti). The protocol can be adopted by the Regions in their building regulations. The drafting of the Protocol was done in collaboration with the international organisation iiETC, based on its system SBTool, and the Italian member of iiTEC is a certification body for inspectors. The Protocol has up to now been adopted in some Regional and Communal codes, but not all. When adopted, the powers are delegated to communes to integrate the requirements in to the local urban development plans, and to exercise the system of control of plans and execution of works [This is an example of central government providing information to facilitate the introduction of harmonised local/provincial regulatory systems, in the absence of central government regulation].
- Ireland: The Department of the Environment, Heritage and Local Government has set up in 2009 a number of *Towards Carbon Neutral - Pilot Social Housing Schemes*. These provide capital funding of up to 10 social housing developments in a variety of locations (ur-

ban and rural), to achieve excellence in terms of sustainability. The dwellings should be near zero carbon buildings with environmental, social and economic considerations also taken into account. This scheme was to support government policy and to build capacity within the industry for future Regulations. So far, plans and initial design details have been prepared. It is reported to have good response from Local Authorities - demonstrating an interest to learn and be involved in energy efficiency and sustainability. Designs have been to a good benchmark so far, and have emanated from a mix of private sector and public sector designers. Control is at both central level within the Department of Environment, Heritage and Local Government (funding and benchmark setting) and locally at Local Authority level (implementation). A set of regulations have been laid down on processes, procedures, and products delivered by initiative members (i.e. strong regulation applies).

- Latvia: *Energy Savings in Housing, Baltic States – Demonstration Project*, Latvia, Estonia and Lithuania. The project was jointly carried out by the relevant ministries in the three Baltic States and was supported by the Danish Ministry of Housing and Urban Affairs. The project was conducted by COWI and performed with the Danish Building Research Institute, Energy and Indoor Climate Division. The project aimed to show inhabitants, industry and politicians the benefits of energy efficiency. Respondents referred to this pilot project as an opportunity "to show good examples (and) an opportunity to gather practical knowledge about energy efficiency measures".
- Poland: *Support for non-conventional energy sources in buildings* - support from National (and Regional) Fund for Environment Protection and Water Management through subsidies and preferential loans for investments in localised RES or non – conventional energy sources used in buildings.
- Slovakia: *Passive House Institute Slovakia*, an initiative that originated under the influence of the German PassivHaus institute. The goal is the promotion of passive houses and environmentally friendly architecture.
- Spain: IDAE (*Instituto de Diversificación y Ahorro Energético* - Institute for the diversification and saving of energy, a publicly funded institution to promote energy reduction and use of renewable energies. It was established in 1974, and initially concerned with general energy issues, but its current goals were redefined in 1984 to focus on use of renewable energy. IDEA is a main source of information about energy efficiency and sustainability in the form of technical guides, awareness campaigns and other actions.

4.4.2 Self-regulation

The second group consists of initiatives taken by the industry as a form of self-regulation. Typical examples are those in the field of labelling, certification and standardization. Some examples from the countries analysed are:

- Austria: *eco label for sustainable building products*, introduced by the Austrian Institute for Construction-biology (IBO- Österreichisches Institut für Baubiologie und –ökologie).
- Belgium:
  - Valideo, a voluntary Sustainable Construction certification system, started by SECO (a private sector inspectorate), BCCA (Belgian Construction Certification Association) and WTCB-CSTC (research institute). Valideo can be compared with assessment

schemes such as BREEAM, HQE, and LEED. The first Valideo-certified green building was completed in May 2009.
    - Sustainability checklist, an initiative started by the Flemish Infrastructural Fund for Personal Matters (VIPA). The 'Sustainability checklist' has to be filled in (some points being compulsory) in the request dossier for subsidies of VIPA (for hospitals, kindergarten, elderly homes, etc.). All parties have to integrate as many elements as possible in order to obtain subsidies. The goal of this initiative is to implement sustainability measures in order to save running costs for the subsidized and to enhance comfort for the occupants. An organization has been set up to administer and steer the initiative.

- Denmark: *Eco-Accounts: Environmental accounting for housing.* Environmental accounting for housing is a widespread activity in the Danish housing sector. By setting up an eco-account it is possible for actors such as owners, residents' associations, or committees of a co-operative housing society to calculate the individual contribution to the environmental impact. Key figures and diagrams explain the level of input and output. The eco-account produces five key figures for environmental behaviour, all figures related to the number of persons involved (quantity per person) and related to the average (ordinary) consumption of a Danish household. The key figures concern heat, electricity and water consumption, waste production and CO_2 – emissions. Respondents emphasised that the figures "reflect the level of the occupiers' (households and individuals) activity more than technical standards" and considered this "an example of best practice in a social and economic perspective".

- Italia: adaptation of *LEED labelling*: the Green Building Council is represented in Italy by GBC Italia, which is promoting the LEED label. It has around 300 members including communes, contractors, design bureaus and materials producers, and also provides training and a green building manual.

- The Netherlands: *BREEAM-NL*, a Dutch version of BREEAM. The initiative aimed at making sustainability in the building industry measurable by developing a sustainability label, which allows for the uniform rating of buildings throughout the Netherlands. The initiative came from the building industry itself. The industry felt a strong need for promoting the concept of sustainability quantification and assessing buildings unequivocally in a manner that is accepted internationally. The initiative was started in 2008 by private sector organizations. Respondents noted that BREEAM-NL "is catching on; it is used in a small number of projects. It is widely used by a large number of companies." The initiative coexists with government regulation, but there is no formal relation between the two. BREEAM-NL sets higher criteria than formal regulation.

- Spain: GBCe (Green Building Council España), the Spanish branch of GBC, provides conferences, information services and certification. It was started in 1998, and recognized by the Council of the World Green Building Council in 2010. It operates an *environmental labelling scheme* for buildings (VERDE) and certification of assessors, which is in its early stages and so far only used in a small number of projects.

- United Kingdom:
    - BREEAM, a voluntary certification scheme for energy efficiency, being adopted worldwide, developed and managed by BRE, a building research body jointly owned by industry bodies.

- Code for Sustainable Homes (CSH): a voluntary code with specifications, design guidance and an assessment system with 6 levels of attainment.
- NHBC-scheme, an insurance-based warranty scheme for new homes. The National House-Building Council (NHBC) cover is in general required by mortgage lenders on new houses for sale, so is widely used except for houses commissioned for cash by owner-occupiers using their own architect, or self-build. The scheme includes a registration scheme for house builders, a set of standards and technical requirements (more specific and in excess of the Approved Documents generally referred to by building controllers), their own inspectors, and insurance provided by NHBC itself. NHBC inspectors are approved persons for building regulations inspection. NHBC's market share of housing is around 60%, so this housing is not inspected by Local Authority inspectors. The NHBC also has a scheme for converted and renovated buildings.

4.4.3 Locally driven voluntary or complementary initiatives

The third group of initiatives is geographically oriented, and initiated by local or regional actors – usually government and/or non-government or non-profit organizations. These organizations aim to achieve certain goals in specific fields, usually within a certain region, city or district. Some examples from the countries analyzes are:

- Austria: the *Low Energy Building Cluster Tirol*, a private-public initiative of the Austrian Federation of Industry Tirol and private firms primarily from the construction industry. Its mission is to accelerate the market diffusion of low energy buildings and to increase the construction quality of new buildings as well as refitting of buildings. This mission is to be reached by networking, professional training and the definition of common quality standards. To secure permanent networking a private institute has been established that offers a broad range of supporting activities from know-how-transfer to corporate marketing, research and development and political lobbying.
- Belgium: Flanders (a government region) started a feasibility study in 2009 aiming to establish a *Belgian Sustainable Building Council*. The mission of the Belgian Sustainable Building Council (BSBC) is to improve the sustainability of the built environment. The activities of the BSBC are focused on developing measurement instruments, assessment methods and certification schemes for sustainable buildings and built environments, including the related exchange of knowledge, professional training and communication activities. These activities are addressed to the building sector and government. The BSBC believes in the force of a multi-actor platform that includes industry, non-governmental organizations, research/academic institutions and (local) government agencies, and that aims for ambitious targets towards a sustainable built environment. This study is still going on in 2010.
- Bulgaria: the *Bulgarian Green Building Council* (BGBC) *certification scheme*. The main goal of the BGBC is the implementation of a national certification system based on the German DGNB's scheme. The BGBC was founded in June 2009 – initiated by private persons, companies (members), and other industry representatives. It was a follow-up of an international initiative. Respondents state that the BGBG's certification scheme "is catching on and is used in a small number of projects". It coexists with government regulation, but there is no direct relation. The scheme sets higher criteria for sustainable construction than formal regulation.

- Czech Republic: *SBToolCZ*, a tool to evaluate sustainability aspects and environmental impacts of buildings, based on the SBTool International, but localized for the Czech Republic. It is an alternative to similar voluntary systems like BREEAM, LEED, and the German DGNB. This tool is to be used in case of upgrading of buildings by developers and building owners. It was started by the Czech Technical University Prague and TZUS. It was a follow-up of an international initiative/initiative undertaken in Germany/France. The tool is being used now in a small number of projects.

- Finland:
  - the Eco-Viiki housing area in Helsinki. Relevant is the introduction of a special set of local eco-criteria (PIMWAG) for design and construction.
  - A web portal of ecological construction. The portal provides information and calculation forms for different aspects of eco-construction. It mainly targets private home builders. This voluntary initiative was started by Ymparisto and the City of Helsinki.
  - 'Tee parannus' (Make an improvement) is an information programme targeting at improvement of energy efficiency in renovation of blocks of flats. The initiative was organised and is coordinated by large co-operation of property and building sector. The basic idea is to add information of user friendly renovation methods and create meeting points for supply and demand of renovation services.
  - Coal neutral municipalities, a research project in which five Finnish municipalities have promised to act as laboratories by working to curb their carbon dioxide emissions ahead of schedule. The project aims at greenhouse gas emission reductions both in the near future (2-5 years) and in the longer term (6-20 years). Commitment of the municipal authorities, local businesses and residents to emission reductions is essential to success. Researchers, experts, businesses, politicians and local residents will together devise and tailor solutions that can reduce emissions, especially related to housing, transportation and foodstuffs.

- France:
  - Greater Lyon drew up on a voluntary basis a local policy to enforce the Rational Use of Energy (RUE) and the use of RES in new buildings. This local policy is based on two tools, complementary to the typical urban planning process: 1) An Urban Environmental Analysis, which is carried out by a subcontractor to the Local Authority, generally an architect specialising in Sustainable Development. The environmental analysis is used by the selected City Planner as an input to the feasibility study for the development. This Urban Environmental Analysis may include planning requirements to increase RUE and the use of RES. 2) A Sustainable Development Guideline which sets targets for RUE and RES and which is used by the City Planning Company to select developers that will purchase the land and construct buildings. This guideline sets a maximum heating need of 60 kWh/m²/year, which is about 40% less than the National Thermal Regulation (RT2005).
  - *Haute Qualité Environnementale'* (HQE) certification process, a certification method for buildings, comparable with BREEAM. Launched in 2001 by public sector organisation PUCA under the program 'Ecologie et Habitat' in 1992.
  - Labels '*Haute Performance Energétique' et 'Bâtiment Basse Consommation'*, a label with which the energetic efficiency with respect to heating, cooling, sanitary hot water, airiness, auxiliary and lighting are measured. The label consists of several levels of requirements. The objective is to incentivise the building professionals to attain energy performance levels superior to those imposed by the regulations (under certain condi-

tions and financial stimuli). These prefigure the future regulatory levels. The initiative was started in 2005 by the public sector organization '*Collectif Effinergie, association HQE*', inspired by the Swiss '*Minergie'* and German '*PassivHaus* initiatives. The label is managed by the authorities supported by private sector certifications organisations. Respondents state that "the initiative is now widely used in a large number of projects. Several tens of thousands of dwellings and several hundreds of buildings are labelled at the level of the highest performance".

- Germany: *Bewertungssystem Nachhaltiges Bauen für Bundesgebäud*, a sustainable building evaluation system for federal buildings. This is a holistic quantitative evaluation system for federal office and administrative buildings based on a life-cycle-assessment approach. It considers environmental, economic, socio-cultural, technical and process qualities of a building with respect to the actual national and international developments in standards for sustainable construction. The goal of the system is to create a transparent, objective evaluation and certification system for sustainability, based on scientific facts and a design-based evaluation system for sustainable buildings. The initiative was initiated by the Federal Ministry of Transport, Building and Urban Development (BMVBS) together with the German Sustainable Building Council (DGNB). At the moment it is used in a small number of projects.
- Ireland: The national training and employment agency FAS has initiated a *training scheme on Construction & Demolition Waste Management* with published material. It aims to educate practitioners (contractors, designers, training institutions, regulators etc) in best practice, and was designed to assist in the implementation of a voluntary agreement in the construction and demolition sector.
- Italy: Pisa aims to be a *sustainable city*. The regulations were imposed for a trial period of one year, and then to be revised, and apply to all new and major refurbishment projects. They set out the assessment system based on the ITACA Protocol, with scores on a scale of -2 to +5. All projects must achieve at least 0 on the scale, with financial incentives for higher scores in terms of subsidies and reduction in the fees payable for approvals. Requirements include for example minimum levels of energy efficiency, and outside the historic centre of Pisa all new and replacement heating systems must use at least 50% renewable energy sources.
- Romania: *Green Public Acquisition*. According to the national Green Public Procurement Directive, Romanian Public Authorities have some voluntary quotas for green public acquisitions including construction materials. The public authorities in Romania have the following targets for GPP regarding construction: 9% voluntary quota for green construction materials, 9% voluntary quota for green furniture, 100% mandatory quota for lamps. The initiative was started by NGOs (Terra Mileniul III, RoGBC, APMCR) and the government (Ministry of Environment and Forestry). It was started in an effort to adopt and transpose the Green Public Procurement Initiative at the EU level. It started as a formal alternative to government regulation, and has now become part of government regulation. A set of regulations have been laid down on processes, procedures, and products delivered by initiative members (i.e. strong regulation applies); the initiative is however not monitored.
- Sweden:
  - Malmö: Bo01, City of Tomorrow: European Building Exhibition and sustainable city development, which was supported by the EU.

- The Building and Living Dialogue, an initiative that consists of voluntary agreements between the Government and different actors within the sector of property-owners and managers, construction sector and others. The aim of the dialogue is that those that are taking part want to get beyond what regulations stipulate. The target is to reach a sustainable construction sector before 2025, mainly concerning a good indoor air, efficient use of energy and the use of natural resources. The result of the efforts of the participants has been presented in a booklet. The Building and Living Dialogue as a whole is evaluated by an independent consultant. The environmental objectives and especially the sub-goals are continuously monitored and evaluated by an special organisation formed for that purpose.

- UK: The Olympic Development Authority (ODA) has set specific environmental and sustainability targets for the developments and urban regeneration connected to the 2012 Olympic site.

5. DISCUSSION

5.1 Introduction

This chapter uses a broad brush to describe the current state of affairs in the EU-27's approaches to sustainable construction, and the actions the European Commission could take to improve this state of affairs. Note that not all 27 member states are covered in this chapter. The chapter starts with a brief overview of the structure of the building regulatory regimes of the 23 member states covered in this report, with a specific focus on sustainable construction (5.2). The chapter continues with a discussion of EU member states regulatory approaches towards sustainable construction (5.3). Then it discusses the coherence and efficiency of the EU-27 sustainable construction regulations (5.4). The chapter concludes by discussing whether and how these regulatory approaches to sustainable construction do (not) meet the criteria of Better Regulation and Smart Regulation.

5.2 Structure of EU-27's building regulatory regimes

5.2.1 Sustainable construction regulation

A wide variance in EU-27's approaches towards sustainable construction can be witnessed. A detailed analysis is presented in chapter 4. Table 5.2a provides a broad overview of the attention paid to various sustainability topics addressed in the questionnaire.

Table 5.2.1 - Attention paid to sustainable construction topics per country

Topics		AT	BE	BG	CY	CZ	DK	EE	FI	FR	DE	HU	IE	IT	LU	MT	NL	PL	RO	SK	SL	ES	SE	UK	NO
Ecological quality	Energy	+	+	+	+	+	+	-	+	-	++	-	++	+	+	+	+	++	+	-	-	++	+	++	+
	Water	x	+	++	--	--	--	x	?	++	-	-	+	++	x	+	x	+	-	-	-	+	+	-	-
	Waste	++	++	++	++	+	++	+	+	x	++	++	-	+	+	-	+	+	+	++	++	-	x	++	++
	Other	+	-	+	-	+	--	--	?	-	+	+	+	+	+	+	-	+	-	+	+	+	-	+	-
Economic quality		+	+	+	+	+	-	-	--	-	+	-	+/-	+/-	-	--	+/-	+/-	-	+	+	-	+/-	+	+/-
Social quality		-	+/-	+	+	--	+	--	--	+	+	+	+	+	+/-	--	+	+/-	+	-	-	--	+	+/-	+/-
Functional quality		+	+	+	+	+	+	+	+/-	+	+	+/-	-	+	+	+	+	+	+	+/-	+/-	+	+	+	+

++ = all questionnaire topics regulated; + = more than half of questionnaire topics regulated; +/- = half of questionnaire topics regulated; - = less than half of questionnaire topics regulated; - = a few of questionnaire topics regulated; x = none of questionnaire topics regulated; ? = unknown

In most of the EU-27 sustainable construction regulations are set on a national level. In some countries these regulations are complemented by regulation set on a regional or local level. The major exceptions of this more general approach are Austria, Germany, Belgium, Spain, Italy and the United Kingdom. In Spain, Austria and Germany sustainable construction regulations are set on a national level, but the regions adapt these to their own needs. In Belgium different levels of authority legislate over different requirements in Flanders and Wallonia. In Italy they have been set up to now at a provincial or commune level, with significant differences, but national government is trying to bring in a national regime. And, finally, in the United Kingdom different regulatory systems exist in 'England & Wales', in Scotland and in Northern Ireland, but with broadly similar provisions.

5.2.2 Enforcement of the sustainable construction regulation

The actual process of enforcement in the EU-27 is to some extent comparable. In order to be allowed to start construction work a building permit is required. Often the building permit has a focus on both technical requirements, zoning and environmental aspects. (Sometimes a separate planning permit or environmental permit is required, see section 3.2). In most EU-27 Member states an application for a building permit needs to be made at the relevant authority, often a local building authority. Upon receipt this authority will check compliance with building regulations and other mandatory requirements (laws, decrees, ordinances, standards etc.). If compliance is found, a building permit is issued. During construction, construction work is often subject to enforcement. Site inspection is carried out by, again often, a local building authority. Upon completion of a building often a final inspection is carried out. If the construction is found to be in compliance, an occupancy permit is issued and the building may from that moment on be occupied.

Much variance to this general approach exists in the EU-27. For instance, in some countries a permit may only be applied for by a professional designer, whereas in other countries anyone (e.g. a landlord, building owner, design professional, constructor) can apply for a permit. Then, in some countries only public authorities are allowed to carry out building plan assessment and site inspections, whereas in other countries this can be done by private sector inspectors as well. In Spain, for instance, responsibility for control lies entirely with the professionals, with their competence and their signatures at each stage checked by the provincial professional *colegio*, and no inspection by local government. Finally, not all countries have introduced the system of a final inspection as a requirement for an occupancy permit. Here there is no formal document stating that the finished construction work does comply with the regulations.

Note that not all sustainability aspects are enforced in a similar manner within the countries addressed (see chapter 4 for a detailed discussion). On the level of building plan assessment most attention is paid to energy, water and various aspects of social and functional quality. On the level of construction work assessment, most attention is paid to energy, waste and functional quality. On the level of pre-occupation assessment most attention is paid to energy and functional quality. Finally, on the level of assessment of constructions in use most attention is paid to energy. Yet, respondents from various countries indicated that enforcement of sustainable construction regulation has limited attention compared to, for example, more traditional areas of building regulation such as structural and fire safety. This general lack of attention to the enforcement of sustainable construction regulation poses serious questions to the effectiveness of these regulations (see also 5.4).

5.2.3 Clustering member states and approaches to sustainable construction

Using a broad brush of generalization when looking at the topics of sustainable construction as addressed in EU-27's regulatory systems, a number of patterns emerge:

- From the four general criteria, *ecological quality* receives full attention in all the EU-27's building regulation systems. Within this criterion the topics energy, waste, pollution and the protection of biodiversity are in some way addressed. Water efficiency/conservation techniques and the minimization of resources receive less attention.
- The criteria *social quality* and *functional quality* are included in most EU-27's building regulation systems.

- *Economic quality* as criterion for sustainable construction receives limited attention in EU-27's building regulation systems.
- Although the actual regulation of sustainability topics may be considered to have attention throughout the EU-27, the actual enforcement of these regulations seems to fall short. This raises serious questions on the extent to which the underlying goals of these regulations will be accomplished.
- On a country level (and sometimes even on regional level) there are different approaches to the different aspects of sustainable construction regulation. Where one topic (e.g. energy performance) is regulated in performance-based terms and faces strict enforcement, another topic may (e.g. waste production) may very well be regulated in prescriptive terms and facing lenient or no enforcement at all.

