European Commission

JRC TECHNICAL REPORTS

State of harmonised use of the Eurocodes

Authors:

Sousa, M.L., Dimova, S.
Athanasopoulou, A., Iannaccone, S.
Markova, J.

Editors:

Pinto, A., Sousa, M.L.

March 2019

Joint Research Centre

EUR 29732 EN

This publication is a Technical report by the Joint Research Centre (JRC), the European Commission's science and knowledge service. It aims to provide evidence-based scientific support to the European policymaking process. The scientific output expressed does not imply a policy position of the European Commission. Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use that might be made of this publication.

Contact information
Name: Maria Luísa Sousa
Address: TP480, Joint Research Centre, Via Enrico Fermi, 2749, 21027 Ispra, VA, Italy
Email: luisa.sousa@ec.europa.eu
Tel.: +39 0332 78 6381

EU Science Hub
https://ec.europa.eu/jrc

JRC115181

EUR 29732 EN

PDF	ISBN 978-92-76-02911-3	ISSN 1831-9424	doi:10.2760/22104
Print	ISBN 978-92-76-02912-0	ISSN 1018-5593	doi:10.2760/777466

Luxembourg: Publications Office of the European Union,

How to cite this report: Sousa, M.L., Dimova, S. Athanasopoulou, A., Iannaccone, S. Markova, J., *State of harmonised use of the Eurocodes*, EUR 29732 EN, Publications Office of the European Union, Luxembourg, 2019, ISBN 978-92-76-02911-3, doi:10.2760/22104, JRC115181

Contents

Foreword

The construction sector is of strategic importance to the EU as it delivers the buildings and transport infrastructure needed by the rest of the economy and society. It represents more than 9% of EU GDP and more than 50% of fixed capital formation[1]. It is the largest single economic activity and it is the biggest industrial employer in Europe. The sector employs directly almost 18 million people. Construction is a key element not only for the implementation of the Single Market, but also for other construction relevant EU Policies, e.g. Sustainability, Environment and Energy, since 40-45% of Europe's energy consumption stems from buildings with further 5-10% being used in processing and transport of construction products and components (EU, 2016).

The Eurocodes are a set of European standards that provide common rules for the design of construction works to check their strength and stability. In line with the EU's strategy for smart, sustainable and inclusive growth (EU2020), Standardization plays an important part in supporting the industrial policy for the globalization era. The improvement of the competition in EU markets through the adoption of the Eurocodes is recognized in the "Strategy for the sustainable competitiveness of the construction sector and its enterprises" – COM (2012)433[2], and they are distinguished as a tool for accelerating the process of convergence of different national and regional regulatory approaches.

With the publication of all the 58 Eurocodes parts in 2007, their implementation in the European countries started in 2010 and now the process of their adoption internationally is gaining momentum. The Eurocodes recognise the responsibility of regulatory authorities in each Member State and have safeguarded their right to determine values related to safety matters at a national level, where these continue to vary from State to State. The Eurocodes provide for national choices full sets of recommended values, classes, symbols and alternative methods to be used as Nationally Determined Parameters (NDPs). The European Commission Recommendation 2003/887/EC[3] stresses the importance of using the recommended values provided by the Eurocodes when Nationally Determined Parameters have been identified in the Eurocodes. It is recommended to the Member States to diverge from those recommended values only where geographical, geological or climatic conditions or specific levels of protection make that necessary. The Commission Recommendation invites the Member States to notify the Commission of the NDPs in force on their territory and to compare them acting in coordination under the direction of the Commission.

The next goal of the European Union is to keep the Eurocodes as the most advanced state-of-the-art codes for structural design in the world. To implement that objective, in December 2012, the Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW) issued to the European Standardisation Committee (CEN) the Mandate M/515 EN[4], for a detailed work programme to develop the second generation of the structural Eurocodes, which includes amending the existing Eurocodes and extending their scope. Among the guiding principles of the project, further harmonisation of the Eurocodes is pursued through the reduction of the number of existing NDPs.

Since March 2005, the Joint Research Centre of the European Commission (JRC) provides scientific and technical support to DG GROW in the frame of Administrative Arrangements on the Eurocodes. The mission initially devoted to the JRC included support to the national implementation and harmonisation of the Eurocodes, support to the training, international promotion and further development of the Eurocodes. Since 2015, the scope of the JRC

(1) https://ec.europa.eu/growth/sectors/construction_en
(2) https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2012:0433:FIN:EN:PDF
(3) 2003/887/EC - "Commission Recommendation 2003/887/EC of 11 December 2003 on the implementation and use of Eurocodes for construction works and structural construction products". Official Journal of the European Union, L332: 62-63.
(4) M/515 EN - "Mandate for Amending Existing Eurocodes and Extending the Scope of Structural Eurocodes" DG Enterprise and Industry, European Commission, Brussels, 12 December 2012.

contribution has been extended to support to policies and standards for sustainable construction.

One of the tasks assigned to the JRC is the development and maintenance of a Database with the Nationally Determined Parameters (NDPs Database) adopted in the countries of EU and the European Free Trade Association (EFTA) applying the Eurocodes. The NDPs Database acts as a platform of notification to the European Commission by the Member States on the adopted values of the NDPs and constitutes the basis for the comparison of the NDPs to assess the state of the harmonised use of the Eurocodes.

The objective of the present report is to evaluate the state of harmonised use of the Eurocodes in the EU and EFTA Member States. Besides that, the report is deemed to highlight the potential for further harmonisation and the associated needs, in order to support the on-going activities of CEN/TC250 "Structural Eurocodes" in the development of the second generation of the Eurocodes.

The editors and authors have sought to present useful and consistent information in this report. However, users of information contained in this report must satisfy themselves of its suitability for the purpose for which they intend to use it.

The report is available to download from the "Eurocodes: Building the future" website (http://eurocodes.jrc.ec.europa.eu).

Ispra, February 2019

Acknowledgements

The work in this report is a deliverable within the framework of the Administrative Arrangement No SI2.767899 between DG GROW and DG JRC on support to policies and standards for sustainable construction.

Authors:

Maria Luísa Sousa	European Commission, Joint Research Centre (JRC), Ispra, Italy
Silvia Dimova	European Commission, Joint Research Centre (JRC), Ispra, Italy
Adamantia Athanasopoulou	European Commission, Joint Research Centre (JRC), Ispra, Italy
Sonia Iannaccone	Fincons S.p.A., Vimercate, Monza and Brianza (MB), Italy
Jana Markova	Czech Technical University, Klokner Institute, Prague, Czech Republic

Editors:

Artur Pinto	European Commission, Joint Research Centre (JRC), Ispra, Italy
Maria Luísa Sousa	European Commission, Joint Research Centre (JRC), Ispra, Italy

Executive summary

The Eurocodes are a set of European standards that provide common rules for the design of construction works to check their strength and stability. The improvement of the competition in EU markets through the adoption of the Eurocodes is recognized in the "Strategy for the sustainable competitiveness of the construction sector and its enterprises" – COM (2012)433[5], and they are distinguished as a tool for accelerating the process of convergence of different national and regional regulatory approaches.

The Eurocodes are the product of a long procedure of bringing together and harmonising the different design traditions in the EU Member States, leading to more uniform levels of safety in construction in Europe. At the same time the Member States keep the exclusive competence and responsibility for the levels of safety of the construction works, the Eurocodes are flexible enough to account for differences in national applications. In fact, the Eurocodes include the Nationally Determined Parameters (NDPs), which are the parameters used for design that were left open in the Eurocodes for national choice, in order to take into account country differences in geographical, geological or climatic conditions, different design cultures and procedures for structural analysis, as well as different requirements for safety levels in the Member States.

The Eurocodes provide for national choices full sets of recommended values (RVs), classes, symbols and alternative methods to be used as NDPs. The European Commission Recommendation 2003/887/EC[6] stresses the importance of using the recommended values provided by the Eurocodes when Nationally Determined Parameters have been laid down. It is recommended to the Member States to diverge from those recommended values only where geographical, geological or climatic conditions or specific levels of protection make that necessary.

The objective of the present report is to evaluate the state of harmonised use of the Eurocodes in the EU and EFTA Member States. Besides that, the report is deemed to highlight the potential for further harmonisation and the associated needs, in order to support the on-going activities of CEN/TC250 "Structural Eurocodes" in the development of the second generation of the Eurocodes.

The European Commission Nationally Determined Parameters Database (NDPs Database), developed and maintained by the JRC was used as a source of information on the countries' choices regarding the values adopted in the Eurocodes National Annexes. The analysis made in the present report is based on the data uploaded in the NDPs Database by 20th November, 2018. **The report encompasses the national choices of the 28 EU Member States and two EFTA Member States (Norway and Switzerland).**

The set of expected NDPs to be uploaded in the Database is calculated with reference to the National Annexes published by the considered 30 countries. Figure ES.1 illustrates the geographical distribution of the percentage of the NDPs uploaded in the Database by November 2018. The Figure shows that 18 countries uploaded more than 75% of their expected NDPs.

The mean percentage of RVs acceptance has remained approximately stable in recent years across all Eurocodes, despite the continuous increasing number of the NDPs uploaded in the Database, as shown in Figure ES.2. In November 2018 the data available reached almost 71% out of the expected data to be uploaded in the Database. Moreover, the uploading rate of NDPs with RVs reached a value of 73% that is slightly higher than the uploading rate for all NDPs (71%).

(5) https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2012:0433:FIN:EN:PDF
(6) 2003/887/EC - "Commission Recommendation 2003/887/EC of 11 December 2003 on the implementation and use of Eurocodes for construction works and structural construction products". Official Journal of the European Union, L332: 62-63.

Figure ES.1. Percentage of NDPs uploading per country

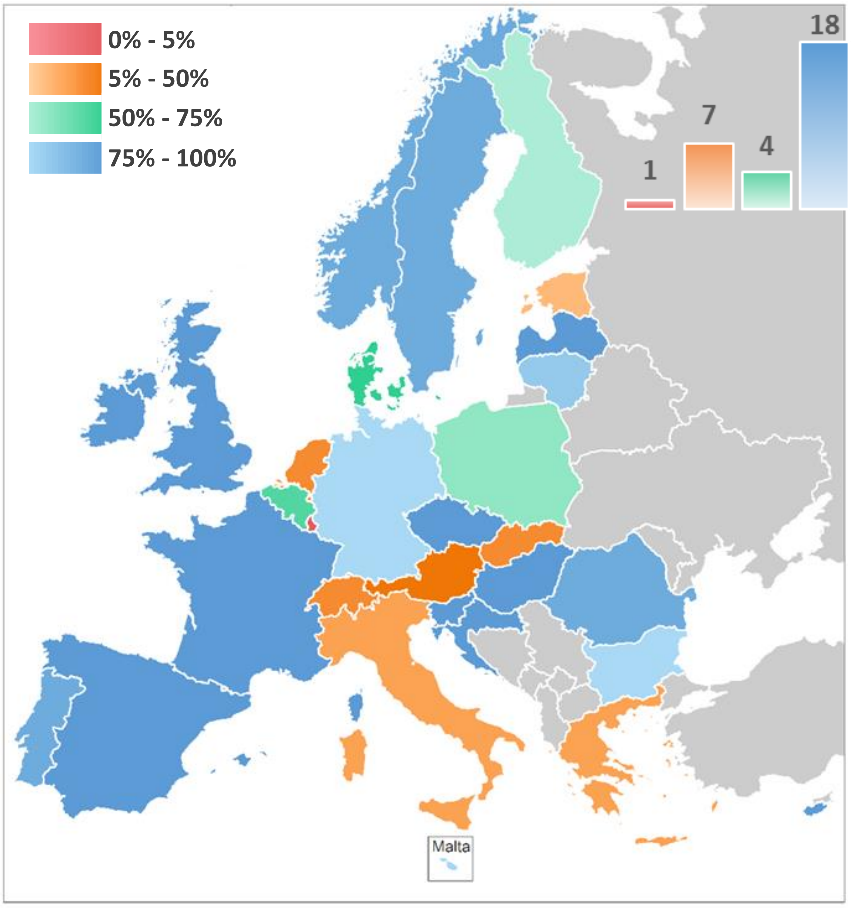
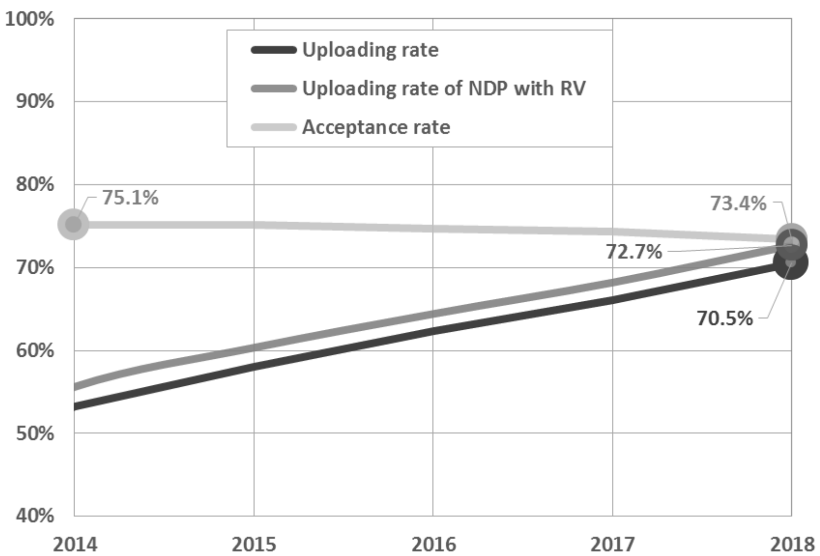


Figure ES.2 Progress of uploading of all NDPs, of NDPs with RVs and progress of NDPs acceptance, across all Eurocodes, since 2014

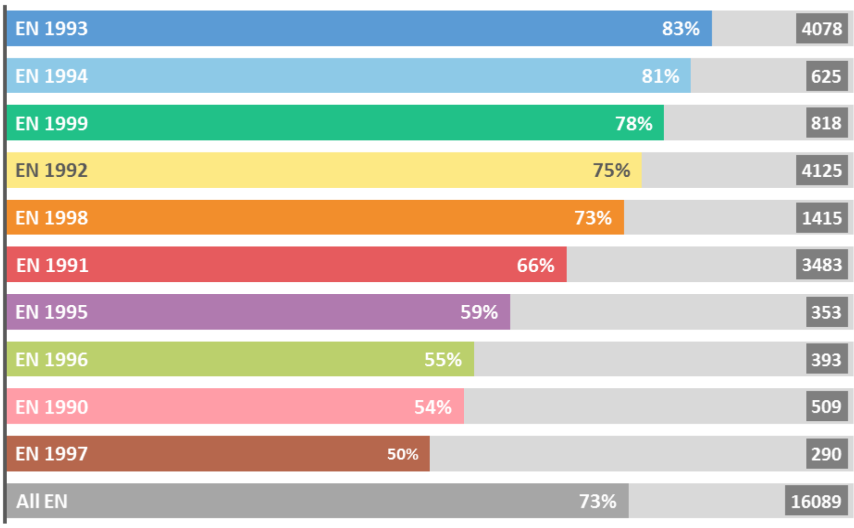


Given the high percentage of the uploading, and the stable acceptance rate of the NDPs recommended values in recent years, the **data can be considered representative of the countries' choices.**