Especially this wide variance in approaches to sustainable construction regulation makes it difficult to find 'clusters' of approaches to building regulation and enforcement of these regulations, although a typical division includes the usual:

- Anglo-Saxon model: generic basic requirements, plus voluntary guidance documents and standards, and advice-based building control officers;
- Germanic model, based on detailed regulation (often on the level of construction products), plus strict control on registration and control of professionals and artisans;
- Napoleonic model based on decennial liability and insurance, with technical control bureaux;
- Spanish model, based on strict control on registration of architects, technical architects and engineers, with total responsibility to the professionals;
- A Nordic model, with a strong focus on self-regulation and self-assessment at the level of builders and building owners.

Besides these typical models, a division could be made between:

- countries with a unified/centralized building and planning code, like the Netherlands and Sweden, versus countries with regional or provincial regulations (but often based on a central or federal format), like Germany, Austria, Spain, Italy;
- countries with a long history and development of sustainable construction regulation, like Germany and UK, and countries where many aspects of sustainable construction are not part of the building permit procedure or in the legislative background, like the former communist countries (Hungary, Czech Republic, Slovakia).

Yet, the practical value of such clustering to the European Committee is questionable. Although some clusters may be considered leaders in sustainable construction (see also 5.4), their particular institutional, cultural and geological circumstances may hamper the travelling of their 'good practices' from one cluster to another. At the same time this may be the major lesson learnt from this attempt to cluster countries: a one-size-fits-all solution to sustainable construction is unrealistic. When introducing future frameworks, or when taking future action the European Committee should keep in mind that frameworks and action taken provide enough room on the level of the member states to include national, regional and local circumstances.

5.2.4 Voluntary programs and complementary programs

When looking at the current state of affairs in sustainable construction in the European member states it becomes clear that voluntary programs and complementary programs provide a major role.

Overall it may be concluded that many of the initiatives highlighted by respondents may best by typified as public-private initiatives, or government-supported private sector initiatives. Mostly these initiatives aim at raising awareness or setting benchmarks, as for instance the Green Building Councils in the various countries analysed do; or aim at providing assessment tools for the monitoring of sustainable construction initiatives, such as the SBTool, used for example in the Czech Republic and parts of Italy, the Code for Sustainable Homes in UK, and the HQE in France – tools to evaluate sustainability aspects and environmental impacts of buildings.

Sometimes the government takes an initiative for an assessment or rating system for the public buildings, followed by a joint public-private initiative to further develop this system. For instance in Germany, where the Federal government developed the guideline for sustainable construction '*Leitfaden für Nachhaltiges Bauen'*, which is compulsory for federal buildings, as the government commits to fulfil the requirements of the guideline. The federal government and the German Green Building Council (DGNB) developed in a joint project these *Leitfaden* into the '*Bewertungssystem Nachhaltiges Bauen für Bundesgebäude*', BNB (Sustainable Building Evaluation System for Federal Buildings).

Three types of such regimes are distinguished: facilitating and promotional initiatives, self-regulatory initiatives, and locally driven voluntary or complementary initiatives.

Facilitating and promotional initiatives
Many governments act as facilitator and promoter of sustainable construction initiatives. Facilitation is taken up by collection and dissemination of information on good practices, the provision of funds for early adopters to (partly) take away the financial risks for businesses that are related to sustainable construction, or the facilitation of an organizational structure for businesses and public agencies to collaborate.

Self regulatory initiatives
With self-regulatory initiatives, representative organizations or groups within the construction industry or client/building owners aim to contribute to sustainability goals. The reasons for doing so may partly be found in economic motives (self regulatory initiatives may be marketed as corporate social behaviour aiming at convincing consumers to use/buy/consume their products), partly in motives to prevent future governmental regulatory requirements (self regulatory initiatives may show that no additional regulation is necessary as the industry is able to deal with sustainability topics itself), and partly in altruistic motives.

The advantage for both governments and the construction industry of these forms of self-regulation is that industry actors can tune the design of these initiatives to its own characteristics, needs and wishes. This is likely to enhance support, efficiency and effectiveness and thus legitimacy of these initiatives. Due to the characteristics of the construction industry – known for its conservatism and fragmented structure – it would be very difficult for govern-

ment to achieve comparable results with one-sided forms of intervention. The disadvantage of such initiatives is (market) protective behaviour by the industry, and a false sense of sustainability. Protective behaviour might be the setting of high entry criteria to self regulatory programs, making it hard for competitors to enter the initiative. A false sense of sustainability might occur when it becomes (too) difficult to actually oversee the action taken by the industry in reaching sustainability goals.

Locally driven voluntary or complementary initiatives
Locally driven and complementary initiatives are often introduced in addition to existing regulations with a specific focus to make the initiative fit to local circumstances (e.g. culturally, institutionally, climatologically). The major advantage of such initiatives is that they bring together regulators and regulatees. This may result in initiatives that are supported by the latter, possibly having a positive impact on regulatees' willingness to comply with the initiatives regulations. These local initiatives give room to bottom-up processes, in which local stakeholders can decide on strategies that are deemed effective and efficient and that respond to local priorities. Sometimes these local initiatives are stimulated and supported by the national government or the EU, for example in the form of knowledge support or subsidies.

Known organizations in this field are ICLEI, Eurocities and the Committee of the Regions. Also in the field of climate change, there are several organizations which unite local authorities in their goal to reduce the effects and adapt the built environment of these cities and towns to changed circumstances.

For all these types of voluntary and complementary initiatives, an envisaged role for the European Commission is to organize a (web-based) portal for collecting information on these initiatives. During the research (especially during the round table meetings) it was often found that both public sector and business representatives are unaware of good practices and evidence based policy making from elsewhere. They mentioned that it is hard to find such good practices and evidence based policy making, often simply for the fact that there is so much information available, but the quality of this information often falls short – i.e. good practices are presented as 'success stories', but little information is available on the underlying reasons why or how these practices became a success.

Another role for the European Commission may be to undertake research into the actual development of these initiatives. Given such initiatives' ability to be an alternative, complement or substitute to existing public policies, it may be of interest for both governments and the construction industry to have a better understanding of how contextual or institutional conditions may be set as to provide fertile ground for voluntary initiatives to develop. The EU could play a role in this, e.g. by bringing various initiatives together, by studying which parts of these initiatives are commonly accepted and fit to be put into regulation, by stimulating the widening of issues to be addressed in these initiatives.

The LMI acknowledges that sustainable construction can best be stimulated by a mixture of governance arrangements, initiated by public and/or private actors at multiple spatial and administrative levels. For the LMI it is especially interesting to focus on how voluntary initiatives are embedded in or related to regulatory, non-voluntary initiatives. Stand-alone voluntary initiatives do not seem to result in any joint progress in sustainable construction.

5.3 Regulatory approaches of EU-27 to sustainable construction

Chapter 4 provided in-depth insight into the state of play of sustainable construction regulation in the EU-27. This section briefly highlights how, EU wide, the criteria related to ecology, economy, social aspects, and functionality are addressed; and whether and how the EU might take action to improve this.

5.3.1 Ecological quality

Ecological quality by far receives most attention in the different regulatory frameworks analysed. All countries' frameworks have a focus on the energy performance of buildings. A strong EU directive (EPBD) may be considered the driver for this widespread inclusion of energy performance-related regulation in the various countries' regulatory frameworks.

Water conservation/efficiency receives limited attention in the different regulatory frameworks analysed. Given the increasing demand for clean water there seems a need for action, possibly to be initiated by the EU. Given the current state of technology a minimal start might be to aim for the introduction of water efficiency techniques. At the same time it may be argued that the successful introduction and adoption of the EPBD could be an example to follow for this particular topic. This holds more true as water quality receives considerable attention at EU level, for instance in the EU Water Framework Directive.

The *limitation of waste* is widely addressed in the building regulatory frameworks of the countries analysed (presumably as a result of implementation of the Waste Framework Directive). Here there seems little need for EU intervention in the form of additional directives, harmonisation or standardisation. The EU could however aim at developing voluntary performance targets for waste reduction. Targets could for instance be set to the production of waste during construction, with limits to bulk volume per construction material. Voluntary performance targets may be a driver for future regulation and may also help in making builders aware of the wastes they produce.

The *protection of biodiversity on building sites* widely addressed in the construction regulatory frameworks of the countries analysed. Again we find a driver for such regulations in EU directives.

The *minimization of using resources* hardly has attention in the regulatory frameworks analysed, although some countries (Netherlands, Finland, Austria, see the previous paragraph) are considering to develop requirements/standards on this topic. Given the built environment's demand for resources this might be a topic that requires future EU intervention (as already taken up by the current work of CEN/BT WG 206 and CEN/TC 350). A start could be to aim at developing voluntary performance targets. Targets could for instance be set to the use of recycled concrete or steel in structures. Again this may on the one hand help to gain insight into how such regulations may work over time; and on the other hand to raise awareness on the specific topic. A EU wide directive seems of less avail given the impact of local characteristics on resources available and needed. Note that the 7th Basic Work Requirement of the Construction Products Regulation addresses the use of resources.

5.3.2 Economic quality

Economic quality as criterion for sustainable construction receives little attention in the building regulatory frameworks analysed. Again here we stress that the actual construction process of buildings requires a severe amount of energy, water and resources for temporary structures – which, on their turn, result in construction related waste.

Hardly any country analysed has introduced regulations aiming at the *effectiveness and efficiency of businesses*. This is not surprising, because business efficiency is considered in most countries to be a matter for the market. This is also a fundamental principle of the market economy and EU industrial policy. Yet, inefficient and ineffective businesses may use more resources (time, money, materials) than actually needed. Sustainability may be considered a principle that should be implemented throughout the whole lifecycle of a building – e.g. the design, development/construction, use and demolition of buildings. However, besides raising awareness on the topic there does not seem to be much action the EU could take related to this topic.

Regulation to ensure the *support of local diversity* is taken up by a range of local and national governments. Supporting local diversity requires tailored policy making. Setting frameworks or directives on an EU level might surpass the actual possibilities to provide tailored policies. Here again the EU could aim at raising awareness about the topic and provide information on possible approaches to support local diversity. Through networking with local authorities information could be disseminated. Another road to take is the development of guidance for public procurement and the promotion of networks between public procurers and the construction industry.

Aspects related to the actual *management of the construction process* are hardly included in the regulatory frameworks analysed. Given the impact of a construction project on its surroundings and local population, more attention might be needed for this particular topic. Again local circumstances may require tailored approaches and regulation. Here the EU could aim at providing information and raising awareness, but only in terms of waste management, noise and dust pollution, and damage to the environment or property caused by heavy vehicles and equipment. Otherwise, the construction process is an economic activity subject to market forces.

5.3.3 Social quality

The different aspects that together make up the criterion social quality appear to receive different attention in the EU-27 building regulatory frameworks. Some topics are addressed in almost all countries analysed, whilst other topics are sparsely taken up.

The *adherence to ethical values during development* is currently hardly addressed in the regulatory frameworks analysed. This particular topic has a direct relationship with doing business – more ethical trading may provide more trust from consumers – and therefore might gain most from public-private initiatives or raising awareness in the market sector. Here the EU could aim at providing information and raising awareness in the construction industry, and promote and support public procurement, but of course this topic falls more under criminal law, equality etc.

The *provision of adequate local services and facilities* is addressed in all regulatory regimes analysed – mostly by local authorities. This topic therefore does not seem to need any EU intervention. However, provision for training space at workplaces may be a topic of future concern. Here a link might be made with the earlier discussed provision of local employment. The EU could aim at providing information and raising awareness in the construction industry, and promote and support public procurement.

The *provision of housing that meet needs* is addressed in most regulatory regimes analysed. But this topic falls more under the heading of social housing (which is primarily a local responsibility within national social policy), then under sustainability. Yet, here the EU could aim for the specific support of countries which have not yet included this topic in their regulatory frameworks. Providing information and raising awareness appear suitable strategies.

The *integration of development* in a local context is addressed in many of the regulatory regimes analysed. Mostly local governments set regulations to these topics. To improve the inclusion of this topic in the EU-27's construction regulatory frameworks the EU could aim at providing information and raising awareness. A general EU directive seems of less avail given the local approach, and thus tailored policies, needed to take up this topic.

The *conservation of local heritage* is addressed in a majority of the construction regulatory frameworks analysed. As with many of the other topics that together make up the criterion social quality this topic appears to require tailored policies. Thus the EU could aim at raising awareness on the topic and provide information to national and local governments on how to address it in their regulatory frameworks.

The *provision of access to green space* again is a topic that in most of the regulatory frameworks analysed is taken up – predominantly by local authorities. Given the absence of EU directives in other planning areas this topic does not seems to require additional EU intervention. The EU could however aim at the development of guidance for public procurement. An illustrative example here is the work of the (informal) EU Working Group on Public Participation that provided a Guideline related to public participation during the implementation of the Water Framework Directive. This working group provided information on which parties to involve (the public in general, organized stakeholders, etc); on what levels this could be done; and what action could be taken (information supply, consultation, hearings, etc). Related to this particular topic a similar working group could be set up to analyze public procurement in the various member states, and disseminate information to local governments, organizes stakeholders, and interested citizens.

5.3.4 Functional quality

Given a clear link with more traditional topics of building regulation – such as healthiness, safety and usability – it is not striking to see that many of the topics that make up the criterion functional quality are addressed in many of the building regulatory frameworks analysed.

Design optimization is addressed in the majority of the regulatory frameworks analysed. However, two topics stand out as non-regulated: the planned service life of constructions and the planned service life of building services. Many countries have done a lot of research and produced guidance on LCC – life cycle costing. This doesn't seem to be a topic for regulation.

In general constructions outdate their economical lifespan – e.g. a dwelling's economical lifespan may be 30 years, whereas its technical lifespan may be over a hundred years. To ensure sustainable construction on a long term, these topics seem to need more attention. Here the EU could aim at providing guidance, pilot schemes, and raising awareness. For instance, a EU Working Group could address the lifespan of buildings throughout Europe, collect best practices on how existing buildings are refurbished in order to meet contemporary sustainability criteria, and disseminate this information to local governments and industry stakeholders.

Most countries have set regulations to the *building envelope*. In countries respondents refer to such regulation having a background in an EU directive. Given the current attention to the particular topic and given the local climatological conditions that affect the functioning of the building envelope a general EU directive might work best if it only sets outlines – a performance based approach. For instance, general requirements could be set to the weather tightness of buildings, but room should left to the individual member states to fill in these requirements. This as the climatologic condition in Denmark may be considered considerably different from those in Greece. Enforcing these national requirements most logically remains a responsibility for the member states, the EU could however assess whether and how the member states have filled in the general requirements. The Construction Products Directive already addresses this topic.

Health, comfort and user satisfaction are, like the previous topic, taken up in most of the regulatory frameworks analysed. Again here local climatological conditions have a major impact on this topic. Thus, might the EU strive for a general EU directive on this topic, such a directive might work best if it only sets outlines. Some participants of the round table meetings suggested that the European Commission should pay more attention to indoor air quality, since this is considered to be a common European problem (it doesn't depend on the climatic and geographic conditions).

All countries analysed have set regulations to ensure the *accessibility of buildings for the disabled*. Some respondents refer to such regulation having a background in an EU directive. Given the general inclusion of this topic in the different regulatory frameworks, additional EU directives do not seem necessary – unless more harmonization of such regulation is sought for.

Some of the topics addressed that relate to *safety* may be considered to be more traditional topics of building regulation. These are already generally included in the regulatory frameworks addressed.

5.4 Coherence and efficiency of sustainable construction regulatory frameworks

5.4.1 Coherence

Coherence may be considered on two levels. First, the coherence of the actual building regulations, sustainable criteria and topics addressed. Second, the coherence of the regulatory framework in that it not only aims at regulation but also ensures the enforcement of regulation.

Coherence as a holistic approach

Considering the coherence of regulatory frameworks none of the frameworks analyzed can be typified as coherent if we would consider coherence as the addressing of all topics addressed in the questionnaire. When counting the number of sustainable construction topics addressed[15] in the analysed regulatory frameworks an image appears as provided in Figure 5.1.

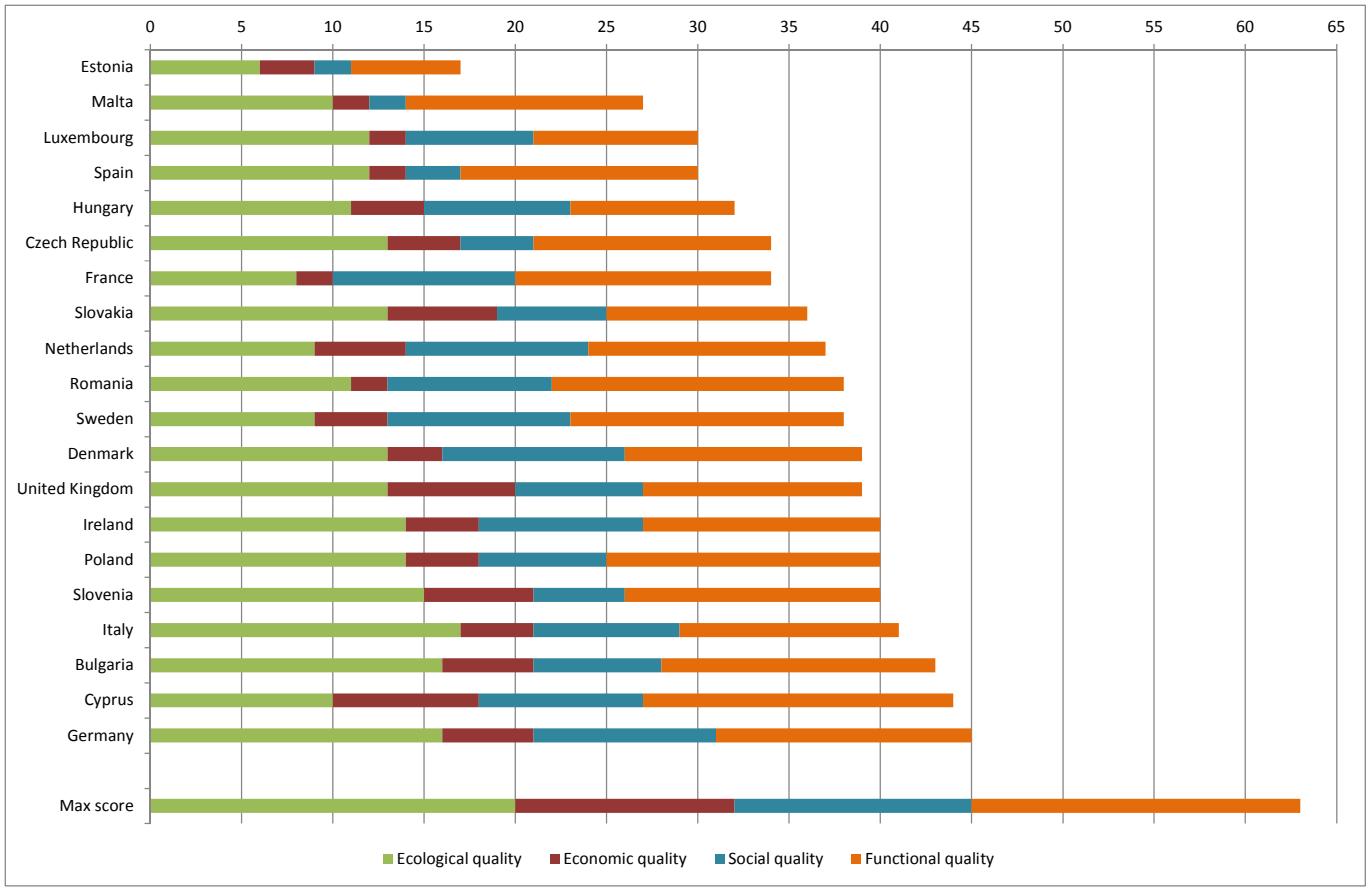

Figure 5.1 – An overview of the number of sustainable construction related topics per criterion, per country, for new development. The 'max score' indicates the maximum score would all 63 topics mentioned in the questionnaire be addressed. Note: understanding the difficulties of the taken approach, this figure presents a simple count of the number of topics related to sustainable construction as specified by the different respondents. It should not be considered as a benchmarking tool. The table only includes those aspects that were considered to be regulated by governments.

None of the countries analysed fully addresses all these criteria in their building regulatory frameworks, although the German '*Leitfaden für Nachhaltiges Bauen*' can be considered as a semi-official act which deals with sustainability in a direct and, in the view of this research, holistic manner (relying on many regulations, laws, act, ordinances), and which is mandatory for public buildings.

[15] As discussed, a broad brush was used to compare the different criteria and topics. Here we only aim at showing the level of coherency. It is impossible to give value to the criteria or even the different topics. As such each and every topic is given the same value.