Besides the attained high level of acceptance of the RVs (73%), the analysis of the NDPs with RVs highlighted the following important results:

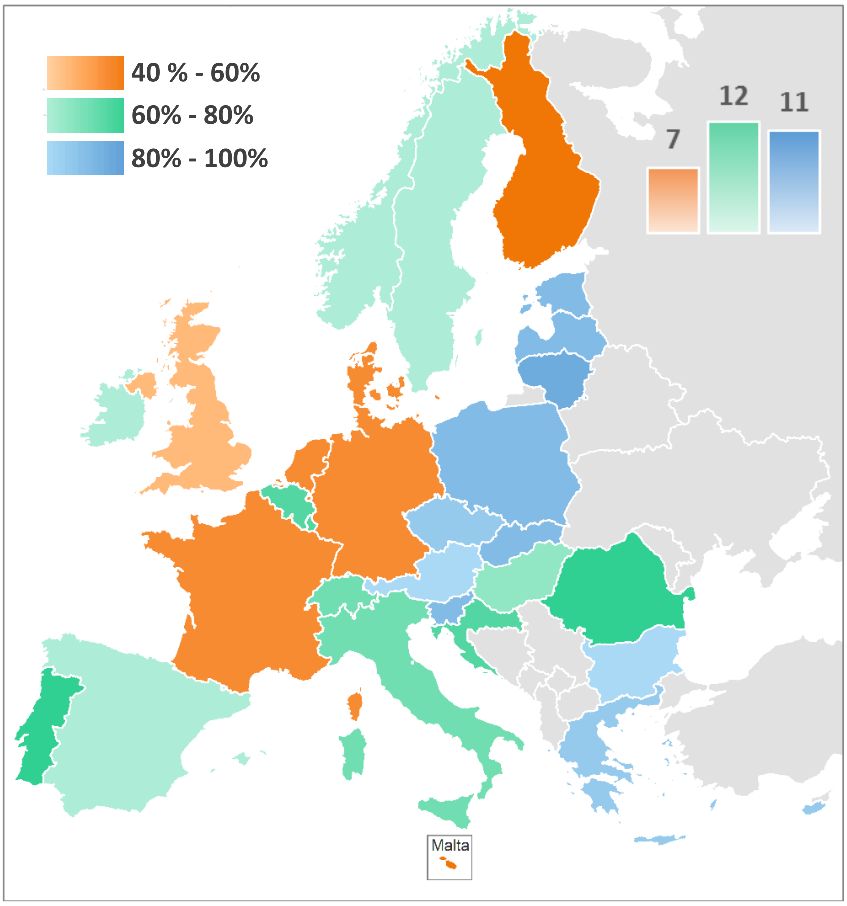
- a good harmonization level has been achieved in the national implementation of the most widely-used "material Eurocodes" (see Figure ES.3), as the Eurocodes with higher than the mean acceptance rate are EN 1993, EN 1994, EN 1999 and EN 1992 with 83%, 81%, 78% and 75%, respectively;
- the Eurocode with the lowest percentage of acceptance of the RVs is EN 1997 with 50%, closely followed by EN 1990 with 54% (see Figure ES.3). This result for EN 1997 can be explained by the fact that it introduces "a common language" in the field of geotechnical engineering design, in which the national practices are very different. EN 1990 specifies the basic elements of structural safety (e.g. partial factors for actions, combination factors, etc.), which are under national responsibility;
- There are three EN 1993 parts (1-6, 1-11 and 4-3) that achieved a very good national consensus having an acceptance rate greater than or equal to 95%, and eight Eurocode parts that reached an acceptance rate greater than or equal to 90%. The parts having achieved a notable consensus among the countries have a great potential to be further harmonised in the next generation of the Eurocodes;
- There are 72 NDPs that reached an overall consensus (100%) among the uploading countries, representing 9% of the existing NDPs with RV.
- The overall level of divergence from the recommended values of the NDPs described as pre-determined parameters with RV (numeric NDPs) is high in EN 1992 and EN 1998 and reduced in EN 1995 and EN 1999. The analysis of the national choices for these type of NDPs, having the largest deviations from the recommended values, led to the conclusion that in various cases a single country uploaded a value with a large deviation from the recommended, and all the others accepted the value recommended in the standards. Those NDPs were identified.

Figure ES.3 Percentage of acceptance (colour labelled bars) and number of uploaded NDPs with RVs (grey labelled boxes), per Eurocode and for all Eurocodes, considering the 30 EU and EFTA MS



- As shown in Figure ES.4, all countries have an acceptance percentage of recommended values over 40%; there are 12 countries having an acceptance rate between 60% and 80% and 11 countries with an acceptance percentage of recommended values over 80%.

Figure ES.4. Acceptance percentage of NDPs with RVs per country



- In more detail, the countries accepting the highest number of recommended values (greater than 700) are Cyprus, Czechia, Latvia and Lithuania, whereas acceptance rates above 90% go to Lithuania and Slovenia; Denmark, France and the United Kingdom have the lowest rates of acceptance of RVs, with values around 50%. The lowest rate of acceptance of RVs by those countries is most probably caused by their preference to retain their national traditions in the design, which are not mirrored in the recommended NDP values or procedures of the standards;

In general terms, the snow load and the wind actions are well harmonised across EU countries borderlines, although some inconsistencies exist. Both snow load and wind maps present very different layouts among countries and the range of altitudes for which the snow load maps apply also varies considerably.

The reliability of structural members which were designed according to the national choice of the NDPs varies in a rather broad range. The reliability levels of the structural members for most common categories of imposed loads match the target reliability indices recommended in EN 1990.

The results demonstrate that **the Eurocodes have achieved a high level of harmonisation in the EU and EFTA Member States**, since most countries accepted the parameters recommended in the Standards. In fact, the analysis performed with a data availability of 71%, shows a mean acceptance rate of 73% for all NDPs with recommended values. The high rate of acceptance of the NDPs does not automatically imply that these NDPs shall be eliminated in the second generation of the Eurocodes, since many of them are directly related to the safety which is under national responsibility, or account for local geographical, geological and climatic conditions.

Nevertheless, it is of primary interest for the achievement of a deeper internal market for construction products and engineering services that further harmonisation in the use of the Eurocodes is attained, as foreseen in the second generation of the Eurocodes. There are still a number of NDPs in the standards that have a good potential to be considered in the works on the second generation of the Eurocodes, as these NDPs are accounting for different design cultures and procedures for structural analysis. The cross-border convergence of the national maps for climatic and seismic actions shall be considered as an indicator for the harmonised use of data and methods for derivation of these maps.

Harmonising the use of the Eurocodes in the EU and EFTA Member States, by reducing the number of Nationally Determined Parameters in the standards, will reduce the obstacles arising from different national practices and will boost the free circulation of products and services within the European Economic Area.

List of most used abbreviations and symbols

a_{gR}	reference peak ground acceleration on type A ground
CC	Consequence Classes
CEN	European Standardisation Committee
CPR	Construction Products Regulation - Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC OJ L 88 of 4 April 2011
DG GROW	Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs
DG JRC	Directorate-General Joint Research Centre
EAA	European Economic Area
EC	European Commission
EFTA	European Free Trade Association
EU	European Union
M/515 EN	Mandate for Amending Existing Eurocodes and Extending the Scope of Structural Eurocodes - DG Enterprise and Industry, European Commission, Brussels, 12 December 2012
MS	Member States
NAs	National Annexes to the Eurocodes
NDPs	Eurocodes Nationally Determined Parameters
NSB	National Standardisation Body
PTs	Project Teams established under M/515 EN
RC	Reinforced Concrete
RC1, RC2, RC3	Reliability Classes
RVs	Recommended Values
s_k	Characteristic value of snow load on the ground
T_{NCR}	Reference return period, T_{NCR}, of seismic action for the no-collapse requirement
$v_{b,0}$	Fundamental value of the basic wind velocity
β	Reliability index
χ	Load ratio

1 Introduction

1.1 Motivation and objectives

The European Committee for Standardization (CEN) published the Eurocodes in May 2007. The Eurocodes are a set of 10 European Standards, EN 1990 to EN 1999[7], providing common technical rules for the design of buildings and other civil engineering works and construction products. The on-going implementation of the Eurocodes in the EU and EFTA countries contributes to strengthening the internal market for construction products and engineering services by removing the obstacles arising from different national practices and encouraging the free circulation of engineering products and services within the European Economic Area.

The Eurocodes are the recommended means of giving a presumption of conformity with the Basic Requirements of the Construction Products Regulation (CPR)[8] for construction works and products that bear the CE Marking, in particular the Basic Requirement 1 *Mechanical resistance and stability* and the Basic Requirement 2 *Safety in case of fire*. The objective of the CPR is to achieve the proper functioning of the internal market for construction products by establishing harmonised rules on how to express their performance.

Further, the Eurocodes are the preferred reference for technical specifications in public contracts since, according to the Public Procurement Directive[9], contracting authorities in the EU must allow the use of the Eurocodes in structural design aspects of tenders. The Eurocodes are the standard technical specification for all public works contracts in EU and EFTA. If proposing an alternative design, one must demonstrate that is technically equivalent to a Eurocode solution.

The Eurocodes are the product of a long procedure of bringing together and harmonising the different design traditions in the EU Member States, leading to more uniform levels of safety in construction in Europe. At the same time the Member States keep the exclusive competence and responsibility for the levels of safety of the construction works, since the Eurocodes are flexible enough to account for differences in national applications. In fact, the Eurocodes include the Nationally Determined Parameters (NDPs), which are the parameters used for design that were left open in the Eurocodes for national choice, in order to take into account country differences in geographical, geological or climatic conditions, different design cultures and procedures for structural analysis, as well as different requirements for safety levels in the Member States.

In the European Commission Recommendation 2003/887/EC[10] on the implementation and use of the Eurocodes for construction works and structural construction products, the European Commission recommends that Member States should:

- adopt the Eurocodes as a suitable tool for designing construction works, checking the mechanical resistance of components, or checking the stability of structures;
- lay down the NDPs usable in their territory;
- use the recommended values (RVs) of the NDPs provided by the Eurocodes;
- compare the NDPs implemented by each Member State and assess their impact;
- refer to the Eurocodes in their national provisions for conformity assessment;

(7) EN - Européenne Normes.
(8) Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC OJ L 88 of 4 April 2011.
(9) Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement and repealing Directive 2004/18/EC.
(10) 2003/887/EC - "Commission Recommendation 2003/887/EC of 11 December 2003 on the implementation and use of Eurocodes for construction works and structural construction products". Official Journal of the aEuropean Union, L332: 62-63.

- undertake research to facilitate the integration into the Eurocodes of the latest developments in scientific and technological knowledge;
- promote training in the use of the Eurocodes.

Member States are encouraged to minimize the number of cases where recommendations for a value or method are not adopted for their NDPs.

The principal objectives of further harmonisation are as follows:

- the reduction of NDPs in the Eurocodes resulting from different design cultures and procedures in structural analysis;
- the reduction of NDPs and their variety through the strict use of recommended values;
- the gradual alignment of safety levels across Member States.

It is important to harmonise not only the values of the NDPs (harmonisation across national borders), but also the methodologies used for their assessment, as well as the design procedures used for different structures, e.g. reinforced concrete, steel and composite structures (harmonisation across different materials).

In May 2010, the European Commission's Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW) sent the Programming Mandate M/466 EN[11] to CEN concerning the Structural Eurocodes. The purpose of this mandate was to initiate the process of further evolution of the Eurocodes system, incorporating both new and revised Eurocodes, and leading to the publication of the so called "*second generation*" (2G) of the Eurocodes. CEN replied to the Programming Mandate in June 2011, with a general work programme that was positively received by the European Commission.

In December 2012, DG GROW issued to CEN the Mandate M/515 EN[12] for a detailed work programme to develop the second generation of the Structural Eurocodes, which includes amending the existing Eurocodes and extending their scope. Among the guiding principles of the project, further harmonisation of the Eurocodes is pursued through the reduction of the number of existing NDPs.

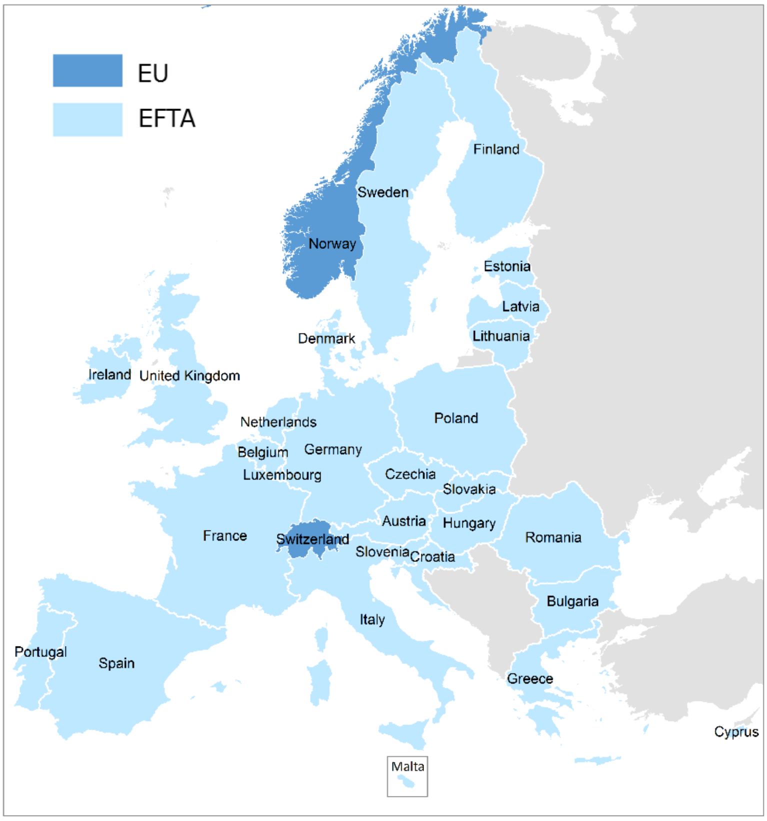
Since March 2005, the Joint Research Centre (JRC) of the European Commission provides scientific and technical support to DG GROW in the frame of Administrative Arrangements on the Eurocodes. In this framework, and in view of achieving the concerned parts of the European Commission Recommendation 2003/887/EC on the implementation and use of Eurocodes, one of the tasks assigned to the JRC was the development and maintenance of a Database with the Nationally Determined Parameters (NDPs Database) adopted in the countries of EU and EFTA applying the Eurocodes. The NDPs Database acts as a platform of notification to the European Commission by the Member States on the adopted values of the NDPs. The NDPs uploaded by Member States in the Database constitute a basis for analysing the level of convergence of their national choices and thus for assessing the state of the harmonised use of the Eurocodes.

The objective of the present report is to evaluate the state of harmonised use of the Eurocodes in the EU and EFTA Member States. Besides that, the report is deemed to highlight the potential for further harmonisation and the associated needs, in order to support the on-going activities of CEN/TC250 "Structural Eurocodes" in the development of the second generation of the Eurocodes. The report assesses the national choices for the Eurocodes NDPs for 28 EU MS and 2 EFTA MS as depicted in Figure 1.