Some countries (for example Netherlands, Finland, Austria) are considering to develop sustainable requirements and standards for construction works, based on LCA-methodologies, to be included in their Building Codes. By doing so they prepare themselves for the Construction Products Regulation that introduces the 7th Basic Work Requirement, which deals with recyclability of construction works, their materials and parts after demolition, durability of the construction works, and use of environmentally compatible raw and secondary materials in the construction works. Together with the 6 other Basic Work Requirements, which are already regulated in their Building Codes, this can be considered as a kind of 'integrated' or holistic approach to sustainable construction. But the Building Codes only encompass the technical building aspects, and not the planning/zoning aspects, which remain mainly a local responsibility.

Of course not all topics are suitable for 'regulation', and the objective is not to regulate everything! As mentioned before, there are areas which seem not proper for sustainability regulation, like areas which are properly the domain of criminal law (ethics), social policy (social housing), economic aspects (which are subject to market forces), competition policy (industry economics) or urban planning (mixed tenures, etc).

In some countries (like Estonia) many quasi-mandatory requirements add to the governmental regulations. At the same time in many countries, for instance Bulgaria (see chapter 4), there is a difference between 'formal regulation on paper' and actual compliance and control of regulation in practice. In a country like UK there are hardly any legally binding provisions at the detail level discussed in this report. Most of the requirements are set at the local authority level and they are based on policies and voluntary guidance (actually applied and so becoming 'requirements' only at the level of individual projects).

Given the major differences between the member states' approaches to sustainable construction regulation it is difficult to highlight leaders and laggards. Overall, all countries do, to a certain extent, address at least some of the topics related to sustainable construction per criterion addressed in the questionnaire – most countries have regulated roughly 30 to 40 of the 63 topics addressed. They do so however in their own way.

An envisaged role for the EU should be to promote the development of a competitive internal market in construction services and products for sustainable construction, by removal of any barriers caused by differences in the EU-27's approaches to sustainable construction. Besides paying attention to 'traditional' aspects of sustainability, such as energy performance, more attention should be paid to removing any unnecessary disparities in regulation of aspects of sustainable construction that currently are at the fringes of the EU-27's regulatory frameworks, such as 'adaptable building' – constructing buildings that may be adapted to changing needs.

Coherence in regulation and enforcement

Chapter 4 and section 5.3.2 discussed the state of affairs considering the enforcement of sustainable construction regulation in the countries analysed. When evaluating the coherence of the regulatory frameworks addressed from this point of view, it should be concluded that, possible with the exception of Germany, none of the frameworks analysed is coherent. To put it simple, the enforcement of sustainable construction regulation falls short in reaching the goals of the sustainable construction regulations in the countries analysed.

At the same time another trend can be perceived. In many countries private sector actors are involved in enforcing regulations. This trend is considered positive given the often highly technical and specialist nature of sustainable construction regulation. It is often found that public agencies are predominantly staffed by generalists. Private sector organisations (and their) staff are often better able to specialize than public agencies are.[16] When it comes to the enforcement of specialist regulations it may be assumed that specialists are able to reach a higher level of assessment. Table 5.4.1 provides an overview of involved enforcement actors (public, private or both) per topic.

Table 5.4.1- Enforcement of regulation (all phases) per topic

Topics		AT	BE	BG	CY	CZ	EE	FR	HU	LU	MT	NL	PL	RO	SK	SL	SE
Ecological quality	Energy	both	both	pub	both	pub		priv	priv	priv		pub	both	both	both	priv	
	Water	both	pub	both		pub		pub	priv		both				pub		
	Waste	both		pub	priv					priv			pub		both		
	Other	both		pub		pub						pub	pub		both	priv	
Economic quality				both	both		pub										
Social quality		both		both	both				both	priv		pub	both	pub	both	priv	pub
Functional quality		both	pub	both	both	pub		priv	pub			pub	both	both	both	priv	

Pub = enforcement by public agencies; priv = enforcement by private sector organization; both = enforcement by both public and private sector organizations; empty cell = no data available

Enforcement is necessary in reaching the underlying goals of sustainable construction regulation. It is therefore stressed once more that there is an important role for the EU here in raising awareness on the importance of enforcement of those regulations that are crucial for reaching the goals of sustainable construction, the support of alternative regulatory arrangements, and the provision of information on the enforcement of sustainable construction regulation.

It should be noted that currently action is undertaken in drawing up guidelines to support the enforcement of sustainable construction regulations. In many of the countries analysed currently Green Building Councils work on assessment schemes for sustainable construction. At the European level standards are developed to harmonize the derivation, verification and presentation of sustainable construction products and processes (e.g. CEN/TC 350). Construction industry representatives work on third party certification schemes that include the assessment of construction work (e.g. the Sustainable Building Alliance's common metrics). Standardized assessment schemes are a prerequisite for an effective enforcement of public sustainable construction regulations.

It should furthermore be noted that the actual implementation and enforcement of regulations has focal attention in the communication *Smart Regulation in the European Union* (European Commission, 2010), which appeared in October 2010. *Smart Regulation* may be considered the successor of *Better Regulation* that had a focus on simplification of legislation, reducing administrative burdens, impact assessment, screening and withdrawal of pending proposals, transposition and application of EU law, and codification and repeal (European Commission,

[16] Van der Heijden, J. (2009) *Building regulatory enforcement regimes*. IOS Press: Amsterdam

2006). *Smart Regulation* adds to this importance of the regulatory design the importance of appropriate and harmonious implementation, enforcement, evaluation and revision of regulations.

5.4.2 Efficiency

Regulatory efficiency is a disputed term. In this section three aspects of the efficiency of the EU-27 building regulatory systems are addressed:

- Flexibility and workability of regulations, with a focus on performance based regulation in combination with accepted solutions or deemed to satisfy solutions;
- Support for simplification and efficiency of regulation and removal of regulatory barriers to trade; and a focus on the public private interplay in the process of implementing (new) regulations;
- Speed and flexibility of implementation, with a focus on the defragmentation/harmonisation of different layers of government.

Flexibility and workability of regulations

A contemporary approach to regulatory design is to ensure the regulations' flexibility. It is argued that flexible and adaptable regulations are better able to deal with unforeseen and future circumstances than strict and detailed regulations. At the same time contemporary reasoning holds that regulations should challenge and allow regulatees to come up with innovative and alternative solutions to existing problems. This holds the more true for sustainable construction regulation which aims at solving existing (and possibly unknown) environmental risks through new approaches. It is therefore understandable that much is expected from performance or goal based regulation as alternative to prescriptive regulation. After all, performance based regulation states goals and objectives that reflect societal expectations and desires that need to be meet, but leaves it to the regulatee to decide how these goals and objectives are met – thus challenging regulatees to do so in an efficient way.

There is however a major risk related to performance and goal-based regulations: they can be too open and provide too much room for flexibility. Often it is concluded that both regulators and regulatees encounter difficulties in understanding when the goals or performance of this type of regulations are met - i.e. what complies, and what does not? A solution to such risks is the introduction of accepted solutions or deemed-to-satisfy documentation. Such documentation states solutions that meet the goals or performance level required, but are not compulsory – i.e. the regulations themselves provide room for innovation, the documentation merely is a guideline for possible approaches to come in compliance. Critics will say that such documentation stands in the way of goal or performance based regulations' ability to truly stimulate innovation as many will consider this documentation as the minimal level that should be reached in order to reach compliance. As such it could be argued that a too strong dependency on such documentation brings back goal-based or performance-based regulation to prescriptive regulation. At present the major problem with accepted solutions documentation is that there is no EU institution to produce them, only national building research bodies, so they naturally become national barriers, which can be high-jacked by the national industries to create protected markets.

When analysing the data from the survey questionnaire it may be concluded that many EU member states have now introduced performance based building regulations. At the same

time it may be concluded that only a few countries have introduced documentation on accepted or deemed-to-satisfy solutions – see table 5.4.2a. Here a role for the EU could be to raise awareness that performance-based regulation is a means to an end, not an end in itself. In order to ensure flexible and workable regulations, performance-based regulation may need to be accompanied by documentation on accepted or deemed-to-satisfy solutions. The role for the EU must therefore be to monitor such documentation to ensure that it does not creat national protected markets, and that any deemed-to-satisfy solutions are made available to the industry in all member states.

Table 5.4.2a - Type of regulation (goal/performance based or prescriptive) and availability of accepted solutions or deemed to satisfy documentation

Topics	AT	BE	BG	CY	CZ	EE	FR	DE	HU	LU	MT	NL	PL	RO	SK	SL	SE
Type of regulation:																	
- predominant prescriptive	X								?				X				
- predominant goal/performance based		X	X	X	X	X	X	X	?	X	X	X		X	X	X	X
Accepted sollutions/DTS																	
- predominant not available				X	X	?	X					X			?		
- predominant available	X	X	X			?		X	X	X	X		X	X	?	X	X

Note this table provides insight into the form of regulation of sustainable construction regulations – as experienced by questionnaire respondents. This may provide an overly positive view of the use of performance regulation throughout the EU-27. More traditional aspects of building regulation are drawn up in performance based terms in many EU member states.

Support for regulation

The second aspect of efficiency considers the approach to rule making and rule implementation. The traditional approach to rule making and rule implementation is top-down: regulation is drawn up in governmental agencies and implemented once developed. Over the years however this hierarchical approach to rule making and implementation is criticized for resulting in a lack of acceptance of regulations by those subject to it. It became clear that more acceptance of regulations was to be expected if those regulated were involved in the actual development of such regulations. Furthermore, regulations may become more efficient when those subject to these are involved in the implementation process. After all, it is the regulatees who are most knowledgeable of their own field. As such these are the actors that know best what should be regulated and why.

Nevertheless, when looking at the actual development and implementation strategies of sustainable construction regulation throughout the EU-27 it becomes clear that in most countries a traditional top-down approach is followed. In table 5.4.2b distinction is made amongst top-down government led approaches amongst rule making and implementation (T); bottom-up industry led approaches to rule making and implementation (B); and government and industry collaborations.

Table 5.4.2b - Predominant approach to rule making and implementation

Topics		AT	BE	BG	CY	CZ	DK	EE	FR	DE	HU	MT	NL	PL	RO	SK	SL	SE
Ecological quality	Energy	G&I	G&I	T	T	B	T	T	G&I	G&I	B	T	G&I	T	B	T	T	T
	Water		B	T	T	B			G&I	G&I	B	T	G&I	T		T	T	T
	Waste	G&I	B	T	T	B	T	T	G&I	G&I		T	G&I	T		T	T	T
	Other	T		T					G&I	G&I			G&I	T		T	T	
Economic quality			B	B	G&I	B			T	B			G&I	T		T		T
Social quality		G&I	T	T	T	B			T	G&I		T	G&I	T	T	T		
Functional quality		T	G&I	T	T	T	T		G&I	T		T	G&I	T	T	T		T

T = top-down approach; B = bottom-up approach; G&I = government and industry collaboration; empty cell = no data available

Again with reference to the communication on *Smart Regulation in the European Union* (European Commission, 2010) (see 5.4.1) this is a relevant issue. *Smart Regulation* explicitly brings up the strengthening of the voice of citizens and stakeholders as an essential element for developing and evaluating policies.

Here the European Commission could take up a role of raising awareness at country level on the importance of including the building users and industry in the development of sustainable construction regulation – whilst keeping in mind the risk of regulatory capture when including industry players in rule making.

It should be noted however that, considering sustainable construction, we are talking about new approaches, new technologies, new solutions, often requiring radical changes in the supply industries. The actors are sometimes highly resistant to any change, so a bottom-up approach cannot always be the best way. (It is only the dominant, often monopolistic suppliers who support/promote new approaches, when they control the know-how, for protectionist reasons).

Speed and flexibility of implementation

Also the number of layers of government that are involved in rule making and implementation affects the speed and flexibility of this process. For example, in the Netherlands the technical building regulations are established on a national level (Building Decree) and cover all kinds of constructions, new and existing. Provinces and municipalities cannot impose their own requirements. This allows new technical requirements to be introduced relatively efficiently. As a result of different governmental structures and historical developments, many of the European countries face more layers of government involved in rule-making and implementation. It may be argued that the more layers of government involved, the less efficient process of implementation. At the same time it may be argued that the lower the level of governments involved in implementation, the wider local of regional variance in regulation – which hampers businesses ability to be efficient. Table 5.4.2c provides an overview of the predominant responsible actor(s) for the implementation of sustainable construction regulation in the EU-27.

Table 5.4.2c - Predominant responsible actor(s) for the implementation of sustainable construction regulation

Topics		AT	BE	BG	CY	CZ	DK	EE	FI	FR	DE	HU	IE	IT	LU	MT	NL	PL	RO	SK	SL	ES	SE	UK
Ecological quality	Energy	2/3	2	1	1	1	1	2	1	1	1/2	1	1	1/2	1	1	1	1	1	1	1	1	1	2/3
	Water		2	1	1	1	1			1/2	1/2	1	1	2		1	1	1	1	1	1	1	1	2/3
	Waste	1/2	2	1	1	1	1	2	1		1/2	1	3	1/2	1	1	3	1	1	1	1	1	1	2/3
	Other	1/2	2	1	1	1	1/3	2	1	1/2	1	1	1	1/2	1	1	1	1	1	1	1	1	2/3	2/3
Economic quality		2/3	2	1	1	1	1/3		1		1/2/3	3	1/3	3	3		1/3	3	3	3	3	2/3	1	2/3
Social quality		1/2/3	1/2/3	1	1	3	1/2	2	1	1/3	1/2/3		1/3	1/2/3	1	1	1/3	1	1	1	1	1/2/3	1/3	2/3
Functional quality		2/3	2/3	1	1	1	1	3	1	1	1	1	1	1/2	1	1	1	1	1	1	1	1	1	2/3

1 = national/federal government; 2 = regional/provincial government (and countries in the UK); 3 = local/municipal government; empty cell = no data available

Here the European Commission could take up a role of further streamlining the implementation process of regulations on the level of the member states. Again this relates to the communication on *Smart Regulation in the European Union* (European Commission, 2010) (see 5.4.1) where this is a relevant issue. *Smart Regulation* explicitly brings up the shared responsibility of the European Parliament, Council and advisory bodies *and* the member states in improving regulation.

6. CONCLUSIONS AND RECOMMENDATIONS

On the basis of discussions in the previous chapters, this final chapter summarises the conclusions and general policy recommendations. First the chapter discusses the major trends identified in the EU-27 building regulation and enforcement (6.1). Then the 10 major conclusions are discussed (6.2). The chapter concludes with recommendations to the European Commission on future actions within the LMI on sustainable construction (6.3).

6.1 Trends and relevant issues in general building regulation and enforcement

Although a wide range of variety in the EU-27 formal building regulatory systems can be traced, a number of trends and relevant issues are worth highlighting for the particular study on sustainable construction regulation:

- Sustainable construction has attention in all building regulatory systems addressed. There is however no single 'European' approach to sustainable construction, neither is it possible to find patterns or clusters of countries that address the topic in a comparable way.
- Only a limited number of countries predominantly uses prescriptive regulation in sustainable construction related topics. Most countries have a predominant performance based approach, or a mixed performance based/prescriptive approach to regulating sustainable construction, or have started with introducing the performance based approach in their building regulations. In general it is assumed that such performance based regulation will challenge regulatees to come up with innovative solutions to come into compliance. Especially for the sustainable construction themes highlighted in this study this is relevant as many of these themes are still developing and lack general information and standardized approaches on how to deal with the sustainability issues that are believed to come from building and construction work.
- Although sustainable construction has focal attention in the building regulatory systems addressed, consistent/ uniform/ harmonised enforcement of these regulations (to reach the goals of sustainable construction) falls short. Nevertheless, the range of countries that involve private sector enforcement actors as sole enforcers or as alternative or addition to governmental building control is growing. In general it is assumed that private sector organizations are better able to specialize in certain topics than public sector organizations. For the sustainable themes highlighted this is relevant as the enforcement of sustainable construction regulation will request a high level of knowledge and expertise.
- Most countries have organized building regulation at a national level, be it as worked out documents or as a framework setting the outlines, but leave the implementation – and often the working out of the details – and enforcement to the local level. Again this is relevant for the sustainable construction themes highlighted. Currently there is a growing awareness that the addressing of environmental problems resulting from the development and operation of constructions should be taken up at the local level, the most appropriate level for intervention since many of these environmental effects tend to be local and because local actors (public and private) tend to have more knowledge of local opportunities for preventing or solving environmental problems.
- Finally, throughout Europe public agencies and businesses work together in addressing the environmental risks the construction sector poses. Furthermore, throughout Europe businesses organize themselves in voluntary organisations addressing these environmental risks.

6.2 Conclusions

1. A strong focus on energy and other ecological aspects (convergence)
Ecological aspects of sustainable construction, and especially energy (see for example, RICCS, 2009), receive major attention in the regulatory frameworks analysed. At the same time the topics that together make up economic quality and, to a lesser extent, the topics that make up technical execution and the quality of the construction process receive limited attention. In short, none of the countries studied currently has a *holistic* view on sustainable construction (as defined in chapter 4) in their building regulatory systems. However, it should be repeated that not all topics are suitable for 'regulation', and the objective is not to regulate everything possible.

Two explanations for the strong focus on energy and other ecological aspects can be considered. First, energy issues are easy to quantify and to measure and thus to define unambiguously and monitor and enforce, which makes it a willing subject to address with regulation. Second, under the influence of the climate change agenda sustainable development is often narrowed down to energy issues, which can count on high levels of support[17]. Especially on a local level, many programs focus on energy, since local politicians can formulate clear targets for which they can be held accountable.

2. Limited attention to the enforcement of sustainable construction regulation (implementation)
Throughout the EU-27 there appears little attention yet to enforcing sustainable building regulation in most of the various countries analysed. An explanation may be found in the fact that sustainable construction regulation is often highly technical in nature and requires well trained and well experienced specialists to enforce these. Wide-spread expertise has not yet developed: in particular most building control officials are in their late career and base their decisions on old experience. Especially in countries where building control is a pure public activity, mostly local governments, it is to be expected that these public sector actors lack specialized staff to properly enforce sustainable construction regulation. This often applies to the mandatory European EPBD energy assessment requirements, and more so to other sustainability aspects. At the same time it was found that in most countries analyzed both public and private sector organizations are involved in the enforcement of sustainable construction regulation.

This lack of attention to the enforcement of sustainable construction regulation may provide an even more negative view of the current state of affairs. The lack of enforcement may imply that many of the sustainable construction regulations highlighted have in fact symbolic value only. Regulation often needs enforcement to cause the intended effects. But at least it means that the disparity in regulations may not be creating the barriers to trade and competition that might occur if there were strict enforcement of disparate regulatory regimes.

[17] The main reason is that energy production and use generates CO_2 and other emissions and there is still not yet a functioning market for emissions, nor proper taxes to compensate for resource depletion costs. If there were, and it will take many decades to develop them, it would not be necessary to regulate energy use.

3. A role for voluntary and complementary initiatives (learning)
Voluntary and complementary initiatives seem promising and widely available throughout the EU-27. The advantage is that they can be tailored to local circumstances (institutionally and physically), need less time to prepare and can therefore be more innovative/cutting edge. Such initiatives often find more support and legitimacy since stakeholders involved address local issues. The disadvantages are a risk of cherry picking, regulatory capture, a lack of control and accountability and window dressing.

Cherry picking (addressing only the issues which are easy to solve) might bring the risk of fragmentation and, related, suboptimal policy results. It is highly unlikely that voluntary initiatives result in a holistic approach to sustainable construction as many issues are difficult and therefore expensive to address. Regulatory capture (private actors taking the initiative, but they also control the path) might result in a situation where the government loses its actual input in the development of sustainable construction regulation. Control and accountability may be lost since the initiators of the initiatives do so voluntary. They cannot be held accountable nor have any political responsibility. Finally, voluntary initiatives may be set up to hide the lack of initiative to address other topics ('window dressing').

Still, for policy practice the major advantage of voluntary initiatives may lie in their ability to teach us what works, under what circumstances and why. Voluntary initiatives, especially those small in scale, may be considered experiments in policy practice.

4. Little attention to existing constructions and renovations
Although much sustainable construction regulation applies to new development, only a few countries have introduced sustainable construction regulation to existing constructions and/or to renovations. Given the long lifespan of buildings (buildings often outlive their economic lifespan) and the slow replacement rate of buildings, it will take a long time for current regulation to have effect.

An explanation for this absence of sustainable construction regulation may be found in the EU-27's legal systems of property rights. It is often difficult to change a legal property right obtained in the past.

Several countries have, however, introduced financial incentives for upgrading the energy efficiency of existing buildings, mainly in the form of grants for insulation and double glazing, or new cladding installation of external thermally insulating composite systems (ETICS); and for renewable energy sources in the form of feed-in tariffs. These supply-side policies are surely relevant to LMI, i.e. promoting the development of a large competitive sustainable construction industry, but not directly to this study of regulatory systems, except as support to enable consumers to meet the regulatory objectives. The UK, for example has recently published a new 'Warm Homes, Greener Homes' strategy, aimed at introducing incentives for refurbishment of the existing housing stock to move towards the sustainable homes standards.

5. Little attention to the life span of buildings and building services

In line with the previous finding, we found little attention paid to the life span of buildings and building services in the building regulatory regimes analysed. There still appears a strong focus on the economic life-span of buildings instead of a focus on their (more realistic) technical life-span. Furthermore, little attention paid to the adaptability of constructions was found. There seems to be no attention to the issue of end-of-life demolition and decommissioning, which can generate difficult waste, pollution and toxicology problems.

The explanation for this might be sought in the past. After World War II many countries construction policies had a strong focus on rebuilding, reconstructing and providing housing for the growing population. As a result quantity (volume building) became leading over quality. Regulators responded to the needs in construction, and housing in particular, by implementing regulations that would provide for fast construction – buildings that would last for 30 years. These regulations and their reasoning have become institutionalised and still play a major role in today's construction industry.

In principle, however, life span and life cycle costing is a topic for regulation by the market and not by legislation[18] and the government and EU roles could be to provide guidance and data for assessment techniques[19].

6. Little attention to sustainable construction planning and zoning topics

Sustainable construction still has a strong focus on the level of buildings. On the urban level we find little attention to sustainable construction regulation. This may have to do with the fact that generally a difference is made between technical building regulation and zoning or planning regulation. There are notable examples, however, such as the Malmö initiatives in Sweden and the London Olympic Development Authority.

7. Limited collaboration between governments and construction industry in developing regulation

Our respondents considered much of the sustainable construction regulation traced to be implemented as a top-down, government led initiative. Such a top-down 'paternalistic' approach runs the risk of a lack of support for regulations by the construction industry. More fruitful approaches seem the bottom-up industry led initiatives and the collaborative government and industry initiatives. The advantages of these approaches are comparable to those mentioned under the previous conclusion, as are the disadvantages.

As for instance the Austrian Building for Tomorrow R&D programme shows a comprehensive and integrated top-down and bottom-up approach may very well speed up innovation towards sustainable development in the building sector. The construction industry is characterized by incremental innovations and major steps can only be reached by a concerted improvement of the total building regulatory framework with a focus on socio-economic aspects to secure market diffusion.

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[18] Although it is implicitly the basis of many building regulations; Eurocodes define the Design Life for the mechanical and thermal performances of products and buildings.,

[19] The 'assumed working life of works' in Guidance Paper F ('Durability and the Construction Products Directive') might be the starting point.

8. Limited documentation on accepted or deemed-to-satisfy solutions

Many countries have introduced goal-based or performance-based sustainable construction regulation, or are beginning with this process. In chapter 3 (section 3.1) we discussed the advantages of this particular type of regulation. Disadvantages are however reported as well. In practice it is found that regulatees, and regulators alike, have difficulty in understanding when a solution complies with the regulatory requirements. After all, only a goal or performance is stated, not a minimum level that should be reached. This often results in discrepancies in what regulatees consider as complying and what regulators or enforcers consider as complying.

A solution to this specific issue is the development and implementation of documentation that states how the goal based or performance requirements can be met. It could be argued that such documentation improves the legitimacy and accountability of the regulations itself: to a certain extent it becomes clear what solutions do comply. This makes it easier to treat like cases likewise. At the same time such documentation does not harm the intention of this type of regulation. After all, to those who do come up with alternative or innovative solutions the regulations provide room. Such documentation, however, must be subject to scrutiny to ensure it does not create new national barriers and protected markets, and that it is available to all throughout the EU.

9. Ambiguous relationship between sustainable construction regulation and other regulation

During the round table meetings it was highlighted that many issues, for instance water conservation, are not addressed in building regulatory systems but are addressed in other legislation. Aspects relating to sustainable construction are often addressed outside the technical building regulations or the local planning/zoning regulations. This may very well provide an explanation why some respondents (from a single country) provided conflicting answers to similar questions. It was furthermore argued that there is often a lack of cohesion at EU level between different directives that aim at environmental or sustainability goals.

10. Not yet meeting Smart Regulation goals

Reviewing the data from a Smart Regulation point of view it may be concluded that currently many of the starting points of Smart Regulation are currently not met in the EU-27. Most notable topics are:

- Limited attention for 'unconventional' sustainable construction topics at both EU and member state level – Smart Regulation considers the improvement of regulation as a shared responsibility for both the EU and the member states;
- Limited attention to implementation and enforcement of sustainable construction regulation – where Responsive Regulation had a strong focus on the design of new regulation and assessment of existing regulation, Smart Regulation looks at the whole policy cycle and considers the implementation and enforcement as an important aspect of the policy cycle;
- Limited collaboration between government(s) and businesses when designing and implementing sustainable construction regulation – Smart Regulation addresses the need to strengthen the voice of citizens and shareholders in the development and implementation of regulations.

6.3 Recommendations

In this section some light is shed on the role actors at EU level could take in increasing sustainable construction throughout the EU-27. Interestingly, a range of respondents welcomes initiatives on EU level as they believe the industry will lack incentives to take action itself. It must be noted however that most of the respondents have a background in governmental agencies and might, as such, be biased in regard to the construction industry. The range of self-regulatory initiatives discussed in the previous chapters paint a less black-and-white picture of the construction industry's (un)willingness to take action.

In general actors at EU level could state a number of spearheads that need attention throughout the EU-27. Examples could be water conservation and resources limitation, the planned service life of buildings and building services, and indoor air quality. By introducing EU-wide legislation or directives related to these topics the construction industry is challenged to meet this legislation. Such legislation may be a driver for knowledge development and knowledge transfer. Ambitious legislation would challenge the European construction industry to move ahead – and by doing so taking the opportunity to become world leader on these sustainable construction related topics. Stating spearheads will however result in a complex process of policy making and consensus finding. What in one country is considered a spearhead, may be considered irrelevant in another country.

1. Domains for coordination at EU level

Standards

- In general, there is a role for actors at EU level to develop European standards that allow sustainable construction to be taken into account. Especially aspects related to functional quality have potential for such standards as these are so closely related to more traditional construction regulation. Setting standards is the most direct way to target sustainable construction. However, the development and implementation of EU standards is a timely and often costly process. Thus, when taking the path of additional European standards no 'quick wins' are to be expected.

  Note furthermore that at the round table meetings it was often argued that if additional standards are to be implemented these should only provide a framework. Standards need to be flexible and provide room for local adjustments. Especially as many environmental risks related to construction activity are location bound. At the same time it was argued that the advantage of EU standards is that they may provide a EU wide common terminology, or definitions on sustainable construction; and EU standards were considered to hold the ability to remove restrictions and barriers for industries in developing sustainable products or processes.
- In the stakeholder interviews and questionnaire responses one substantive current problem is often been identified. That is the problem for professionals, builders and construction product suppliers of providing all the disparate information, and complying with the requirements of the multiple assessment procedures adopted across the EU. At present this is mainly limited to the needs of energy efficiency assessment – BREEAM, LEED, SBTool, and other national assessment systems, each with their own software or calculation systems and their own certification authorities. Even within a given certification system it is often found that there are differences in interpretation and calculation used by dif-

ferent assessors. This problem will become ever more serious as more parameters are included in wider sustainability tools such as DGNB and SBTool. This is a clear need for an EN standard on assessment techniques, drawn up through the CEN procedures. An important role for actors at EU level is seen to develop and define a framework for the assessment of construction work and the enforcement of sustainable construction regulation. A Working Group could be established that aims at collecting, analyzing and comparing information on different currently existing assessment procedures. These procedures could be assessed against EU standards and/or member states regulations' to find whether and where these surpass existing standards and regulations. A benchmark could be developed to set a minimal common denominator for assessment procedures; or a 'conversion table' could be developed to help industry players and consumers to compare the different assessment procedures.

Comparable approaches to regulatory enforcement do improve the free movement of goods and services throughout the EU. Currently different approaches to regulatory enforcement are in force in the various EU member states. A Working Group could address the various approaches, develop benchmarks and provide information on the similarities and differences between the various countries.

Here it should be noted that at EU level already action is taken in this direction. The work of CEN/TC 350 (a system for the sustainability assessment of buildings using a life cycle approach and quantitative indicators for the environmental performance, social performance and economic performance of buildings) appear to fully meet the intention of this recommendation. Another promising example here is the Sustainable Building Alliance's common model for the comparison of different sustainable construction certification schemes (see below).

- Many industry stakeholders and participants of the round table meetings expressed their wish that there should be more coordination of the various initiatives and policies at the various levels of the European Commission in many areas, with regard to Green Public Procurement, eco-labelling, ecodesign, recycling, waste management and 'green taxes' and subsidies. See the scheme below. It was recommended to introduce an interdisciplinary or holistic approach from inside the Commission. The Commission should talk with one voice, or try at least to communicate the full picture relating the ongoing EU initiatives. Any further development from the Commission should be aligned with the precedent initiatives from the Commission.

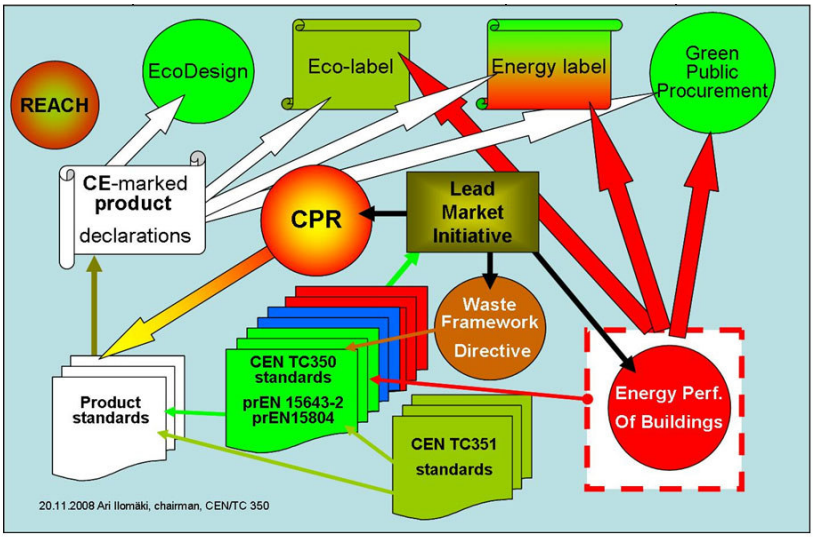

Figure 6.1: The interrelationship between the Lead Market Initiative, CEN/TC350 standardisation work and other European initiatives (source: www.bsigroup.com/Standards-and-Publications/Committee-Members/Construction-committee-members-area/M350-Standards/?id=158921)

Again, a Working Group could be established to address such coordination. Questions to be addressed could be: what initiatives and policies exist? Where do these conflicts, where do these overlap, and where do these interact? Who is affected by these initiatives and policies? The Working Group may provide an overview of these initiatives and policies – i.e. it could provide insight into the bandwidth of current and past initiatives and policies. This may help the Commission to (at least) reflect if future initiatives and policies are in line with current and earlier ones.

- Furthermore an important role is foreseen for actors at the EU level to develop standards related to technical execution and the quality of the construction process. Given the direct link with the construction industry standards on, for instance, construction management processes might be a driver for a more integrated construction market. Here the Commission could for instance address the minimization of wastes, material use and labour use during the design and construction process.

Legislation/directives

- In general it may be questioned whether additional legislation or strengthening current legislation will actually result in a more sustainable built environment. After all, legislation is only a part of the puzzle. Legislation needs to be implemented and enforced by the various member states. The implementation of the current Water Framework Directive provides an excellent example of the time it may take from initiative to actual EU Directive (about 15 years – from the mid 1970's onward); the time it may take to implement the Directive in the member states' regulatory systems (10 years - 2009); and finally the time it may take to actually reach the goals of the directive (again another 6 to 18 years – 2015-2027). In total a period of about 50 years. Note that strengthening existing legislation may consume less time given that various relevant stakeholders are familiar with the existing legislation.

Furthermore, in order to reach the goals of a directive, member states have to take and implement a wide range of measures. This brings in issues of enforcement (how can and will the Commission enforce the actual implementation and discipline Member states that lag behind?); and it brings in issues of divergence (political, administrative, geographical and climatological circumstances differ amongst the member states, which affects their possibility to implement the legislation as foreseen by the Commission).

- In general there is a role for actors at EU level to encourage the adoption of performance based regulation. Many countries have already introduced this type of regulation. In the IRCC-report *Performance-Based Building Regulatory Systems; Principles and Experiences* (2010) the advantages of a performance based approach is formulated as follows: "*With the focus on outcomes rather than specifications, performance-based regulations are better equipped to take advantage of market capabilities to quickly and appropriately respond to changes, pressures and threats impacting the built environment without compromising core objectives of health, safety and welfare. This includes adapting to such factors as changing demographics (aging population, percentage of persons with disabilities – permanent or temporary), sustainability (energy performance, materials usage, carbon footprint), resilience to extreme events (driven by climate change, acts of malice or other), and rapid changes in technology and practice which could result in defective design or construction (inadequate ventilation, plumbing cross-connections, leakages, etc).*"
  At the same time it should be considered that performance based regulations are a means to an end, not an end in itself. Various problems may result from this type of regulation.[20] Most severe are related to compliance: for regulatees it is often unclear whether and how to comply with performance based regulations; for enforcement agencies it is often unclear what to accept as compliant and what not to. A solution to such issues may be the introduction of deemed to satisfy documentation, which stipulates what solutions under the performance based regulations are accepted as compliant with these regulations.
- In line with the previous recommendation, the usage of prescriptive regulations should be discouraged. For example, France has launched the 'Decree on the use of wooden materials in certain buildings', which prescribes minimum quantities of wooden materials to be used in certain types of buildings. These kind of prescriptive regulations are not a stimulus for the industry to develop innovative products as an alternative to wood, but with the same performance on sustainability criteria as wood. Another example is Ireland where there was a regulation which stipulated that building envelopes must have less than 20% glazing, for energy conservation. This ruled out innovative glazing and curtain walling systems and led in some cases to ugly buildings. Now they have a regulation based on U-values.
  The role of the Commission could be to make an inventory of such prescriptive regulations and assess their possible effects on barriers to trade.
- Given the increasing demand for clean water there can be a role for actors at EU level to implement legislation on water conservation. Such legislation could be brought in line with other European regulation, for instance the Water Framework Directive. Here the EPDB may be a source of inspiration. Following on from the EPDB a system of water efficiency

[20] See for instance: Meacham, Brian, Robert Bowen, Jon Traw, and Amanda Moore. "Performance-Based Building Regulation: Current Situation and Future Needs." *Building Research & Information* 33, no. 2 (2005): 91-106.

labelling may be developed and implemented. Yet, it seems of most avail to relate such a water efficiency labelling to building products than to buildings.

- As Basic Works Requirement 7 (on sustainable use of natural resources) of the future CPR together with the other 6 BWRs constitute a holistic approach to sustainable construction, a need for new Interpretative Document shall be expressed. This would certainly support various actions taken by the member states aimed at implementation of sustainable construction principles.
- Also indoor air quality could be a topic for future EU level legislation. At the round tables this particular topic was considered an EU wide problem, which does not relate on local climatic and geographic circumstances as many other sustainability topics do (note that the indoor climate does of course strongly depend on the outdoor climate, but indoor health and comfort may be considered a similar goal throughout the EU-27). It should however be noted that CEN is already preparing harmonized methods for measurement or indoor air quality.

The introduction of standards and legislation at EU level is welcomed by some respondents. A respondent from Bulgaria for example replies: "Yes, EU Directives are indeed a strong incentive and need to be stricter, not voluntary or advisory. Know-how and knowledge can be spread fast and efficient in a network such as the EU and it definitely has to play a role in stimulating sustainable construction in Europe." A participant of a round table meeting said: "For the east European countries, like Hungary, Czech Republic, Slovakia, many aspects of sustainable construction are not in the building permit procedure or in the legislation background like it is in Germany or the UK because these countries are much further with this. So therefore, for our countries it would be very beneficial to have European Directives, as a first step. Afterwards of course we can think on the way how to adapt it on the national level."
However, as the following response from a German respondent shows, such frameworks should leave room for local conditions: "For that we would be happy, if the European Commission would respect the different competencies between the Commission and the member states. EU Directives like the EPBD are OK but only as a framework. It must not be too detailed. The details must be filled in by the member states or the Länder in the member states." The EC, however, faced with a possible rush of new national regulation on sustainability must be extra vigilant through the existing mechanisms to ensure that new national technical regulations and new barriers to trade are not introduced.

2. Domains for raising awareness at EU level

- Raising awareness may be a less time consuming approach than coordination, it may however be questioned if raising awareness does actually result in reaching a more sustainable built environment. After all, raising awareness does not force member states to take action. However, raising awareness on the importance of sustainable construction may ultimately provide a fertile soil for future coordination: if member states and stakeholders understand and agree on the importance of sustainable construction they might be more willing to accept and collaborate in coordination approaches.
- Given the predominant focus on 'traditional' topics of ecological quality (especially energy performance of buildings) and technical quality, attention should be paid to raising awareness on the importance of including topics related to economic quality, social quality and technical execution and quality of the construction process. Here lies an important role for

actors at EU level – which received agreement by industry stakeholders, experts and government representatives at the round table meetings. A first step towards more awareness of the various topics that may be included under the umbrella term 'sustainability' is the dissemination of studies such as these. A recurring issue when carrying out the study and reporting on it is the wide range of definitions of sustainability. Severe criticism was expressed to the wide definition adopted by the researchers, whilst at the same time others expressed criticism on the 'conservative' stance taken. Whilst the former group of critics would liked to have seen a narrow focus on sustainability, the latter group would liked to have seen a definition as broad as possible (for example also including 'architectural quality' or 'cultural quality').
The major lesson learnt here is that although the European Commission should aim at setting a definition (in order to be able to use a single voice – see above), it should not be expected that all will agree and follow this definition. A second step towards more awareness of the various topics that may be included under the umbrella term 'sustainability' may therefore be to actively set this definition, disseminate it and enter into a discussion with various stakeholders in the member states. What is it that they consider as sustainable construction? How do they think sustainability may be reached? What actions are currently taken? What are their effects?

- A specific domain where we see a role for actors at EU level in raising awareness is the existing building stock. The slow turning rate of this existing stock and the current lack of sustainable regulations for the existing stock was discussed in this report. Actors at EU level could aim to make governments, the construction industry and building owners aware of the impact the existing building stock has on energy consumption and waste reduction, and the need to address make the existing building stock more sustainable. An even bolder proposal is to divert funding: some of the current funding that goes into structural funds might be diverted into a new structural fund for the upgrading of existing buildings throughout the EU.
  A way to take up this recommendation is the establishment of a EU Working Group that aims to collect examples of whether and how the existing building stock is currently regulated from a sustainability point of view. Different examples could be compared (e.g. on content, actors involved, effects) and analyzed. Findings (e.g. good practices) could be disseminated through websites and discussed with relevant stakeholders.

- Many of the countries analysed have introduced a non-governmental organization which aims to improve sustainable construction (e.g. Green Building Councils). EU actors could aim to partner-up with these organisations in raising awareness on sustainable construction in the EU-27. Furthermore, national, regional and local governments could be challenged to set an example in sustainable construction and by so raise awareness in their respective jurisdictions. A good example here may be found in the German '*Bewertungssystem Nachhaltiges Bauen für Bundesgebäude'*, an evaluation tool to assess the level of sustainability of federal buildings.

3. Domains for supporting public procurement at EU level

- Supporting public procurement may affect the 'independent' position of the Commission. Nevertheless, a part of procurement relates to the gathering (and dissemination) of information. Here actors at EU level may have a role in providing information to public authori-

ties to buy sustainable goods and services. An example is the current EC guide: "Buying Social: A Guide to Taking Account of Social Considerations in Public Procurement"
In general, there is a role for actors at EU level to support the use of public procurement to raise sustainability performances. Especially topics that bridge technical construction aspects, planning and zoning aspects and profit (e.g. providing housing that meets needs, providing green space, supporting local diversity) may require public procurement to make the construction industry aware of sustainability topics.

4. Domains for supporting voluntary action and government-industry collaboration

- In general voluntary action and government-industry collaboration may be considered a 'quick win'. After all, it may be assumed that industry stakeholders that join such initiatives feel need to and are willing to life up to sustainability requirements. Yet, the actual implementation of these initiatives may result in severe issues. First, industry stakeholders may develop and implement voluntary initiatives to prevent future regulation or to secure the market from other stakeholders. Second, for public actors it may be difficult to actually gain insight into the effects of voluntary initiatives. Third, in some member states the introduction of voluntary initiatives may result in conflicts between public and private law. Nevertheless, voluntary action and government-industry collaboration appears promising especially as industry stakeholders are involved in the development of these programs. It may be assumed they know the market and know how and where to take action.
- There can be an overall role for actors at EU level to support voluntary action and government-industry collaboration in the development of sustainable construction regulation. A specific role for these actors is to make governments and the construction industry aware of the advantages and disadvantages of voluntary action and government-industry collaboration. An approach could be to set up a (web) portal or database on good and bad practices/examples of voluntary action and government-industry collaboration (comparable with the EU Build Up website, the European portal for energy efficiency in buildings) – a recommendation that received wide support during the round table meetings. Such a database should move beyond the current descriptions of good practices and highlight the structure, aim, regulatory regime, enforcement regime of these initiatives, the reasons why these initiatives were introduced and the experiences with these initiatives – part 2 of the questionnaire sets an outline.