(11) M/466 EN - "Programming Mandate Addressed to CEN in the Field of the Structural Eurocodes" DG Enterprise and Industry, European Commission, Brussels, 19 May 2010.

(12) M/515 EN - "Mandate for Amending Existing Eurocodes and Extending the Scope of Structural Eurocodes" DG Enterprise and Industry, European Commission, Brussels, 12 December 2012.

Figure 1. EU and **EFTA Member States** for which the state of the harmonised use of the Eurocodes was assessed[13]



1.2 Brief outline of the Eurocodes

The Eurocodes are a set of European Standards (EN) for the design of buildings and other civil engineering works and construction products. The Eurocodes cover in a comprehensive manner the basis of design, actions on structures, the principal construction materials, all major fields of structural engineering and a wide range of types of structures and products. For the design of special construction works (e.g. nuclear installations, dams, etc.) other provisions than those in the Eurocodes might be necessary. The Eurocodes cover the basis of structural design (EN 1990), actions on structures (EN 1991), the design of concrete (EN 1992), steel (EN 1993), composite steel and concrete (EN 1994), timber (EN 1995), masonry (EN 1996) and aluminium (EN 1999) structures, together with geotechnical design (EN 1997) and the design, assessment and retrofitting of structures for earthquake resistance (EN 1998) (see Figure 2[14]).

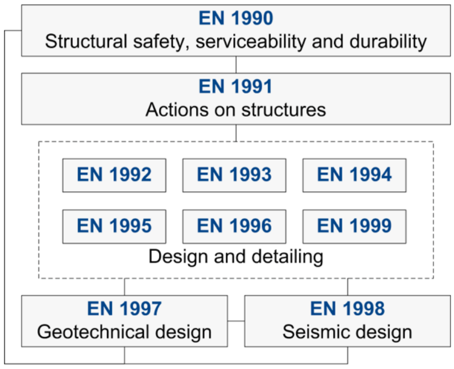
Each of the standards (except EN 1990) is divided into a number of parts covering specific aspects of the subject. In total, the Eurocodes included 58 parts to which a new part recently published by CEN was added: EN 1992, Part 4: *Design of fastenings for use in concrete* (EN 1992-4:2018). All Eurocodes related to materials (EN 1991 to EN 1996 and EN 1999) have a Part 1-1 that covers the design of buildings and other civil engineering structures and a Part 1-2 for structural fire design. The standards for concrete, steel, composite steel and concrete, and timber structures and earthquake resistance have a Part 2 covering the design of bridges. Parts 2 of the standards should be used in combination with the appropriate general parts (Parts 1).

[13] The maps presented in this report are for illustration purposes only. The designations employed and the presentation of material on the maps do not imply the expression of any opinion whatsoever on the part of the European Union concerning the legal status of any country, territory or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

[14] http://eurocodes.jrc.ec.europa.eu/home.php

Figure 2. **Eurocodes** and links between the Eurocodes

Eurocodes	
EN 1990	Eurocode: Basis of structural design
EN 1991	Eurocode 1: Actions on structures
EN 1992	Eurocode 2: Design of concrete structures
EN 1993	Eurocode 3: Design of steel structures
EN 1994	Eurocode 4: Design of composite steel and concrete structures
EN 1995	Eurocode 5: Design of timber structures
EN 1996	Eurocode 6: Design of masonry structures
EN 1997	Eurocode 7: Geotechnical design
EN 1998	Eurocode 8: Design of structures for earthquake resistance
EN 1999	Eurocode 9: Design of aluminium structures



According to CEN-CENELEC Internal Regulations - Part 2:2018, CEN National Members when implementing any European Standard, and thus also the Eurocodes, have to give the standard the status of a National Standard. The National Standard transposing the Eurocode part, when published by a National Standardisation Body (NSB), is composed of the Eurocode text (preceded by a National Title page and a National Foreword), generally followed by a National Annex (NA). The NSBs normally publish a National Annex, on behalf of and with the agreement of the national competent authorities. The National Annex contains the national choice of the NDPs and references to Non-Contradictory Complementary Information (NCCI). When the Eurocodes are used for the design of construction works, or parts thereof, the NDPs of the Member State on whose territory the works are located are to be applied.

In all 58 parts of the Eurocodes there are 1 506 NDPs. The set of the NDPs comprises: (i) values and/or classes where alternatives are given in the Eurocodes, (ii) values to be used where a symbol only is given in the Eurocodes, (iii) country specific data, like climatic or seismic zone maps, and (iv) choices or procedures to be used, where alternatives are given in the Eurocodes.

Figure 3 provides a comparison of the number and percentage of NDPs per Eurocode and Figure 4 a qualitative comparison among each Eurocode and respective parts. The NDPs numbers shown in Figure 3 do not include the new EN 1992-4 part, and do not consider the amendments and corrigenda referred in section 1.3.

Figure 3. Number and percentage of NDPs **per Eurocode**

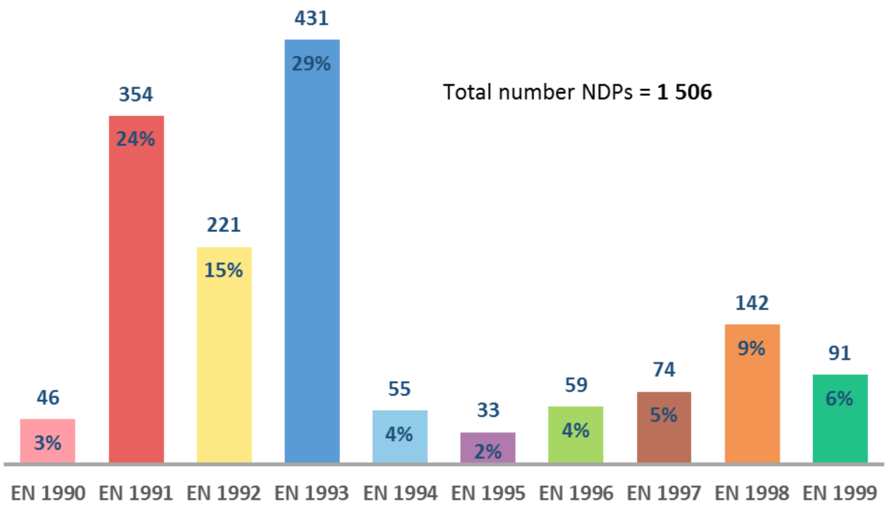


Figure 4. Proportion of NDPs in Eurocodes **parts**

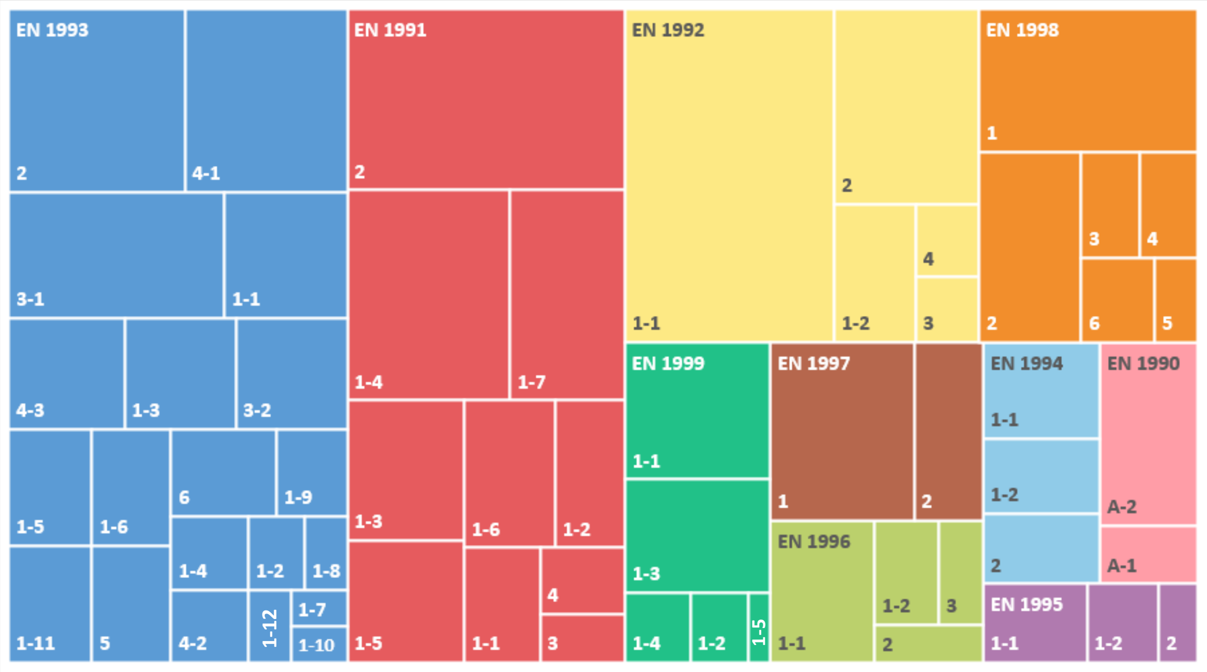


Figure 3 shows that in terms of NDPs the most populated Eurocode is EN 1993, with 431 (29%) NDPs, followed by EN 1991 and EN 1992, with 354 (24%) and 221 (15%) NDPs, respectively. EN 1995 has the lowest number of NDPs (33, 2%). Altogether, EN 1991 and EN 1993 have a number of NDPs close to the remaining Eurocodes, which have a lower number of parts, varying between 2 and 5 for each Eurocode (see Figure 4).

1.3 Scope of the analysis performed

The analysis made in the present report is based on the data uploaded in the NDPs Database by **20th November, 2018**. The countries included in the analysis are mapped in Figure 1; they are the 28 EU Member States plus the two EFTA Member States that are registered in the Database, i.e., Norway and Switzerland. These 30 countries are currently uploading data in the Database. More details on the current users of the Database can be found in section 2.1.

The set of expected NDPs to be uploaded in the Database is calculated with reference to the National Annexes published (or expected to be published) by the above mentioned 30 countries, taking into consideration (i) the information on the state of implementation of the Eurocodes in the EU MS resulting from an enquiry performed by DG GROW and the JRC in 2014 and 2015 (Dimova *et al.*, 2015) and (ii) the NDPs that have been so far uploaded in the Database for the parts not referred in that enquiry.

Considering the 30 countries uploading data in the Database, the set of expected data calculated with reference to the National Annexes of these countries contains 39 046 NDPs.

Recent Amendments and Corrigenda to the Eurocodes were not considered in the analysis, since they are not yet fully implemented in the Database, and currently there is no data available for the analysis. The list of Amendments and Corrigenda that were not considered in the analysis is presented in the Annex A. The new part of EN 1992, Part 4: *Design of fastenings for use in concrete* that was recently published by CEN (EN 1992-4:2018) is also not considered in the analysis, for similar reasons to those of the Amendments and Corrigenda.

In short, the analysis made in the current report is based on the data uploaded in the NDPs Database by November 2018, for the 58 Eurocodes parts, where there are 1 506 Nationally Determined Parameters (NDPs).

By November 2018, the Database contained NDPs for all 58 Eurocodes parts and there was a total of 27 529 NDPs available for data post processing, reaching a percentage above 70% out of all expected data to be uploaded. In view of such uploading percentage, and having in mind the stabilisation of the acceptance rate of the NDPs recommended values (as discussed in section 3.2), the data set may be considered representative of the countries' choices and be used to derive conclusions on the state of harmonised use of the Eurocodes by the EU and EFTA Member States.

Note that the information about the progress of the NDPs uploading in the Database is regularly being published in the JRC Eurocodes Website. The latest information can be obtained at the following page:
http://eurocodes.jrc.ec.europa.eu/showpage.php?id=371.

1.4 Organization of the report

The analysis of the NDPs uploaded in the Database, as presented in this report, is focused on:

- analysis of data available in the NDPs Database, attributed to each Member State and each Eurocode, in order to assess the representativeness of the data set to draw conclusions on country choices (chapter 2);
- the harmonised and deviating patterns of the NDPs uploaded in the Database, examining the acceptance of the recommended values per Eurocode and country, the divergences from the recommended values and the evolution of uploading and acceptance rates in recent years (section 3.2);
- the harmonised use of NDPs for specific parts of the Eurocodes, namely the NDPs for fire parts and bridge parts, and the cross-border convergence of the national maps for climatic and seismic actions (section 3.3);
- identifying specific NDPs, for instance, NDPs with high and low percentage of acceptance and pre-determined parameters with the largest divergence from recommended values in order to facilitate the harmonisation in the second generation of the Eurocodes (section 3.4);
- a recent study on the reliability levels of structural members in buildings designed according to the partial factor method given in the Eurocodes and the reliability achieved using the NDPs adopted by Member States. The study results, summarized in chapter 4, aim at supplying a more global assessment of the impact of national choices on the technical differences for construction works, or parts of works, and to compare their combined impact on the level of safety achieved.

The last chapter of the report (chapter 5) contains a summary of the results obtained and highlights the main conclusions.

The report further contains five Annexes addressing (a) the list of Amendments and Corrigenda and respective NDPs that were not considered in the analysis, (b) the list of NDPs uploaded in the Database with the respective rate of uploading and acceptance of the recommended values, (c) the list of NDPs type 1.1 used in the analysis of the convergence of the national choices (d) the list of copyrights of maps related to the definition of climatic and seismic actions, (e) the list of NDPs relevant to the definition of climatic and seismic actions and (f) the list of NDPs that achieved an acceptance rate of 100%.

2 The Nationally Determined Parameters Database

2.1 General

As referred in the Introduction of this report, the Nationally Determined Parameters Database (NDPs Database) is a platform created by the JRC to collect and systematise the NDPs chosen by the EU and EFTA Member States. The Database contains data to be used in the analysis of the NDP values adopted by the Member States, in order to support the development of strategies to achieve further convergence on the national choices with respect to the implementation of the Eurocodes.

The uploading to the Database of the NDPs adopted by each country is made by the respective National Authority, which may delegate this task to the corresponding National Standardization Body (NSB). The National Authority, or the NSB acting on its behalf, declares its agreement with the use of the uploaded NDPs within the scope of the European Commission Recommendation 2003/887/EC. The study carried out in this report falls within the mentioned scope, since the NDPs in the Database are used to evaluate the state of harmonised use of the Eurocodes in the EU and EFTA Member States.

The Database site has restricted and controlled access and it is administrated by the Safety and Security of Buildings Unit of the JRC. By November 2018, the access to the NDPs Database was allowed to the following user groups:

- Group 1: interested Commission Services (DG GROW, DG JRC);
- Group 2: CEN/TC250 Coordination Group, its Subcommittees and Horizontal Groups;
- Group 3: interested National Authorities;
- Group 4: National Standardisation Bodies;
- Group 5: possible others to be defined by the Commission.

The Database may also serve as a platform of information exchange on the NDPs among the Member States, by offering them the possibility to analyse the NDPs chosen from different countries, providing a basis for comparison with their own national choices and supporting the development of their National Annexes.