  A promising example of a voluntary program is the Sustainable Building Alliance's common model for the comparison of different sustainable construction certification schemes.[21] The initiative aims at more collaboration between the different schemes, the development of common minimum requirements for such schemes, and consistency amongst such schemes. The initiative brings together different stakeholders' interests, it serves a common goal and provides payback to those involved (acknowledgement of certification schemes), whilst at the same time aiming at a more sustainable built environment.
- Furthermore, there can be a specific role for actors at EU level to stimulate and support voluntary and government-industry initiatives that aim at construction waste limitation and initiatives that aim at the minimization of the use of resources.

[21] See: http://www.sballiance.org/

An example of increasing the relationship between government and the construction industry in the field of sustainable construction may be found in the Swedish 'Building and Living Dialogue'. This initiative consists of voluntary agreements between the government and different actors in the construction industry, including within property-owners. See further the description in section 4.4.3.

- Finally, stimulating or facilitating voluntary action and government-industry collaboration is not limited by direct funding. A promising approach may be to train specialists on the topic and second these to NGOs, businesses or public agencies in member states. By doing so they can directly work with local organizations and structures. Another promising approach would be to (financially) support international exchange projects of local experts.

5. Domains for stimulating learning

Learning may be considered an approach complementary to raising awareness. The difference between the two is the expectation that learning will result in the use of existing knowledge (active use of information), whereas raising awareness leaves room for actors to develop their own approaches to sustainable construction – or to remain passive.

- In line with the above recommendation a specific role for actors at EU level could be to stimulate learning across countries, regions and municipalities. Such learning may ultimately result into evidence based policy making.
    - Although no generic approach to sustainable construction regulation was traced, nor clusters of countries that follow a comparable approach, actors at EU level may aim to draw lessons from leading countries and regions. These lessons could either be generically disseminated at country level, or focussed at regional level – at regional level the traditional clustering may be leading (see 6.2.2). Cross country or cross region learning may help those countries or regions that lag behind in gaining an understanding of how to improve their building regulatory systems.
    - Currently many networks of municipalities already exist (e.g. ICLEI). Here actors at EU level may aim to map these networks and provide insight into the various networks (e.g. by a web portal) aiming at connecting the different networks. Municipal networks appear valuable for learning purposes as it is, for a government perspective, the level closest to the actual implementation of sustainable construction regulation and construction work.
- Another valuable domain for learning lessons is in voluntary and complementary programs. This is the level where citizens, businesses and government agencies can learn from actual practices. Such learning may ultimately result into the application of proven practices beyond their initial context and may result in an attempt of businesses, citizens and government agencies to move beyond mere bottom line compliance with formal sustainable construction regulation.
    - Learning from voluntary and complementary programs starts with knowing about the existence of such programs. Actors at EU level may aim to identify good practices, describe how these have developed and work, their strengths and weaknesses, and disseminate this knowledge. A web-based portal, for instance based on a Wikipedia format, may provide a fruitful approach to ensuring accessibility of the knowledge gained. Key is however to move beyond mere descriptions of successful good practices. It may be advisable to start a pilot project to get to such a web based portal on good practices.

- A next step in learning from good practices may be to implement promotional schemes and to actively share experiences from these good practices. For instance, once a good practice is identified and has proven its merits in a particular (geographical) area it may be actively be promoted in other areas. Different possibilities to do so exist. First, those having experience with the original good practice could (temporarily) work in other areas to teach other people about the good practice. Second, actors at EU level could be trained to implement good practices in different areas. Or third, the former or latter could be given an ambassador role to promote (certain) good practices throughout Europe. Especially the allocating of staff to local governments, NGOs and businesses was considered a necessity by those attending the round table meetings. This as local governments, NGOs and businesses often lack the (financial) means to attract (temporary) staff for implementing good practices in sustainable construction.
- Another step in learning from best practices may be to build networks between municipalities and regions. Here existing networks of local governments (e.g. ICLEI) and private sector organisations (e.g. the Europe Regional Network of the World Green Building Council) could be reinforced or bridged. Again the role for actors at EU level may lie in identifying existing networks and ensuring knowledge about such networks is easily accessible. In addition actors at EU level could support the bridging between networks or the start-up of new networks by allocating (trained) staff for such purposes.
- A final step in stimulating learning from and supporting good practices is to reward these in a highly visible way. This could for instance be an annual prize for the best good practice in a certain area (e.g. location, but also building type or element). By actively promoting the development of good practices it may become an incentive to do so. By actively disseminating the "winners", these may set an example or benchmark for others to work towards to.

- Note that all recommendations in this domain are interrelated. A holistic approach towards stimulating learning may be most fruitful. By this we mean a combined approach to identifying good practices (in different levels of government *and* NGOs and private parties), the active dissemination of knowledge on these good practices (e.g. a Wikipedia based web portal), the active support of learning and implementation (e.g. by allocating EU staff to government agencies, NGOs or businesses), the building and bridging of networks and the rewarding and promoting of good practices (e.g. by an annual prize).

- Finally, it should be noted that facilitating voluntary action and stimulating learning should move beyond rewarding and marketing good practices and 'leaders' only. Sustainable construction is addressed in different speeds in different countries, sectors and organizations. Leaders might be most interesting to look at, as they provide success stories. The laggards appear less interesting as they lag behind, do not seem to come up with innovative solutions, and may be difficult to mobilize. However, it is the laggards that in the end may make the difference – once they implement the good practices identified in their own areas sustainable construction may scale up from incidental good practices to a normal state of affairs. At question therefore should be: why do some countries, sectors and organizations lag behind? During the round table discussion meetings a number of barriers were identified: finances, knowledge, experience:
  - In the current time of financial crisis sustainable construction may lose its position on the political agenda – this may hold even more true for the countries that are most af-

fected by the crisis. This may imply that less public funds will be allocated for testing and innovative solutions. This may make businesses (and public agencies alike) less eager to enter into risky pilot projects. Here it may be chosen to divert existing construction related funding into a new structural fund to support voluntary or public initiatives in sustainable construction.

  - Although many countries, sectors and organizations may lack the funds to start pilot projects on testing innovative approaches to sustainable construction, clear and available information on existing approaches may entice them in implementing approaches that have proven to work (evidence-based policy). Such information is as yet difficult to obtain, as some respondents mentioned (see above for possible approaches to overcome this barrier).
  - Last but not least, when aiming to implement a new approach to sustainable construction this is often hampered as the experience to do so falls short at organizational level, as participants explained. Here previously mentioned ideas on training EU staff to support organizations or to facilitate international exchange between organizations may help to overcome this barrier.

- Note furthermore that a one-sided view on leaders may give the laggards a feeling that they cannot meet up to their successful counterparts. Thus, when identifying leaders and good practices it may be best to also identify whether and how experiences can be exported to other countries, sectors and organizations.

6.4 A final consideration

The over-arching objective of this study in the context of the LMI was to identify the role the regulatory systems in the EU member states may play in developing, or hindering, the development of a world-beating competitive sustainable construction industry. Good regulation may promote the development of the industry: poor regulation, over-regulation or incompatible regulation will hinder it. Member states must be encouraged not to introduce unnecessary regulation, and most of all must not be allowed to introduce regulation which is incompatible with a common European approach. The LMI objective is not to create the maximum amount of regulation and 'jobs for local authorities and control bodies'. It is to promote a large, efficient and competitive industry to provide the sustainable built environment which Europe needs, quickly and at low cost, and to be the world's best at doing it.

From the standpoint of this study the first priority is to get harmonious and compatible regulations, in particular the assessment methods. If they are not, then enforcement could become a protectionist measure and so should not be actively encouraged by EC until barrier-free methods and regulations are in place.

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ANNEXES

ANNEX 1 NAMES OF ORGANIZATIONS/PERSONS WHO PARTICIPATED IN THIS STUDY

1. Interviews with stakeholder organizations

Initial interviews in February/March 2010, and subsequently in October 2010 were held with the following organizations:

- CEBC (Consortium of European Building Control), with their representative in LABC, the UK building control association;
- UK government representatives from BIS (Department for Business, Innovation and Skills - the lead department for the Strategy for Sustainable Construction) and DCLG (Department for Local Government and the Regions – responsible for building regulations);
- Dutch government representatives from the Ministry of VROM, the department responsible for building regulation;
- CEPMC – Council of European Producers of Construction Materials);
- EBC – European Builders' Council – representing small builders and crafts;
- FIEC – European Construction Industry Federation;
- ACE – Architects' Council for Europe;
- Focope – Forum for Construction in the European Parliament;
- CoDEM Picardie (Construction Durable & Eco Materiaux);
- UEPC – European Union of Developers and House Builders.

2. Organization responses to questionnaires

Because the respondents of the questionnaires were promised confidentiality, in the next table only the organizations that filled in (completely or partly) the questionnaire are mentioned.

Country	Organization	Type of organization
Austria	ATP sustain GmbH	Private consultancy/engineering firm
Belgium	ARCADIS Belgium	Private consultancy/ engineering firm
Belgium	WTCB	NGO
Belgium	FOD Volksgezondheid en Milieu, FOD Economie	Government
Bulgary	Ministry of Regional Development and Public works	Government
Bulgary	Bulgarian Green Building Council	Non profit organization
Cyprus	Ministry of Interior, construction sector department	Government
Czech Republic	TZUS Prague (Technical and Test Institute for Construction)	NGO
Czech Republic	EZ MEP International (commercial real estate development)	Private engineering and consultancy firm
Denmark	Danish Building Research Institute (SBI), Aalborg University	NGO
Estonia	Estonian Technical Surveillance Authority, Building and Electricity Department	Government
Finland	Ministry of Environment (Ymparisto)	Government
Finland	VTT Technical Research Centre	NGO
France	ARCADIS France	Private consultancy/engineering

		form
France	Socotec (construction inspection body)	Private
France	Agence Qualité Construction	Non profit organization
France	CSTB (Centre Scientifique et Technique du Bâtiment)	NGO
France	Hespul (association for the development of renewable energy and energy efficiency)	Non profit organization
France	Ministere d'Ëcologie, de l'Ënergie, du Développement durable et de la mer	Government
Germany	Karlsruher Institut für Technologie (KIT), on behalf of the Bundesinstitut für Bau- Stadt- und Raumforschung of the Bundesministeriums für Verkehr, Bau und Stadtentwicklung	NGO
Germany	Ministers' Conference (ARGEBAU)	Government (Länder)
Germany	ARCADIS Germany	Private consultance/engineering firm
Hungary	ERM Hungary (consultancy firm on 'Environmental Resources Management')	Private consultancy firm
Republic of Ireland	Department of Environment, Heritage and Local Government	Government
Republic of Ireland	Construction Industry Federation	Non profit organization
Republic of Ireland	Dublin City Council	Government
Italy	Regione Marche	Government
Italy	KlimaHaus Agentur (private certification body, Bolzano),	Private
Italy	Italian Green Building Council	Non profit organization
Luxembourg	Ministère du Logement	Government
Malta	Building Regulation Office, Ministry for Resources and Rural Affairs	Government
Netherlands	PRC B.V.	Private consultancy firm
Netherlands	Ministry of Housing, Spatial Planning and the Environment (VROM)	Government
Norway	National Office of Building Technology and Administration	Government
Poland	ITB (Building Research Institute), Section for Technical Harmonization in Construction	NGO
Poland	Office General du Controle de la Construction	Government
Poland	Spaczynski, Szczepaniak i Wspolnicy sp.k. (bureau for tax and legal advisory services, including energy and natural resources)	Private
Romania	Romanian Green Building Council	Non profit organization
Romania	State Inspectorate of Construction	Government
Romania	Consultancy Associate at the Institute for Real Estate, Construction and Housing Ltd. Vienna	Non profit organization
Romania	B.I.A. Tomescu Eugen-Gabriel Architecture & Planning	Private consultancy firm

Romania	Wienerberger	Private
Slovakia	Faculty of Civil Engineering, Slovak University of Technology in Bratislava	NGO
Slovenia	Ministry of Environment and Spatial Planning	Government
Spain	Ministry of Housing, Deputy Director General for Innovation and Quality in Building	Government
Spain	Instituto de Ciencias de la Construcción Eduardo Torroja (iETcc)	NGO
Sweden	The Swedish National Board of Housing, Building and Planning (Boverket), Ministry of Environment	Government
Sweden	Chalmers University of Technology	NGO
UK	National House-Building Council (NHBC)	NGO
UK	CEBC	Non profit organization
UK	Wigan Council, building control	Government
UK	Royal Institution of Chartered Surveyors (RICS)	Non profit organization
UK	Ballymena Borough Council Group, building control	Government
UK	ARCADIS UK	Private consultancy/engineering firm

3. Participants of round table meetings

Meeting of 6 October 2010 (industry stakeholders)

- Frank Baumeister, CEETB (European Technical Contractors Commitee for the Construction Industry)
- Christine Beunen, secretary general CEPMC
- Zsolt Toth, RICS, EU Public Affairs Officer
- Camilla Vakgaard, Economic consultant, BAT-kartellet, on behalf of EFBWW (European Federation of Building and Woodworkers)
- Ari Ilomaki, forest industries, chairman CEN TC 350
- Johan Vyncke, director research & innovation, WTCB (Scientific and Technical Research Centre for the Construction Sector)

Meeting of 13 October 2010 (experts and representatives Green Building Councils):

- Gabor Szecsi, Director of the Hungary Green Building Council, lawyer and assistant professor at the law school of Budapest
- Jiri Sobola, Managing Director, TZUS (Technical and Test Institute for Construction Prague), Czech Republic
- Thomas Ragot, International Relations, Green Building Council Italy
- Nicolas Busquet, ARCADIS FRANCE, Référent Développement Durable
- Karel Dekker, KD/Consultants BV, Strategic Research for Building & Construction (Netherlands)
- Roman Rabenseifer, Slovak University of Technology in Bratislava Faculty of Civil Engineering Department of Building Structures
- Bram de Meester, ARCADIS Belgium, expert sustainable construction
- Michael Scharpf, ARACADIS Germany, expert sustainable construction
- Klaus Hansen, senior researcher Energy and Environment Danish Building Research Institute, Aalborg University Denmark

- Consolata Russelli, International affairs, Deutsche Gesellschaft für Nachhaltiges Bauen e.V. / German Sustainable Building Council
- Ivanka Boteva, Bulgarconsult / Bulgarian Green Building Council Technical Director / DGNB Auditor
- Alfonso Ponce, CSTB, International Affairs manager / French Green Building Council (prospective)
- Rafael Villar Burke, architect, IETcc (Eduardo Torroja Institute for Construction Science). Spain.
- Amil Dacosta, Cencenelec, Programme Manager - Industry and Technology

Meeting of 20 October 2010 (government representatives)

- Godlive Bonfanti, AQC (Agence Qualité Construction)
- Paul Swift, Wigan Governm. (RICS)
- Madeleine Hjortsberg, Swedish National Board of Housing, Building and Planning (Boverket)
- Kerstin Wennerstrand, Ministry of the Environment, Sweden
- Sebastian Wall, Section for Technical Harmonization in Construction, Building Research Institute (ITB) Poland
- Prof. Lech Czarnecki, Faculty of Civil Engineering, Warsaw University of Technology
- Zsombor Barta, Hungary, consultant, BREEAM Internat. Assessor, ERM (Budapest)
- Tanja Brockmann, Referatsleiterin, Referat II 6 "Bauingenieurwesen - Baustoffe, Baukonstruktion", Bundesinstitut für Bau-, Stadt- und Raumforschung (BBSR) im Bundesamt für Bauwesen und Raumordnung (BBR)
- Garbriele Krater, Expert in charge of the European Affairs at the German Building Ministers' Conference, c/o Ministry of Economic Affairs, Energy, Building, Housing and Transport of the State of Northrhine-Westphalia Germany
- Anna Kühlen, PhD student Karlsruher Institut für Technologie (KIT), Germany
- Lino Fucic, Director of the Directorate for Construction, Min. of Env.Protect.,Physical Planning and Construction, Zagreb, Croatia
- Petit Josianna Vassallo, architect & civil engineer, Ministry for Resources & Rural Affairs (Malta), Building Regulation Office
- Catherine Grimonpont, Min.v. Economie (Belgium)
- Antonio Paparella, European Commission, DG Enterprise and Industry

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ANNEX 2 KEY ISSUES FROM STAKEHOLDER INTERVIEWS

Interviews have been held with key stakeholders, to identify their perceptions of key issues, possible barriers to innovation in sustainable construction, and any comments on the scope and objectives of the study.

The key points raised are as follows:

Barriers to innovation:

- None of the interviewees in this stage saw the content of building regulations per se, nor differences between regulations, nor lacunae in regulations, as barriers to innovation in sustainability. This may be because cases where such barriers may occur have not yet been identified, and will be identified in this study. It may also be because interviewees generally do not think approximation of building regulations at the European level is desirable for their members, or feasible.
- Potential barriers mentioned include:
  - Insurance systems: the technical control function (technical control bureaus working for insurers) discriminates against innovation, and registration requirements discriminate against small firms and new ventures.
  - Liability and Professional Indemnity insurance: the liability of designers and contractors for problems caused by products and materials makes them unwilling to specify or use innovative methods and products.
  - Prescriptive regulations in some member states, which prevent new solutions;
  - Lack of expertise, and traditional skills of designers and building control officials, which makes them insist on tried and trusted methods and designs.
  - Public procurement using lowest initial cost.
- Insurance systems in particular discriminate against small firms, who may be innovative, and carry out most refurbishment work. French insurance companies only except French Avis Techniques and no European technical approvals. Innovative new components (like sustainable construction products) are difficult to insure, or against high costs.
- Some product characteristics in the harmonized European product standards (hEN's) are not appropriate for innovative products like ecomaterials (like bio-based materials). This counts of course for every innovative product, but what is special about sustainable construction is that it presupposes a lot of innovative products and methods, all at once, and probably many innovative products in one particular innovative design/construction method. The unapropriateness of hEN's (and therefore the difficulty for getting CE marking) can of course be solved by means of Cuap/ETA (and the new arrangement under the CPR), but this supposes competence and experience in testing by the Approval Bodies, and appropriate test methods and equipment. The AB's only work for products similar to existing ones, and we know that even then they can take years and a lot of cost. But completely new materials (e.g straw, hemp, wool based) don't have test methods or facilities. Demonstration projects would be essential as a first step, to developing the test/approval methods as well as developing the designs/materials.

Nature of the regulatory systems

- Sustainability criteria are being introduced into many MSs' regulations and this is not coordinated at an EU level. This could create barriers for cross border activity in future.
- The proliferation of voluntary labelling schemes and design initiatives is seen as healthy, but if they become embedded in national building regulations and hence mandatory this could be anti-competitive and a barrier to innovation.
- Mandatory labelling schemes for construction products (e.g. from the revised Energy Labelling Directive; and a recent French decret) are questioned either by manufacturers or designers. In any case, respondents think product eco-labelling schemes should await the standards from TC350.

- Building regulations should be performance based, not prescriptive.

Actions at the EU level

- There are mixed opinions about the feasibility of extending structural Eurocodes to sustainability requirements.
- The standardisation work of TC350 is generally welcomed as a common basis for voluntary product declarations and building performance assessments, as long as standards are flexible and do not become the basis for new mandatory labelling schemes.
- Public procurement (using MEAT tender selection process), the European Regional Development Funds and TENs can be used to promote best practice and sustainable development schemes.
- Training of building practitioners and information are big problems. The European Social Fund could be used to fund training.
- Edit and harmonize systems for risk management (insurability of components) related to experimentation and use of new components (materials or systems, like ecomaterials or sustainable construction products). Reduce the cost part of insurance in construction projects. (In France, it is sometimes up to 10% of the total price of the construction project).
- Promote the development of innovative ecomaterials and sustainable products and reduce the additional costs associated with their use. Encourage demonstration and pilot initiatives to create the necessary feedback to develop innovative products.

Some interviewees are afraid that the study could lead to a dangerous move towards legislations on harmonising Building Regulations.

None admitted that they saw fragmentation, discrepancies etc. as a barrier to innovation. With respect to enforcement, etc., the point was made that lack of training, conservatism, and the fact that building inspectors are often at the later stage of a career and were trained long ago, can lead them to be cautious about innovative methods and products. It is only architects who are really concerned about differences in Building Regulations, not because they are a barrier to innovation, but because those very few architects who work abroad need to learn about the requirements – but the fact that submission of plans is usually either reserved for or in any case done by local architects means it is not a big issue.

These attitudes are not surprising among the EU federations: we know they are resistant to anything which suggests new EC legislation affecting their members.