A number of queries were developed for the NDPs Database, aiming at facilitating the extraction and analysis of data concerning the uploading of the NDPs and the acceptance of the recommended values.

Under the Mandate M/515 EN, 2012, on the second generation of the Eurocodes, access to the Database was provided to the CEN/TC250 Project Team Leaders (PTLs) appointed to perform the standardisation works.

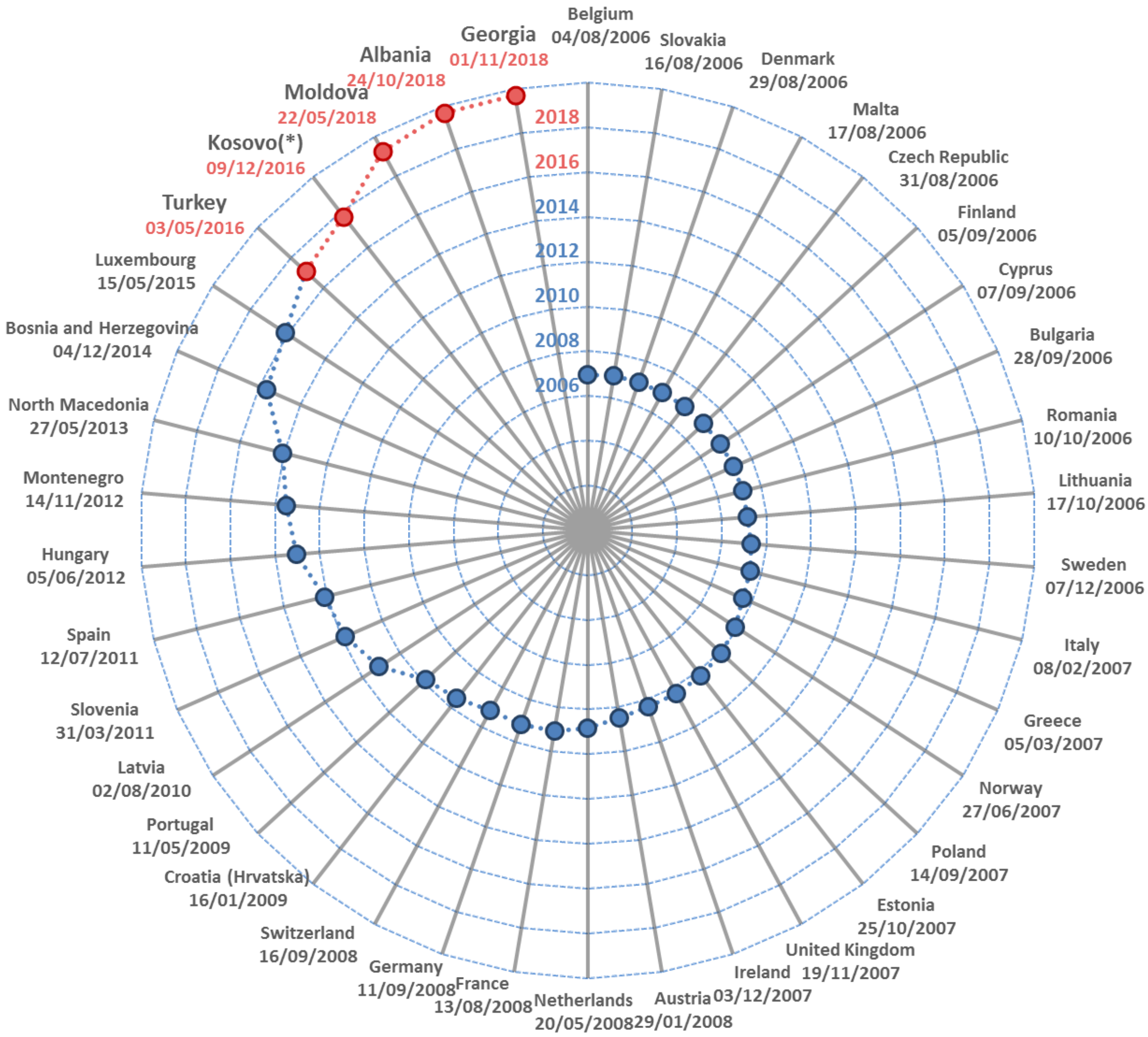
Currently, the total number of countries that have appointed users of the Database is 38. Those countries are the 28 EU Member States, two EFTA Member States (Norway and Switzerland), four EU Candidate Countries (Albania, North Macedonia, Montenegro and Turkey), two Potential Candidate Countries (Bosnia and Herzegovina and Kosovo[15]), and two H2020 Associated Countries included in the JRC Enlargement and Integration activities with the Balkan non-EU countries (Georgia and the Republic of Moldova). One EFTA Member State, Iceland, is not registered yet.

The date of the registration of each country to the NDPs Database is depicted in Figure 5. Among the 38 registered countries, 32 are uploading data to the Database. They are the 28 EU Member States plus Norway, Switzerland, Bosnia and Herzegovina and Georgia. The last two countries have started uploading in the Database in 2018. Highlighted in red in Figure 5, are the registrations for the period 2016-2018. They reflect the JRC efforts to provide scientific and technical support to non-EU countries for the adoption and

[15] This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence.

implementation of the Eurocodes. It should be mentioned that the JRC is engaged in activities of promotion of the construction sector outside the EU as part of its efforts to support the EU policies and standards for sustainable construction

Figure 5. Date of first registration of countries to the NDPs Database



(*) This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence.

Table 1 presents a summary of the number of countries that are registered and uploading data to the Database.

Table 1. Number of **registered** and **uploading** countries in the NDPs Database

Countries	Registered	Uploading
EU MS	28	28
EFTA MS	2	2
Others	8	2
Total	**38**	**32**

In line with the European Commission Recommendation 2003/887/EC, the JRC activities comprise guidance and training to the countries showing commitment to adopt and implement the Eurocodes and the European policies and tools for sustainable construction. Among the countries that have shown commitment and progress in the adoption of the Eurocodes are the non-EU Balkan countries. The interest in the Eurocodes adoption and implementation in the Balkan region is based on the opportunity for an advanced common standardization environment, adaptable to the local requirements of each country (*i.e.* geographical, geological or climatic conditions) and allowing selection of the level of safety. Moreover, the adoption and implementation of Eurocodes will help the Candidate Countries to fully implement the EU *acquis* at the time of accession and support Potential Candidate Countries (and Horizon 2020 associated countries) to progressively align with the EU *acquis*. Thus, particular attention has been given to the non-EU Balkan countries through organization of dissemination and training events on the Eurocodes adoption and implementation since 2013 (Athanasopoulou *et al.,* 2018).

2.2 Types of NDPs in the Database

For all Eurocodes, i.e. EN 1990 to EN 1999, the Database contains a description of each NDP and its recommended values, if any. The users with uploading rights in the Database should upload NDP values according to the decisions adopted in the country's National Annex of each Eurocode part. The format of the information to be uploaded and the user's uploading actions depend on the type of NDP.

In a number of cases, a NDP cannot be represented by a single numerical value. Indeed, many NDPs take the form of tables, graphs, acceptance of recommended procedures, choice of calculation approaches among given alternatives, introduction of a new procedure, etc. The description of the different types of NDPs may be found in Table 2. In this Table, the NDPs are grouped in 10 types and 21 subtypes. Also identified in the Table by the symbol √ are the types of NDPs with given recommended values and those where the EN text can be accepted as proposed in the standards, although the NDPs do not have RVs. In the latter case, the countries are indicating that they do not provide their own choice, but they are adopting the EN text as is.