ANNEX 3 SUMMARY OF THE ROUND TABLE MEETINGS

1) Holistic view on sustainable construction

Taxonomy of SC

- In the study you define 5 pillars of sustainable construction: 'ecological quality', 'economic quality', 'functional quality', 'social quality' and 'technical process quality'. In CEN/TC 350 the decision has been made to have only three dimensions of sustainability: 'social', 'economic' and 'ecological'. It is important to align with CEN TC350. With sustainable construction you should always go for the performance based approach. Sustainability performance is the combination of those three dimensions of sustainability (ecological, economic, social). That's really what you are supposed to measure and assess for sustainable construction, not the ways or the process how to get there.
- Technical process quality and functional quality are indirect ways to reach sustainable construction. When you are building a building or are using a building, you have to achieve a certain level of technical quality, otherwise you don't have any building or functional quality. So from the point of standardisation you have to separate sustainability issues and issues which are now already taken into account in the building project. You have to meet certain technical and functional quality for the building, even if you have never heard of sustainability. And sustainability is just another dimension of the construction process and the lifecycle of building.
- In the study you also categorize health and safety issues under 'functional quality'. Within CEN/TC 350 it is part of the social dimension. The functional quality is just the regulator's way of looking at sustainability, when he's considering health and safety issues as part of functional quality. But from the sustainability point of view the building should be considered over its lifecycle. How does it affects humans and society? Issues like health, comfort, user satisfaction and safety are clearly within the social alignments of sustainability. Starting at the beginning of the lifecycle there is also the construction process itself, the workers. Of course health and safety issues for the workers are already regulated in the member states, so that's the minimum level. But when it comes to the holistic view of SC and social dimension of sustainability, then of course this technical execution issues are part of the social dimension.
- For the ecological, economic and social/cultural quality you need a process and functional requirements. You can also call them: the three P's: people, planet, profit. You cannot separate the technical process from the others, also to achieve social quality you need a process.
- For the German DNGB-system we use: economical, ecological and social qualities. And then functionality and process is like a balance around these three pillars, and so functionality and process is not sustainable in itself but it is a crucial mean of getting sustainability.
- The three dimensions is probably the right way to look at it. Technical and functional quality are not necessarily to be considered as 'ends' in themselves but as 'means' of how to reach those three aspects of sustainability, that can be measured, and that should be the goals in itself.
- 'Adaptability' of a building is a major point in reaching sustainable construction. You can call it 'functional quality', but you can also assess what the effects of adaptability are on the social, ecological and economic dimensions. You have different ways how you can reach sustainability. You should make distinction between how you can reach sustainable construction and what a sustainable building is. Those are two different issues.
- 'Accessibility' fits better in social quality than in functional quality. Maybe it's better to speak about what they call 'universal design'. Everybody must be able to use the building, people without disabilities and with disabilities, young children and adults. So maybe something about universal design also has to find a place in the taxonomy.
- What about demolition? Demolition of the present housing stock is a big issue for the sustainable building and the construction sector.
- The traditional view of sustainability has indeed the three dimensions, but there is no problem with another classification, as long as it is defined well.
- Sustainability is like a cake. You can slice it in many ways. It is a taxonomic discussion. The architects also see 'cultural quality' or 'architectural quality' as part of sustainable construction. But you can call this also 'social quality'. For instance in Brussels there is a system called BATEX (Bati-

ments Exemplaires), for exemplary buildings. Some architects didn't want to accept the Valideo certification system for sustainable buildings (developed in Belgium) because Valideo does not take architectural quality into account. So it's hard to get all the dimensions that people want to include in sustainable construction.

- When you look at BREEAM and other tools you see that more aspects are included in SC.

What is sustainable construction?

- We should try to define what is a sustainable construction, compared to ordinary construction. What is a green building? Sometimes it was defined as: 20% better than the ordinary regulations.

Difference between physical planning and construction of the building

- With sustainable construction, you must differentiate between physical planning/zoning and construction. Construction in itself is already a huge challenge. The idea of the LMI is to create competitiveness of the construction sector, related to the actual construction of buildings. Than it's perhaps better not to include physical planning in the study, because that kind of planning is created in municipalities etc (a very local level). Of course the early stages in the development process (the planning stage, spatial planning) are very important for sustainability, because these are the stages in which environmental issues can be taken into account. But not physical planning itself. This is complicated enough. Many the social quality aspects etc. belong to the physical planning area. So I prefer to start with a 'holistic view' on construction. What requirements are needed there, and what do we have to focus on? What do we have to do better to get sustainability?

City structure, transportation, social aspects

- For a sustainable building it's not only about energy performance or water consumption, but also about location, the city structure, transportation, social aspects etc.
- The EPBD focuses on zero-energy buildings. But to build such a building is very expensive, and only the second or third generation will start benefiting from this building. So such buildings cannot be built in the city centre of Prague of Budapest, where people can't afford it. People who can afford it live 30 km from the city centre, without infrastructure. So the family living in that house has three cars to do the shoppings 5 km away to the nearest shop. When you include the consumption of petrol, all effects of the green house are gone. So humans aspects, and the availability of infrastructures and services are so important.

Scattered responsibilities within governments and the EC

- From the governmental point of view the problem is that there are so many departments which deal with the different aspects of sustainable construction. Every department has its own agenda. In the Commission, with the different Directories, there is the same problem. So if we want to make that holistic view come true, we all must work together. I think that's the problem.
- In Sweden there is one planning act for physical planning and one act for buildings and works. But the Swedish parliament decided months ago upon one law dealing with both within the Ministry of the Environment. This makes it much easier for clients and contractors, because they have everything together.

Ethical values (within 'social quality')

- Ethical values have to do with the way how the production process is done (toxic waste, low wages, child work). Recently ISO standards were published on social responsibility and ethical values.
- Ethical should be included in the procurement procedures (social standards are under procurement law), not in sustainable construction regulation. It is impossible to say: you should do this or that, you should heat your house in this and that way. Things change all the time. What is acceptable today isn't it tomorrow. Besides: how can you control it?
- In my opinion we should focus again on construction, not dealing with occupational health, employees laws, or physical planning.

The weighting problem of the different aspects of sustainable construction

- It seems logic that the EC is focussing so much on energy (and that energy is more important in the balance than other aspects of sustainability), because the economic aspect of energy is so important.
- But, still, there should be a balance between the different aspects of sustainability, otherwise there is no sustainability.
- With certification schemes, like BREEAM of LEED, you can get many points for certain aspects (like energy), and for other aspects you get less points. One of the criticisms to LEED and BREEAM is that it is sometimes easy to score the high points, whereas it is difficult to score the low points. Maybe it is better to look upon for instance biodiversity at a local level.
- Giving points to the aspects (the weighting problem) is a very political debate in the end.
- Do we need an approximation with the way how experts use the weighting criteria? It is probably not possible for us to come up with a weighting of the criteria, but you can give a minimum. If one of the aspects is lower than so many points, then there is a veto. If you try to get a weighting, you must do it with fixed minimum and variables. So a kind of performance based weighting regime with minimums.
- The problem is that weighting with the aim of voluntary benchmarking and its optimization is not equivalent to the maximization of the overall level of sustainability. On the positive side, if optimal minimum levels for some criteria are set by legislation, then an evaluation system designed on benchmarking can help drive the adoption of good practices that would be otherwise mainly out of focus.

Regulation on minimum levels or on an economical optimum level?

- For an evaluation tool, you should step aside from the weighting problem, and try to have minimum levels put in European legislation, so that at least everywhere the minimum level of urban planning, and some minimum concepts or strategies are taken up by everyone, and then everyone can try and differentiate in respect of the needs of their markets and their local situation. There the role for voluntary initiatives becomes important. But the minimum level should be set by regulation.
- Should the minimum be the same in all countries? If you compare the differences between the countries you may conclude that there is a collective minimum, but there are very big variations in the levels achieved in the different countries.
- Therefore it is probably better to strive for an economical optimum level, as has been done in the Recast of the EPBD, where energy consumption is not expressed as minimum kW/m2 per year, but as the economical optimum level. That can be the perspective also for other aspects of sustainable construction. This economical optimum doesn't have to be the same in every country. The countries should look for the economical optimum meeting their minimal criteria, as is formulated in the EPBD.

2) Harmonisation/standardisation issues

Harmonization by creating a toolbox

- It is important that there is a common language, a common assessment methodology.
- The European standards for energy efficiency have some 4.500 pages for the calculation of energy use. That is standardized. But on a national level there is still freedom of choice to use the European standards or national standards for calculation of energy use. The justification of this freedom of choice is that energy performance calculation is still too complex.
- The standards behind energy efficiency are more or less not visible, it is too complicated. For the energy efficiency certificate of the building, A-B-C-D-E, there is no common definition on what exactly is energy efficiency. We need more explanation.
- Harmonisation is needed. Creating harmonization could be done within several frameworks, EU frameworks or non-governmental frameworks. Accepting that regulations, building permit systems, local governance and benchmarks need to stay local, you can of course strive towards standardized measurements and metrics. Every country or every region can create his own benchmark

(dependent on local conditions), but based on the same toolbox of how to calculate and how do the measurements. There are already very good tools. But it would be very helpful if all countries calculate their benchmarks on energy consumption, embodied energy, product quality, water consumption, social and economic criteria and so on, in the same way.

- Most products are globally produced and sold, and why not create an EU-system for a uniform calculation method? With that we can create different levels which can be achieved based on local deviations and local conditions, but below that we calculate it on the same way. So a toolbox must be created. How we use this toolbox is up to the local situation. That is also the philosophy of the 'Sustainable Building Alliance'.
- In the Netherlands there is a kind of voluntary requirement for Life Cycle Costing. There is not one model, but performance requirements. The system has to fulfil these requirements. And that is standardized. But there are 3 or 5 different models to calculate it. You have to fulfil the requirements on a certain level. I believe in this toolbox, but not in an energy calculation tool that everyone has to use. It's true: building physics are not negotiable, it's the same all over the world. But the influence of the users and the tenants on energy consumption is so big. It is very difficult to have one system, but you can have standardized requirements for the systems in Europe. Then there will be several models in the different countries fulfilling these requirements calculating levels A, B, C etc. You don't need to have one software. But the way the different types of software operate should be the same.
- Wit life cycle assessments there are a number of physical issues which can be choosen or where there is a certain freedom how to model it, for example by including district heating, how the sun comes in, and things like that.
- CEN/TC 350 is providing the tools for assessing ecological and environmental performance of the building, covering the whole life cycle. On EU-level it can be stressed that everybody uses these standards for the criteria setting and the certification schemes and so on. So in the future there won't be different Green Building certification schemes which are not comparable. There will be one European system.

<u>Harmonization of national building regulations?</u>

- You cannot make tomorrow European building regulations and planning regulations But it would be a good idea to start the harmonization process on the building level, starting up with some kind of framework, establish a common terminology, and some definitions. With the Eurocode there are national deficiencies. You could imagine those national deficiencies also with other aspects of sustainable construction. So try to come up with some frameworks for a European harmonisation of building regulations on the level of the building. CEN has mandates to make standards for sustainable construction on the product level. The CEN standards have a strong focus on environmental product declarations, but have included also a certain framework for environmental, social and economic assessment on the level of the buildings.

3) Role of the Green Building Councils and rating systems

- With certification systems like BREEAM or LEED we see that there is a need in the market for some kind of assessment so that the customers can brand or market themselves with sustainable construction. Also construction companies want to brand themselves in the market that they can build 'green'. Since there is no EU framework for a uniform assessment method, they have implemented their own system. There is a danger that big building companies try to work in their own interest when they have a place in the Board of the Green Building Councils. This could be a plea for a EU-wide approach.
- But on the other hand: green building councils generally have accreditation rules for certification, and there are different kind of stakeholders represented in the steering or working group of the council, not only private interests, but also public and other organisations (standardisation institutes, ministries, unions, trades, architects). All participants of a green building council have to pay a membership fee. A big contractor pays more than a small contractor or an architect. But the influence is for all people in the steering/working group the same.

- The role of Green Building Councils goes far beyond just raising awareness. The most successful rating systems LEED and BREEAM are non-governmental, and they are nationally or even internationally accepted.
- There are different rating systems used in France or Germany, each with their own label. They are used to address a particular audience. In France for example you have HQE, but also other methods. For example in the business district of La Defence there are several buildings that have two or three different kind of labels. These are strategy tools, communication tools. The problem is not to have several systems/labels, but that they are not interconnected, that they are not comparable, that we measure things in several ways. That is the problem that the Sustainable Building Alliance is trying to solve by bringing common metrics.
- An interesting example is that the Dutch GBC adopted BREEAM ,and the government is now making rules for sustainable procurement for the government. In the rules it is said that you have to get at least so many points of BREEAM. So there you see the combination of public regulation and a private assessment system. But it is also agreed that you can calculate it with another program. So that is the interaction between the two. If the government would say: only BREEAM is allowed, than it would be a bit tricky. They also allow another system. You always need to be open.
- Nevertheless, there are worries that you should be aware of. If a GBC is just an umbrella to cover certain business in a certain way then it would be difficult to discuss it with the European Commission and government authorities. Moreover, it is also sometimes considered as a lobby to convince government to recognize their own system.
- The main objective of 'Open house' (a European funded research project) is to develop a transparent evaluation methodology, a kind of European system.
- The BNB-system is the system for the government. It has life cycle assessment, and a database Öko-Baudata. Also DGNB uses these. The government plans to make it obligatory for governmental buildings. It was very important that it was a joint action, government and industry together. You shouldn't have two different systems developed separately by the industry and the government. In the end it will be good when the government will take responsibility. I don't how it will work and how many buildings will be certified in practice. With the DGNB we also try to be conform the European standards which are being developed on sustainable construction.
- In the report you shouldn't indicate one particular NGO organisation, like the Green Building Council, as a preferred organization for the EC to partner up. It should be open for all organisations.
- The European GBC's work together. They try to create a discussion platform for a policy taskforce group at a European level, that gathers information from the GBC's in order to find a common ground, a common language, a neutral rating system that would implement some of the elements of every GBC. In the end they want to present that to the Commission.
- The European Commission can facilitate an advisory role for GBC's very easily, in the same way as for example the advisory group of notified bodies for the CPD.

4) More consideration of 'economic and financial quality'

- If you are an investor for a SC-product, the bank doesn't finance it, because they don't understand the lifecycle approach. The financial advantages are too far in the future.
- It's not yet clear three year after the first EPBD what the impact of the EPBD has been. Better performing buildings? Higher rental value? Is it reflected somewhere in higher rental prices? If more research is done in this sense (impact assessment of the EPBD), it would probably ease the work of financiers.

5) More focus on performance based regulation

- The only solution on EU level for any regulation on sustainable construction should be performance based regulation. The member states should be informed on what this means, what it is and how you should comply with is.
- The problem is that sustainability should be reached at a local level, and at the same time you might want to regulate it on a EU-level. There is the difficulty between setting a framework and

setting a horizon and meeting sustainability on a local level, where there are so many local factors that impact on the building and the local environment, that affect the abilities to come in compliance with sustainable construction regulation and truly meet the goals of S. It's hard to find a right match and to set a framework for this.

- CEN/TC 350 provides the tools, the technical instruments for how to assess sustainability. But you can't really set on EU-level any regulations for sustainability for the three dimensions of sustainability, because sustainability means a different thing for everybody. Everybody has his own ideas. But with the CEN/TC 350 tools at least everybody can speak the same technical language. Then it is up to the member state client, the local client or the EU-level client to decide what sustainability is.

6) More or less regulation by the EC? What is 'better regulation'?

- The first task for the EC is to remove restrictions and barriers for industries when they develop sustainable products or processes. The EC can do this by studying the barriers and then to solve them by regulations, for getting an open market for sustainable production. That's the same as with the CPD. The CPD was set up to get a system for an open market for all products in Europe.
- Secondly, for an open European market, with contractors working in different countries, there needs to be a uniform European label for sustainability, so that the contractors don't have to study for each member state how to address the sustainability label. The EC has to support the development of instruments for this.
- The question is not only about labelling. Regulation must be clear, no restrictions and so on. In most countries there is probably no lack of regulations. It is more important that there is more harmonization and understanding how regulations in other European countries work.
- Nobody wants more regulation. But more regulation on a European level could also lead to less national regulation. We have seen this with the CPD, where most national regulation on the level of the product is now abandoned. So European harmonization and legislation could lead to less regulation.
- On the other hand we accept that regulations are very local and that we need to take this into consideration. So we should take a look at those local regulations and keep them like that.
- There is no need for EU regulation on sustainable construction because those issues are already covered. What we can do is maybe define it more better from the EU regulation point of view in the existing regulations and directives. But I'm not in favour of having for example a directive for sustainable construction.
- What is 'better regulation'? As sustainability is a very complex issue, legislation needs to be very complex, and it must be grounded on several pillars, and these pillars must include finance and investment questions, skills, and an integrated view with life cycle aspects.
- I'm in favour of mandatory targets which needs legislation and binding themes in both European and national legislation. Probably some legislation needs to be adapted to national systems and national traditions as well as surrounded conditions (for example relating to climate differences). So we need a room for flexibility as well. We have discussed an issue within the Social Dialogue context, which is called flexibility and security, put together as 'flexecurity'. This is desperately needed here to be established for the legislative framework. On the other hand we still have the free markets. We have many SME companies, crafts, they carry forward the construction and markets. And there are a small range of big manufacturers, wholesellers of the product. So all these mechanisms needs to be taken in consideration and make the whole system even more complex. But we have to realize they're all important players to the market. And therefore the earlier statement: not more but better regulation, smarter regulation which is flexible enough and which also offers reliability, will this legislative framework continue for quite some while. Because many players in the market (building owners, installers, construction companies, producers) have to rely on those framework issues.
- Part of the practical issues is also condominiums, split incentives. How do you incenticive tenants to carry out the energy efficient refurbishment? Some of these practical obstacles should be or will be addressed by different financial instruments of schemes. There are some pilots in the UK. This has more relevance for market based instruments or tools. Because it is the owner who decides to

carry out, and what and how. So the demand should come from the market. So it is not regulation for its own sake, but also to look for the obstacles which exist in the market today.

- What is 'better regulation'? For the manufacturers it is certainly to avoid a lot of different regulation for environmental impact of the production of goods and products. It must be underlined that construction products are not usual goods that are consumed. Construction products have a long life inside the building. So the construction product in itself has to be considered inside the building life. So that's the philosophy of CEN TC 350. It's also the philosophy behind the CPD/CPR. It is related to works. However when you consider environmental impact there are a lot of initiatives of the EU, coming from DG Energy or DG Environment that want to address this aspect for all products in a horizontal way. So they came with a Ecodesign Directive, Energy Labelling Directive, Green public procurement. And all these are little pieces next to each other. And the producer is supposed to be in accordance with everything. And we say that's not the good way to regulate things for construction products. So not making 'mushrooms' in the field of the manufacturers. It is impossible to address everything. The manufacturer has to measure the same impact, to make new tests and to use other methods to show that he fulfills the requirements of the different regulations. This is what we try to address to the EC for years.
- Sustainable construction is the sum of many things. A good understanding of the existing regulations which are in place now in EU-27, is really necessary before being able to speak on the possible future EU-legislation. It is necessary also to understand how to respect subsidiarity. You need to have a good picture of what the existing problems of the underlaying layers are before thinking of solving it by new regulation.
- You can do it in the same way as it is done with the EPBD recast, by setting out the principles and the framework. Is that regulation or that it is standardization? The goal of a framework is that we all do it in the same way. But then the weighting factors will be local. Eurocodes is full of what they call boxed values. Each country has its national application. But you have the same manual when you are using which you all called A, B,C,D, but the figures you can determine yourself.
- Is water conservation important or not? That depends on whether you are in Netherlands or in Spain. It cannot be that you make the same assessment independent of the environment where you are. So it's about setting a broad framework, with local adaptations and local filling in of the topics.
- The solution to the problems we have in SC cannot be more regulatory requirements. There is already very good regulation, but it is not adopted. So we must also ask: do people accept it? What will be the outcome of new laws and regulation? You must have the effect you want from it.
- For the former communist countries, the east European countries, like Hungary, Czech Rep., Slovakia, many aspects of sustainable construction are not in the building permit procedure or in the legislation background like it is in Germany or the UK because these countries are much further with this. So therefore, for these countries it would be very beneficial to have European Directives. It is clear that you can't solve all problems with creating new directives, creating threshold limits, but in case of the East European countries it is beneficial to take this first step. And afterwards of course we can think on the way of adaptation on national level. I see it many times on different new building projects in the east European region if I am doing a BREEAM of LEED assessment. These problems are everyday problems for the developers, because of the lack of these directives and threshold limits, they are not doing anything in this direction. And of course if someone decides to go through the BREEAM certification procedure, this is a different case, because this developer is a sustainable developer and is willing to develop a green building. But this is not a common practice in these countries. We have only three certified BREEAM buildings in Hungary, and only two in the Czech Republic. So this is only for a small group of developers. They began with this practice, and they adapted for example also the UK standards. So this is a special group. But what we would need is also for the mass, to push them in the right direction.
- The EC is legally not allowed to go into issues concerning building control. They are not in charge of this. So it's OK if the EC sets a standard in a European directive or guideline or regulation, but how you do it or who is doing it, should be left to the MS. That is one of our big requirements. The EC can make regulations and frameworks on European level, but only on the subjects and levels of where the EC is in charge of.

- There are 27 different MS with different geographical and other aspects, different cultural institutions, administrations. So the EU can't go into too much detail. They should only set the framework, the aims, like the '20/20/20 targets' (reduction of 20% in EU greenhouse gas emissions below 1990 levels, 20% of EU energy consumption to come from renewable resources, and a 20% reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency). And maybe some consideration how we can meet these aims. But they shouldn't go into detail. I think there could indeed be another approach for the new MS, like the east European countries, because they have another background. So Hungary, Poland are lucky. They don't have any problem with meeting the requirements the EC sets, because they start from scratch. They have joined the EC and they have committed themselves to meet the requirements. But in countries like Germany of UK there is already a set of regulations and established administration, which in part they have to change. Changes can be good, and sometimes it's better to change than going on in the old way. But in the case of Germany they have to cope with a new administration, and they don't see why that is needed.
- Of course the EC can encourage certain initiatives. But I don't think it is necessary from the holistic idea on sustainability to make a Directive for all 63 criteria of sustainable construction. You can't make a Directive for each criterion. It is already a big step that sustainability is mentioned at all. So I'm sure that this is the right level.
- The EU should encourage initiatives but must not to say how the aims should be reached. MS should be able to set their own targets. So the EU role should be to set a framework of aims, but not going into too much detail. Let the EU 27 MS use their own different geographic and climatic and cultures to set their own targets.
- Only recommendations are not enough in several countries, like the east European countries. They will only implement it when it is obligatory.
- But if such a country sees a need for sustainable construction, why doesn't the government do it? If you have EC-requirements, you can always put the blame on Brussels. But normally it should be initiated at a national level.
- Malta is a very small MS with 400.000 people. We lack skilled personnel, so sometimes it's better to start from the scratch. But I can agree with the view that EU regulation should be only a framework.
- The EU should not tell how to reach the ends, they only should give the aims. And then evaluate if the MS meet the standards. I think a good example is the new EPBD. It gives aims, and even the benchmarking process. Only if you don't meet the requirements in the framework you have to explain why. And this is OK.
- If the MS don't achieve the aims there must be a control system. That's not a bad idea.
- That's very difficult with sustainable construction. It is good to have a common approach, a technical language, how do you define sustainable construction, and how do you control it? For example: with ethical standards: how do you want to control that?
- In countries like Germany they say: if you fulfil the standards you have a high quality anyway. And with a certification system you can go for better than the standard and go for silver or gold. How could you control and what do you want to control?
- Under European level we say that SC is considering those five fields, so could control that those five fields are somehow regarded in the MS. Maybe this would be an idea. But to say: that for example functionality should cover those ten aspects, that might be already to detailed for different MS.

7) Regulatory role of the EC: new topics for regulation?

<u>Durability/recyclability of construction products</u>

- The recyclability and durability and the use of the product, is an issue for EU regulation, but EC should do this as a framework directive, not by more regulatory requirements in a EU regulation, in order to give to the MS some ideas on what has to be achieved, something which is similar to the EPBD.

Sustainable product performance characteristics

- Sustainable product performance, and defining product properties oriented to sustainability, is important. But this doesn't have to be regulated by the EC. I prefer more soft measures, like guidance or recommendations from the side of the EC.
- The producers should indicate the intended use and the lifetime of the products. Products should be tested on durability. This must be taken into account in the CPD and later on in the regulations. In a country like Sweden they are thinking on how the products could be tested in public laboratories or similar circumstances, and are evaluated before being placed on the market.

The skills and competences of construction actors

- There is a EU-directive on the professional recognition, which means for example that architects or engineers, who want to work abroad, may require formal professional recognition in the host country in or to practice and/or perform certain services or acts in that country. This system of free movement of services and professionals is only possible with a certification system. For the different expertise fields of sustainability you would lots of certified experts. This creates a lot of costs for the tax players, because it means extra costs for this professional to get the certificate in addition to the ordinary education. The certified energy expert is an example. But for a holistic view on sustainability this could mean we need many qualified experts, and I hope that there will be experts who are qualified to a broader and wider area for this holistic view.
- So either we agree upon this personal certification system in MS, or we try to find an EU-level with the same level of competence for all participants, because we need a free movement of services.
- Important is also that the technical skills and education of the parties that take part in the construction process are regularly renewed and updated in the field of sustainability. For example in France certification is only needed for builders, not for other actors. How to recognize that everybody has at least some sort of competence for the part that he has in the process? This could be reached by means of a certification system or diplomas. After the formal education you should have to renew your competences every 4 years. If the parties don't have the necessary skills, a green building cannot be built.
- So, there could be a role for the EC on this: regulatory requirements on qualification, updating skills, certification and accreditation, related to SC.
- It would be good to have kind of European framework for mutual acceptance or mutal recognition, with equal requirements.
- The Client decides on the sustainability of the building. Therefore the skillness and the competence of the client (the persons who are serving the client in the management of the project is also important to lead him trough the procurement process etc..
- If the client is not willing to have a sustainable building, then everybody has a problem to achieve the goals.

Water conservation

- Water conservation had big attention, also because of the implementation of the Water Framework Directive, requiring member states to introduce certain legislation by the end of 2009. But one of the conclusions of the study so far is that water conservation/efficiency receives limited attention in MS' regulatory frameworks. In the questionnaire there are questions, in different subcriteria under the heading of 'ecological quality', about the use of water during construction and the use of water in the building during operation, for example water metering. But most of the respondents said that it had little attention in their country. It seems that there is not yet a link between the Water Framework Directive and the building regulations in the MS, or regulators have missed it. This is peculiar.
- Water quality is regulated very well, even so that tap water has a better quality than water sold in plastic bottles. But consumption and conservation is the problem.
- Conservation and economy on water consumption is important. For different quantities of water there are different buttons in the toilet. Those are the things that can be introduced slowly into the regulatory framework.

- Technologies for the conservation of water could be introduced. The EC can support this, to foster the development of this new technologies. That would be a touching new innovation.
- From the manufacturers point of view water conservation is always been taken into account during the life cycle of the building. They have to deal with water regulations for preventing water pollution. But of course that's not part of the building regulations but of the environmental regulations.
- Water conservation is an issue for the EU regulation. In 20 or 30 years time water conservation will be as important for the EU as energy is now.
- April this year water requirements were introduced into the UK building regulations. New houses have to be designed on a designed consumption of 125 litre/person/year usage limit. It takes care of toilets (dual flush buttons), size of the baths, the types of taps, it makes allowance for rainwater harvesting and recycling of water, it allows for white goods washing machines etc.. So it's a whole package that assess the potential water usage. It was originally introduced into the Code of Sustainable Homes that came out in 2007, but now it is part of the Building Regulations. As the Building Regs improve every couple of 3 years for energy, it's very likely that the requirement for this designed water consumption would follow the same path. Because 125 liters is equivalent to a Sustainable Home code level 3 house, so the next thing will be to go for code level 4. And we expect the water conservations regulations in 2013 to go to the next level, down to 115 liters or whatsoever. When someone applies for a building permit he has to submit the design calculation of the details so that the building control authority can check that. When the house is ready, the building control authority issues a completion certificate, and water is checked as part of that. And if it is being done with the Sustainable Homes Code they will do a check at design stage also, and a further check 'as built', to make sure that the right types of taps and baths have been used. So it should all be regulated and checked that way.
- Hungary unfortunately does not have those kind of regulations dealing with water. So with BREEAM there is a problem there, because there is no pressure from the legislation. It would be beneficial for east European countries like Hungary to have some EU Directive on water conservation.
- How should this be formulated in a EU-Directive? Like a benchmark, or only as "water should be conserved", without saying how this should be done?
- A centralized threshold would not be beneficial, because there are other issues in UK, Malta or Spain regarding water efficiency. On the other hand it should be also clearly indicated what should be the aim of a European Directive. Otherwise there are two many ways to escape for the developers. Countries have to set their benchmarks, and the countries have to implement that in the building permit procedure.

<u>Indoor air quality</u>

- Should we recommend that the EC should pay more attention to indoor air quality? This is a European common problem, because it could conflict with energy reduction or thermal comfort. It doesn't depend on the climatic and geographic conditions. So it is a real topic for the EC. This is a difficult task, but an effort in research can be put to reach some conclusion. CEN is already preparing harmonized methods for measurement. But is important to go further.
- Indoor air quality should not be a separated EU-approach. Because it has a relation with energy. With regulation you have to think of the interconnection of all those aspects.
- In Sweden it was realised years ago that indoor air quality becomes an important topic with energy efficient buildings, a mandatory ventilation check system was introduced, which includes almost every kind of building, and it has to be repeated over the lifetime. This really has helped, because people and owners became more aware of their ventilation system.

<u>The technical execution process</u>

- Should there be more regulation on the technical execution process? If we have a nice set of regulations for products and buildings, but if we do not look upon how these buildings are built, if we do not look upon the practice in the field, the awareness of the builders, how can we reach the goals of sustainable construction regulation, if the builder really doesn't care about a healthy, safe,

sustainable building, and just wants to have a quick gain? But I agree this is a topic that touches upon to autonomy of the MS. So it will be a very difficult one to sell.

- The problem is here that the CPD is not linked to the execution, it is only linked to the product. FIEC doesn't support any European standardization in this field, because they feel it is the responsibility of the member states. Each MS has its own way of execution of the work.
- In each country there are execution standards. So there is room for harmonization, and there is room for discussion, similar like Eurocodes. With Eurocodes there has also been years and years for discussion, about national determined parameters. Decades. And now it works quite well.
- An important aspect is subsidiarity. There is a heavy discussion in all countries on what is for the MS to regulate and what is for the EC. For the free movement of people. capital, services and goods, there is a role for the EC. The next step was for energy. And now the standards for safety and health on the building place. But standards for the way how to execute the buildings, are very local.

<u>Broadening the EPBD, for instance to include embodied energy by means of LCA</u>

- Should there be any regulation on embodied energy, for example by broadening up the EPBD? For example: problems with solar panels produced in China, resulting in a lot of toxic waste over there.
- I am a bit concerned by the suggestion to see a broader role of EPBD in the future, including for instance embodied energy. EPBD is about the use phase, the operational phase of the building. You must not mix it up with embodied energy. In future the energy performance of building will be better, so then the energy use for producing the products and material will also be better for the life cycle of the building. However you must not put that as part of the EPBD, because embodied energy is just one indicator for products, you have a lot of others. So if you put the focus on embodied energy it's just taking one element out of a lot of different elements, and then there will be inequity between products, you may need more energy to produce but have other environmental properties. So you cannot introduce that in EPBD.
- By including embodied energy or carbon, it will be even more difficult to measure the actual performance. I'm a bit reluctant of how this would happen to harmonize this.
- Embodied energy and embodied carbon are already two of the indicators in the calculation of the rules for the standards, prepared by CEN/TC350. So that is covered in the EU standards. But standards are horizontal, they cover all building materials, all types of buildings. At the moment they are not written in a way that you can use only those standards. You have to consider also the material specific issues, which are not standardized yet. But the main rules are in the CENTC350 standard. This is what you have to test, to consider, it's all life cycle at the building level.
- Explicitly mentioning embodied energy in the EPBD would be, in my opinion, a very positive move to promote a wider application of the methodology. The subject of embodied energy is quite mature (more than other parts of sustainability which still need more investigation to get a deeper understanding of them). Most sustainability certification systems consider embodied energy efficiency as a main topic and the EPDB could drive mainstream use, even if the public databases on embodied energy need to be improved.
- Embodied energy can be assessed by means of LCA. For LCA there are already standardized approaches (ISO 14000 series). LCA could be included in public procurement.
- The EPBD is resolving all these issues, because it has the philosophy of optimalization of cost, which covers embodied energy. National indicators should be established based on the analysis of optimalization of cost. That means that if you enter the embodied energy into the cost of the construction product, you must arrive at a certain optimum. So it is part of the EPBD generally now. But how it is implemented is of course a matter of standardization. CEN is already working on this standard.
- LCA can help to show that sustainable construction is affordable. It should be part of education and regulation.

More regulation on existing buildings?

- In rating systems like LEED the building envelope for existing buildings is considered.
- Methodologies and technologies and incentives are more for new green houses rather than old houses. Here must be an effort, reconstruction, refurbishments, new research and new technologies. Some of them you cannot apply to existing building because of the historical or monumental facade. But historical buildings can be isolated from the inside. But do we know how to do that? Are we able to control moisture?
- There is the question: more regulation or more incentives? Is more regulation the solution? There must be more pressure on owners to renovate.
- In most countries this is really difficult, because you interfere with ownership. That is the key problem. How can you break the rights of the owner not to do anything and to push him. Because we agree that the building sector is so fragmented that regulation is a most effective tool. As soon as you use only financial incentives you always help one group, and the other group is abandoned. So to really push together and force some collaboration, that regulation is the most effective tool.
- But on the other hand: the owner has to respect the authorities to a certain extent, because the constitutional law in many countries says that the ownership is 'bounding' (it commits the owner to take care about his/her property in accordance with legislation).
- At least it's difficult, to grip owners of buildings and make them to spend money. But a good example are sewage systems. Years ago every building had a septic tank. Now there is a general sewage system and everybody had to invest to provide pipes and make a connection. But
- Yes, as far as safety and health is concerned this is absolutely possible to force owners to spend money. So why not create a kind of same system for sustainability? This is also a kind of health and safety program for our society.
- Concerning installations in existing building, renovation means in most cases adding a new system to already existing technical systems of buildings. Either the building is expanded or maybe one of the technical building equipment systems has broken down and needs to be replaced, for example the electrical or heating system, or a new generation is moving in a building. So you need renovation. And then you are adding a new system to the old one, and you have to integrate the different systems. Which is quite a challenge. Because from the technical point of view it's really not 'plug and play'. So construction companies, and installers are looking desperately for reliable solutions which they can find again two weeks or even two years later. Because everything is changing so quickly. The market constantly develops new and better systems. Everybody is confused on that.
- The 'Directive on energy end-use efficiency and energy services' is addressing the issue of existing private owners and making incentives for them to renovate and giving examples of free energy advice. So the EC has been touching the issue of how to get private owners and explicitly on how to do it on a national level.

8) Role for EU in raising awareness

- In the existing building stock there are also existing people. So social aspects of existing building stock are much more than the social aspect of new buildings. So also in the European projects on renovation, the social aspects are most important. To save energy, water and waste you need the awareness of people, otherwise you are lost.
- Raising awareness is a big part of the game. I do agree with that. We need a lot more initiatives to change behaviour of energy consumption and things like that. I miss a little bit the smart building concept. Smart building also needs a change of behaviour. Smart building means using a lot of electronic and digital controls. I think the smart part behaviour needs to be added here as well.
- The life cycle awareness element is also a part of raising awareness. This is for example very important in terms of making investment decisions. Investment decisions on new technology are connected to financial investment.

9) Facilitation role of the EC

Identification and dissemination of best practices and methodologies in Europe

- The EU should identify best practice throughout the MS and develop that throughout the rest of Europe. Water conservation was already mentioned as an example.
- Consumers can't always compare the right measures to take because of lack of information on new technologies and methodologies. In many situations the problem is not the cost of technology or the payback time, but the lack of information to base the best decision on. And that's what Life Cycle Assessment and other tools provide. You can use regulation for this, enforcing that LCA is a requirement for a new development or for refurbishment, but of course you can do this also with 'facilitation'.
- It is Important to create a platform for dissemination of best experience in Europe.
- We noted that there are many obviously different types of initiatives and actions to spread or create information and not everyone knows what's going on next door. I'm not sure if we can change this easily, but we could at least do an attempt to know more about it. The EU could spread information, could create information.
- We see the need for creating a pool of experts in terms of sustainability in the EU. There seems to be a lack of information and expertise in the real estate and construction business.
- There can be role for the EC for showing good examples on how can you teach or educate the client to build green, to formulate performance requirements. Promotional schemes, sharing experiences sharing experiences between different governments or local authorities.
- A good example is the Build-up initiative, a collection of best practice example.

Building networks between town or territories

- Building networks between towns or territories for creating ecological landscaping and defining the needs for ecological buildings, can also be a good idea.

Benchmarking, and rewarding or not rewarding successful countries?

- Rewarding successful economic operators but also not rewarding them, because of the possibility that not rewarding might feel that they are not doing enough.
- In the recast of the EPBD you should achieve a cost optimal level. If you don't achieve that cost optimal level you won't receive any funds. That is a great incentive and push for investors and developers. If they like to benefit from national funds. They have to level the performance of the building to that level. For many countries you raise the level. So why not all countries reaching that level?
- The EC can promote benchmarking on the way how sustainability is implemented in the MS. Benchmarking has influence, because parliaments see it and start questioning about it. But in order to benchmark sustainability, you need to measure it. This is a very important topic. With the CPD there is one methodology of how to measure and express the quality of the building product, and what information the producer has to deliver. I think it was a very good idea not to standardize the product, but to standardize the information and the way of measuring properties. Now, in the same way we can discuss sustainability and the way how to measure and benchmark it. And then countries can compete, and everyone can see who is the best in the class.

Guidelines or recommendations for developing a national strategy

- EC could develop guidelines or recommendations to help national authorities to develop a national strategy on sustainable construction to address the construction actors in a country. This strategy needs to address regulatory issues also.

Common approach for enforcement

- Should the EC be involved in the enforcement of the regulations? For example with the EPBD, there are goals, but on the enforcement we don't have a common approach. Could the EC give a recommendation on that? The same with checking on seismic aspects. Is 'seismic durability' covered in the checking process? The EC wants to have Eurocodes as a common tool, then the EC must have some thoughts about the implementation and enforcement.

Identification of local conditions

- EC must keep in mind that we face different local and cultural conditions. For example in Bulgaria the zoning planning, city planning is very important for a sustainable society. If we use sustainable construction products with environmental product declarations, this does not make our society sustainable. It would be a good idea to identify these differences. That could be a role for the EC, to identify those local conditions.

Coordination role of the EC

- I would go beyond facilitation. The EC has the role of monitoring developments, giving an overview, and if there are developments which cannot be combined with EU thinking there must be a way of giving back information and bringing back those on track who have managed to get out of track. So there is also a coordination function of the EU, not only facilitation.
- The EU plays a central role for the development. But I see it more as a coordination function. Facilitation is good, monitoring is good, but there should be flexibility to national regional and local solutions. Many solutions are possible because different regional/local solutions take account of surrounding conditions, climate, finance, real estate market. So there are lot of local issues to be taken into consideration. We don't want a single Europe with one solution only, but a multi solution market with many choices.
- The EC should coordinate the fulfilment of the aims/targets of sustainable construction. And also the tools that are to be applied.
- The EU also monitors the national energy action plan. They coordinate them and put them back to the original directive and they check if the national achievement match the requirements of the Directive. That's the coordination function, and if one country cannot comply with the rules or the recommendations of the directive, then probably there will be a letter to this country with the recommendation to speed up.

More coordination of the various initiatives and policies on EU-level

- The EU should rather not go for any recommendation for tax related things within sustainable construction, for example related to substitutes in concrete, or recycling. Tax systems are so different between countries. You have green PP, they have some ideas, you have all those different groups. It would be good to adjust, to coordinate between all those policy fields.
- So maybe the different European politics should adjust to each other, considering subsidies, taxes etc. What do they aim for?
- There are some overlaps within the LMI, for example for the recycling initiative, a small part also considers recycling of construction materials. At least within the LMI you should go the same direction. If the LMI should give recommendations they should adjust those recommendations also to the other markets, because it's not only sustainable construction policy, but also the policy on recycling and energy efficiency. The interrelationship between all those markets, and also the coordination of all the activities is important. This also account for ecolabeling.
- So there is a link between sustainability and recycling, waste management and taxes and subsidies and competition law. It should cooperate more.
- There is such a coordination function with the CENTC 206, they screen all the standards, but they don't screen the other initiatives.
- There is indeed lack of coherence at EU level on the different environmental issues, EcoDesign directive etc.

- We recommend to introduce an interdisciplinary or holistic approach from inside the Commission. There are lot of activities going on with different DG's and different groups, but they are not very well coordinated together. They should first start with harmonization inside the Commission.
- EU themselves are confused taking so many initiatives in so many areas. Talk with one voice, or try at least to communicate the full picture relating the ongoing EU initiatives to each other, which may be not represent the full picture: LMI are at least not mentioned.
- The most important point is that any further development from the commission should be aligned with the precedent initiatives from the same commission.

Coordination role for reaching the targets

- The client can set targets and criteria for his own building. Like they are doing now with marketing with green building labels with which they claim to be more 'green' and competitive. Targets can be set also on a national level. There can be national regulations which set limit values or targets on a national level. For this they should use the European standards for the target setting. These targets are performance based, so there are never any threshold values or limit values in the CEN/TC350 standards. They are tools with which you can set your own standards.
- Sustainability is such a complex issue. So I don't see how the EU can set targets for sustainability in order to have a holistic view. There are only a few indicators with sustainability that the EC can set targets on, for example climate change. You can set targets on climate change for buildings, but it must be global aspects, not local. So there might be some indicators, some aspects of sustainability that on EU level could be defined, but that's always a political decision.
- Do you speak of global targets or specific targets? For example energy efficiency. This is defined at a global level, what is the contribution of building, what could be likely the targets for buildings. In recycling it is fixed by the Waste Framework Directive.
- I mean the specific targets on EU level, for example requirements that all new building from 2015 must not release greenhouse gasses more than …./m2. That can be a EU target. It is specific for sustainable construction and it's not so general as the recycling target because they are in a way material specific targets. 'Zero Energy' can also be a target. It is performance based but no one has defined is. That is why we need to speak about the same thing.
- For energy and recyclability there are a few targets, but if you want to go for everything it is a huge challenge. Is it realistic that you can achieve this high ambition if you see all the work to be done on the other more focused issues?
- Companies are not in favour of too much regulation. There is a lot of administrative burden. On the other hand we know from experience that only binding targets have helped in the past to go tremendous steps forward towards energy efficiency. For example when you look at the EPBD we have the example of public buildings. The public buildings should be ready two years (2018) earlier than the rest of the buildings. So they give a good example for the rest of the scene. They set a benchmark for energy efficiency. Only with these kind of binding targets there is progress at all.
- Only with this framework and by setting binding targets the necessary progress on sustainability will be made. Tremendous effort to connect it to finance and probably quality and qualification is another thing that needs to be discussed.
- So the EU should coordinate the fulfilment of the targets. Sustainability is one of the targets. Efficiency is another target. Also the EPBD defines targets. You cannot do without targets, targets which are hopefully binding, and which everybody must reach. There are many ways to reach the targets. That's why I preach for flexibility. It must be possible to have local solutions.
- We have two different things. First the political targets (2020 targets). This has probably not very much to do with the technical targets, of how energy efficiency is calculated technically spoken. There is a big lack in the technical calculation. Either we have no definition at all, so nobody knows exactly what the calculation method is about. Or the other definition is: we have too many methodologies to calculate energy efficiency. Either of the two, so all together there is a big irritation about the results. For instance with the car industry, no car today is sold today without a label with the energy performance, CO2, fuel. With buildings there is no such clarity available. And we must find a way of definition which is common enough to be accepted by everybody, and easy enough that everybody can understand better: is my building energy efficient or is it not. The cal-

culation methodologies that are available are still very confusing in the market. This has nothing to do with the political target. EU Legislation will never concentrate on the technicalities, that's the work of standards. But the political target must be set, and probably we must look for enforcement to get forward.

10) What should the EC not do? What are the areas the EU should not interfere with?

- EU should use a step-by-step procedure. For example, the EU should not come up suddenly with a common standard for certification of sustainable buildings. The Italian proposal for an Ecolabel related to the European label suddenly came up as a European standard which overrules HQE, BREEAM and so on. That would not be the right thing to do. So make a survey of the national certification schemes and differences in context. Take a step by step approach, and identify areas where something should be done at the European level. It is of importance to acknowledge, that until now regulations and certification schemes at building level are decided upon on a national level; but also that harmonisation efforts are ongoing concerning standards for energy calculation, structural safety etc. My proposal is therefore to further identify the differences in context in the different MS's to prepare the ground for further harmonisation on building level.
- The strength of the EU is that it is so different, that there are so many types of countries, and so many cultures. That means that some regulations must remain local, like building permits or building regulations. It is up to the local people how to deal with the tools (standards, calculation methods etc), how they set the benchmarks, or set level of qualities. That's up to the local inhabitants of the EU. EU should step out of this.
- So, beyond the specific minimum of quality of benchmarks, the EU should step out of local conditions. How local municipalities should set their benchmarks is up to them. How building permits are created, what is necessary for building permits, is a local matter. The minimum levels don't have to interfere with forefront runners, early adopters. They have to be supported by research and so on.
- So in stead of focussing on the leaders look upon the people who lag behind and try to get them on the level where you want them to have, which are your minimum requirements. We could also say that the LMI should start focussing on the laggards. Why should the EU want to have the leaders move beyond, and why shouldn't the EU focus on the people who stay behind, and try to get them on the road. Why always focus on leaders?
- That means: upgrading the least performing member state!
- You must also look at governments and municipalities who want to set a higher level than the minimum that is required by the legislation. They are now not allowed to do that, they can't require certification. So it is also of interest to look at the restrictions in EU regulations that influence municipal actors (who can't do what they want to do). As far as I know, these barriers are both related to EU regulations and to national regulations, which differs from country to country.
- The EC could leave the creation of criteria for the single countries, but the EC could provide them with calculation / assessment guidelines, perhaps standards.

ANNEX 4 SURVEY QUESTIONNAIRE

1. Survey questionnaire

In order to analyse the trends of regulatory approaches regarding sustainable construction in the EU-27, a questionnaire survey on the current situation of sustainable construction regulation in each EU member state was conducted. The collected information has been supplemented and updated by information from literature and internet sources.

2. Set up of questionnaire: part 1, screening of the regulatory systems

Criteria and topics of sustainable construction

The questionnaire builds around the five sustainable construction criteria as specified in the call for tenders: *ecological quality*, *economic quality*, *social quality*, *functional quality* and *technical quality/construction process*. The combination of these five aspects was considered to be a holistic approach to sustainable construction.

In the different round table meetings there was however criticism to this five tier approach to sustainable construction. Participants noted that this five tier approach conflicts with initiatives such as CEN/TC 350, which distinguish amongst *ecological quality, economic quality,* and *social quality.* The topics addressed throughout this report can however easily be brought in line with such a three tier approach: all topics addressed under *technical quality/construction process* in this report are in line with what other approaches consider *economic quality*; and roughly all topics addressed under *functional quality* in this report are in line with what other approaches consider *social quality*. Throughout the report *technical quality/construction process* will therefore be discussed under *economic quality*. *Functional quality* will be however be discussed as a separate issue given its focus on more traditional construction regulatory aspects such as structural and fire safety.

Approach to data collection

In 2009 a preliminary questionnaire was drawn up by the LMI Working Group on Sustainable Construction, requesting its respondents to precisely fill out the various laws and regulations that address these sustainable construction criteria. The aim was to gain insight into the content of these laws and regulations, the level of implementation and their background in EU directives. All in all the research resulted in six returned questionnaires, most of these only partly filled out. Criticism was expressed regarding the level of detail of this particular questionnaire – i.e. it took respondents much time to go through legal documentation to find the exact regulations.

Considering the difficulties with this earlier questionnaire the consultants decided to focus not so much on the content of the regulations, but on the topics regulated. It was assumed to be more relevant to know *whether* a certain topic is regulated, than to know exactly *how* it is regulated (the how-much-questions, e.g. how much thermal insulation is stipulated?). It is expected that by taking a look at a range of major sustainable construction themes – the regulations on an aggregated level –an overview of the state of the art in EU-27 sustainable construction regulation can be drawn up.

As such it was decided to put the five sustainable construction criteria provided into practice and build the questionnaire around these. This was done on the basis of an extensive review of 'state of the art'-literature on sustainable construction. This led to a specification of the content of the five criteria, giving answer to the what-questions – i.e. what is the range of sustainable construction topics that make up ecological quality? Paragraph 5 hereafter provides an overview of the different criteria and topics addressed in the questionnaire, the major literature used in designing the questionnaire.

Having specified the content of all five sustainable construction criteria, a systemized questionnaire was built by addressing all criteria in a similar way. It was decided to take a multiple-choice answering approach as this would relieve respondents from typing a lot of detailed data, and would provide information that is, on an analytical level, to a certain extent comparable.

For each topic questions were asked about:

- Whether and at what government level is a sustainable construction topic regulated?
- If regulated, do the regulations have a background in EU directives?
- How are the regulations ordered?
- Do regulations apply to existing buildings?
- Do regulations apply to the renovation of existing buildings?
- How are the regulations drawn up?
- Is there any documentation on accepted solutions or deemed to satisfy solutions?
- What type of design-process preceded the implementation of the regulations?

Regulation

In the questionnaire and throughout this document the word 'regulation' is used. In a strict sense regulation means legally binding provision. As such requirements are drawn up differently in the different EU member states and regions, a broader definition of the term is used. Under regulation can be understood to include:

- Government laws, decrees and regulations, including approved documents, government guidance and other documents which have a 'deemed to satisfy' status under the regulations;
- Regional or local authority building regulations or planning/land uses regulations;
- 'Quasi-mandatory' codes and standards: this could include codes and standards required by insurers or by the insurers' technical control bureaus, where the insurance requirements themselves are mandatory or quasi-mandatory: this would include for example decennial insurance requirements in France and Belgium; the technical requirements of the NHBC in UK and similar warranties for housing elsewhere funded by mortgage lenders or public funds; and also Codes which are mandatory for all members of chambers of commerce or architects chambers, for example, where membership is mandatory for all practitioners.

A coherent regime: regulation and enforcement

Regulations only have value when enforced. An important element of a *coherent* sustainable construction regulatory regime is when it considers both the regulation of sustainable construction topics and the enforcement of these regulations. To gain insight into the enforcement of the sustainable construction regulations, questions were asked, in a comparable systemized manner, about:

- Are building plans monitored to check compliance with sustainable construction regulation?
- Is work under construction monitored to check compliance with sustainable construction regulation?
- Is finished construction work monitored to check compliance with sustainable construction regulation?
- Are occupied constructions monitored to check compliance with sustainable construction regulation?
- If building plans/work under construction/finished construction work/occupied constructions are monitored, who does so?
- Is this monitoring process regulated in law?
- How is this monitoring carried out?
- How thoroughly is this monitoring carried out?
- If non-compliance is found, how is this disciplined?
- If compliance is found, whether and how is this reported?

3. Set up of questionnaire: part 2, screening voluntary and complementary initiatives

Formal public regulation is but one approach to sustainable construction. In order to gain insight into other approaches to sustainable construction a second part to the questionnaire was added. In this part the respondents were asked to name a number of private, non-governmental, or hybrid public-private sustainable construction initiatives that may be considered complementary to the formal regulatory regimes.

Since the structure of voluntary or complementary initiatives is often highly comparable to formal regulatory regimes, highly comparable questions were asked about these as under part 1. By gaining insight in such voluntary and complementary initiatives a better understanding might be gained about the range of topics of sustainable construction that are taken up in the EU-27. This will add to drawing up approaches for the EU to address sustainable construction initiatives in the EU-27.

3. Organization of the questionnaire

The survey was set up as an online questionnaire in three languages (English, French, German), to be filled out by specialists in building regulations and sustainable construction. It was expected that answering the questionnaire would take a specialist about two hours, for a non-specialist filling in the questionnaire was expected to take about a day as he/she would have to collect (some of) the data from others. For experts from private bureaus a modest consultancy fee was available. For other respondents an incentive was prospected in the form of receiving a copy of the final report (once that it was approved by the client), and/or receiving an invitation for attending a round table discussion.

A first version of the questionnaire was discussed on 17 March 2010 in Brussels. Members of the Working Group were requested to provide comments to the questionnaire. The received comments were taken into account in a second version of the questionnaire, which was the basis of the final online survey.

The respondents and experts were found in the network of ARCADIS affiliates, other consultancy bureaus, government officials, and other experts in the various member states found from various sources. This resulted in a pool of 330 potential respondents. Furthermore, CEBC (Consortium of European Building Control) asked their members to collaborate, and also the technical-scientific attachés of the Embassies of France, Germany and Sweden assisted in requesting organizations in their country to collaborate.

In addition an invitation to fill out part 2 of the questionnaire was sent to members of ICLEI ('International Council for Local Environmental Initiatives').All these respondents were invited in April/August 2010 to fill in the questionnaire, with a deadline of October 2010 for completion of the questionnaire.

A helpdesk was to set up to help respondents in completing the questionnaire.

4. Topics addressed

Ecological quality

- Energy
  - To energy performance
  - To use renewable energy sources
  - To implement energy efficiency techniques (e.g. low-energy light bulbs)
  - To thermal insulation
  - To reduce air permeability
- Water
  - To implement water conservation techniques
  - To implement water efficiency techniques (e.g. low-water flush toilets)
  - To water metering
- Minimize pollution
  - To minimize waste during construction
  - To register waste production (e.g. in site waste management plan)
  - To separate/recycle waste
  - To limit emission of CO2
  - To limit ozone depleting gasses
  - To limit green house gasses
- Protect biodiversity and natural environment
  - To conserve flora on sites
  - To conserve wildlife on site
  - To conserve natural habitats on site

- Minimize the use of resources
  - To use recyclable materials
  - To use renewable materials
  - To refurbish and redevelop existing buildings instead of demolition and new development

Economic quality

- Enable businesses to be efficient and competitive
  - To reduce energy consumption in construction
  - To reduce waste in construction
  - To keep water use to a minimum in construction
  - Top construct adaptable buildings
- Support local economic diversity
  - To the density of the development (e.g. minimal/maximal number of dwellings per area)
  - To mixed land use
  - To use local material/goods in construction
- Provide employment opportunities
  - To use local labor in construction

Social quality

- Adhere to ethical standards during development
  - To ensure ethical trading throughout supply chain
  - To provide safe and healthy work environment
- Provide adequate local services and facilities
  - To provide information to local community during construction activities
  - To provide space for training workmen
  - To provide local schools, health, social facilities
- Provide housing that meets needs
  - To develop a mix of tenure types
  - To provide affordable housing
  - To provide housing for the elderly
- Integrate development in local context
  - To reject or discourage gated development
  - To provide transport links to local context
  - To provide links to adjacent neighborhoods
- Conserve local heritage
  - To reuse locally valued buildings
- Access to green space
  - To have green space within a certain distance

Functional quality

- Design optimalization
  - To shape of exterior
  - To aesthetics
  - To planned service life of structures
  - To planned service life of building services
  - To the demand of space per occupant and/or dwelling
- Building envelope
  - To moisture protection of building envelope
  - To wind protection of building envelope
  - To electro-magnetic shielding
- Health, comfort and user satisfaction
  - To indoor air-quality
  - To thermal comfort in winter
  - To thermal comfort in summer
  - To acoustic comfort

To in-door daylight entry
To the capability of conversion by a construction/building user
Usability for disabled
To accessibility for disabled

Technical execution and quality of the construction process
Technical execution (building the construction)
To limit construction time (planning)
To construction management
To keeping records on construction progress
To level of education/experience of builders
Structural safety
To the structural safety of the construction
To fire resistance of the construction
To the safety of a construction during a fire

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ANNEX 5 DEFINITIONS AND INFORMATION SUPPLIED WITH QUESTIONNAIRE

Questionnaire part 1
Our definitions and classification of sustainable construction and of regulatory systems are set out below.

By Sustainable Construction, we mean: the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life-cycle from initial planning approval to design, construction, operation, maintenance, renovation and deconstruction. This practice expands and complements the classical building design concerns of economy, utility, durability, and comfort. Sustainability is considered from an ecological, economical, social, functional and technical point of view.

Requirements to sustainable construction may be implemented in formal regulatory systems or in complementary systems. As element of a formal regulatory system these criteria may, for instance, be a part of the mandatory building regulations or codes. Complementary systems might be drawn up to supplement such formal regulatory systems. Complementary systems might have a voluntary status, or a quasi-mandatory status.

By Building Regulatory System we mean: an institutional structure of requirements that prescribe expected behaviour or outcomes of constructions and construction activities; standards that are the benchmarks against which compliance with the requirements can be measured; a mechanism for determining the degree of compliance with the requirements; and sanctions for failure to comply with the requirements.
We understand that such requirements are drawn up differently in the different EU member states and regions. In the first part of the questionnaire we therefore would like you to consider separately:

- Government laws, decrees and regulations, including approved documents, government guidance and other documents which have a 'deemed to satisfy' status under the regulations;
- Regional or local authority building regulations or planning/land uses regulations;
- 'Quasi-mandatory' codes and standards: this could include codes and standards required by insurers or by the insurers technical control bureaus, where the insurance requirements themselves are mandatory or quasi-mandatory: this would include for example decennial insurance requirements in France and Belgium; NHBC and similar warranties for housing in UK funded by mortgage lenders or public funds; and also Codes which are mandatory for all members of chambers of commerce or architects chambers, for example, where membership is mandatory for all practitioners.

Regulatory systems come in many forms, some are:

- Traditional system: all requirements are drawn up and enforced by governmental agencies. An example could be a system in which a national government sets requirements and local/municipal governments enforce these.
- Private system: all requirements are drawn up and enforced by private sector organizations. An example could be a system in which a private sector code organization sets requirements and accredits technical inspectors who assess code compliance.
- Hybrid system, or umbrella: a system which shows characteristics of both a traditional and a private system. An example would be a system in which a national government sets the regulatory framework and leaves it to private sector code organizations to fill the framework with specific requirements. Compliance could, for instance, be assessed by certified architects.
- Insurance based system: a system in which insurance plays a major role. An example could be a system in which an insurance policy is needed in order to obtain a building permit. In such a system the requirements set by the insurer may be considered de facto mandatory building codes.

Specific information with matrix questions
What are the subjects of regulations and requirements which specify sustainability aspects of construction? And, at what level are these drawn up?

In the first column of the below table we have highlighted a number of subjects relating to sustainability aspects of construction. In the second column we have highlighted a number of topics that may be

regulated in your country. Could you indicate at what level this topic is regulated by clicking the boxes referring to:

- Nation/federal requirements: laws, decrees, regulations, official guidance, approved documents etc.
- Regional/state requirements.
- Quasi-mandatory codes/standards: required by insurance and warranty schemes, or for membership of chambers of commerce, institutions and professional bodies' or for lending agencies and publicly funded projects; or
- Local level: planning, zoning, land use, requirements for connection to infrastructure networks etc.
- None, if no requirements apply.
- Future, if there are plans for future requirements – irrespective of the level of requirements.
- I don't know, if you don't know if requirements apply to a certain topic.

We are furthermore interested if requirements have a background in EU directives. Could you please tick the appropriate box under the question: do the requirements have a background in EU directives?

We divide sustainability aspects of construction in: ecological quality, economic quality, social quality, functional quality, and technological quality/quality of the construction process.

- Ecological quality. We focus on regulation which aims at minimizing the use of resources, energy, waste and pollution; and on regulation which aims at protecting biodiversity on and the natural environment of a construction site.
- Economic quality. We focus on regulation which aims at enabling businesses to be efficient and competitive; on regulation which aims at making construction and construction initiatives support local economic diversity; and on regulation which aims at providing employment opportunities to local workers.
- Social quality. We focus on regulation which aims at adhering ethical standards during development. On regulation which aims at providing adequate local services and facilities. On regulation which aims at providing housing that meets needs. At regulation which aims at integrating development in the local context. And at regulation which aims at development which provides access to green space.
- Functional quality. We focus on regulation which aims at design optimalization. On regulation which aims at providing a safe, healthy and comfortable in-door climate. And on regulation which aims at ensuring constructions' usability for disabled.
- Technical quality/quality of the construction process. We focus on regulation which aims at improving the actual construction work. And on regulation which aims at providing a certain level of structural safety[22].

Enforcement is considered as all actions and mechanisms for determining the degree of compliance with the requirements related to sustainability aspects.

Supporting information

If you feel that the terminology or the types of construction regulatory system we use throughout the questionnaire do not suit your country, please add a note on what you are including in each category, and complement the questionnaire as appropriate to your case. The questionnaire provides space for such notes.

Questionnaire part 2

Complementary sustainable construction initiatives are considered enterprises by public sector organizations and private sector organizations that aim to add to or to go beyond (governmental) regulation which specifies sustainability aspects of construction as addressed in part 1 of this questionnaire. These complementary sustainable construction initiatives aim to go beyond regulation which specifies sustainability aspects of construction. As some initiatives may be set up by private sector organiza-

[22] Note that in this report the criterion technical quality is discussed under economic quality and functional quality. This in response to the round table discussions. See annex 2.

tions in collaboration with governmental bodies, we also address 'joint public-private initiatives' in this part of the questionnaire.

Often specific rules or requirements are drawn up which participants have to meet in order to join the complementary sustainable construction initiative. For example: staff has to meet certain criteria relating to education and experience in order to become a certified plan checker; an organization has to meet certain criteria related to sustainable business; or a construction work has to meet certain criteria in order to get a certain green rating. The latter rules relate to the requirements which specify sustainability aspects of construction discussed in the first part of the questionnaire. We keep to similar terminology when discussing these rules in this second part of the questionnaire.

A number of questions are in-depth. If you do not know an answer to a question, one of your colleagues might know. We kindly request you to fill out the questions as complete as you can. If you encounter any trouble filling out the questionnaire, please feel free to contact [contacts PRC helpdesk].