Figure 6 shows the number of NDPs per Eurocode, according to their types. Whereas 1 476 NDPs are to be set by the countries, the remaining 30 NDPs, marked as type 10 in Figure 6, comprise references to information which is included in other parts of the Eurocodes text or in informative annexes. Therefore, those NDPs are neither uploaded to the Database, nor considered in the evaluation of the uploading rate for the purposes of the analysis in this report.

The number and percentage of NDPs per type and sub-type is also presented in Table 2 and the proportion of NDPs per type and sub-type is illustrated in Figure 7. The NDPs with RVs given are 839 representing almost 56% of all NDPs, and together with the NDPs types without RV but where the EN text can be accepted as is in the standards, constitute 71% of all NDPs. The most frequent type of NDPs is type 3, depicted by the darkest blue in Figure 7, meaning that the majority of the NDPs relates to the choice or to the acceptance of options or procedures. Only 566 NDPs in the Eurocodes (38% of all NDPs) have numerical values. The most frequent sub-type of NDPs is 1.1 (25% of all NDPs), *i.e.*, numeric *Predetermined parameters with RVs*, represented in the red part of Figure 7.

Table 2. NDP types and description; number and percentage of NDPs per type

NDP types and description			RV given	Accepted as is	Nb. NDPs	% NDPs	Nb. NDPs with RV	% NDPs with RV
Type 1	1.1	Predetermined Parameters with RV	√	√	369	24.5%	369	43.9%
	1.2	Predetermined Parameters without RV	--	√	11	0.7%	--	--
	1.3	No Predetermined Parameters	--	√	16	1.1%	--	--
Type 2	2.1	Fixed Tables (only cell values can be changed)	√	√	52	3.5%	52	6.2%
	2.2	Flexible Tables (rows and columns can be changed)	√	√	117	7.8%	117	13.9%
Type 3	3.1	Acceptance of recommended procedures / approaches or introduction of new ones	√	√	235	15.6%	235	28.0%
	3.2	Country procedures / approaches	--	√	184	12.2%	--	--
	3.3	Alternative choice from given options with RV	√	√	13	0.9%	13	1.5%
	3.4	Alternative choice from given options without RV	--	--	16	1.1%	--	--
	3.5	Choice from given options	--	--	12	0.8%	--	--
	3.6	Choice from given options (without recommended value) or introduction of new procedures / approaches	--	--	4	0.3%	--	--
	3.7	Acceptance of recommended procedures / approaches in fixed tabular form or introduction of new ones	√	√	10	0.7%	10	1.2%
	3.8	Acceptance of recommended procedures / approaches in flexible tabular form or introduction of new ones	√	√	28	1.9%	28	3.3%
Type 4	4	Country specific data	--	√	19	1.3%	--	--
Type 5	5	National charts or tables	--	√	1	0.1%	--	--
Type 6	6	Diagrams	√	√	15	1.0%	15	1.8%
Type 7	7	References to non-contradictory complementary information	--	√	23	1.5%	--	--
Type 8	8	Decisions on the application of informative annexes	--	--	249	16.5%	--	--
Type 9	9	Provision of further, more detailed information	--	√	102	6.8%	--	--
Type 10	10.1	Reference to information which is included in an informative annex	--	--	7	0.5%	--	--
	10.2	Reference to information which is included in other Parts of the EN text	--	--	23	1.5%	--	--
				Total	**1 506**	**100%**	**839**	**100%**

Figure 6. Number of NDP **per Eurocode** according to their **type**

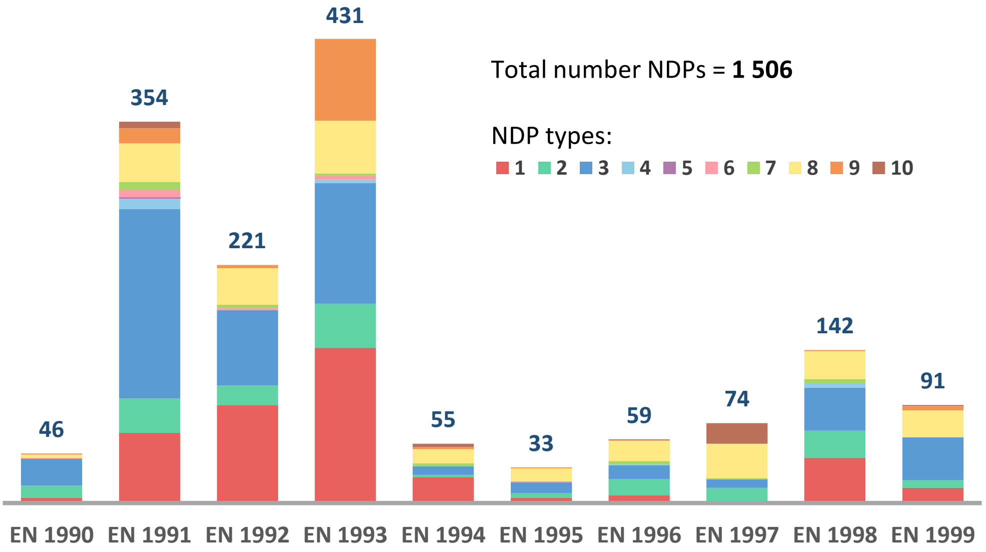
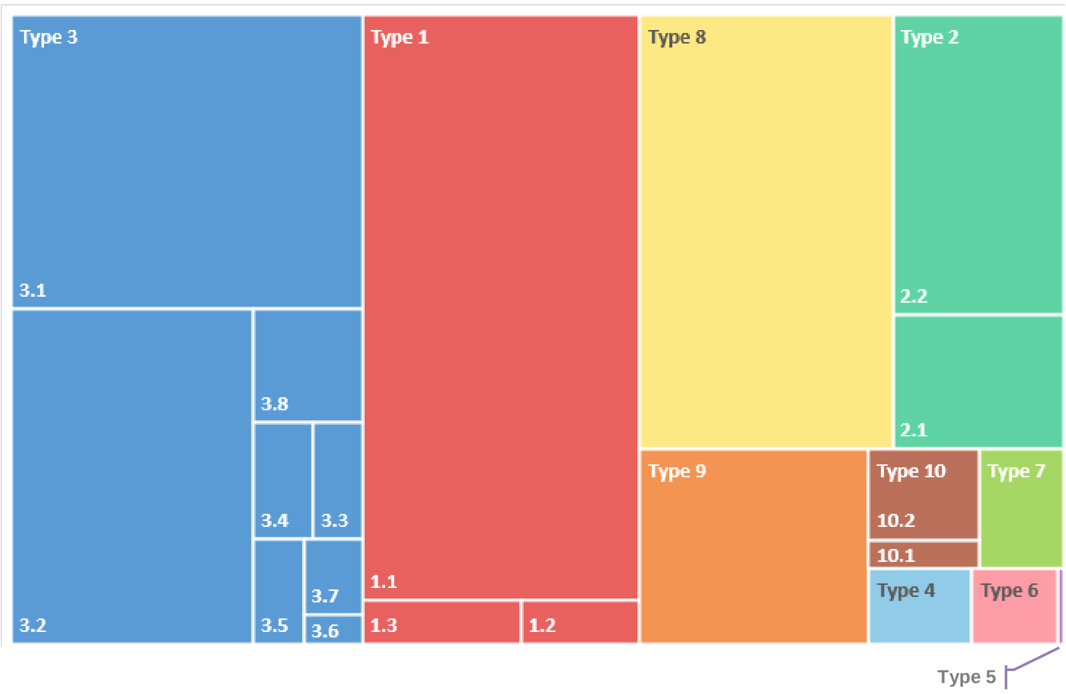


Figure 7. Proportion of NDPs **per type** and **sub-type**



2.3 Progress of uploading of the NDPs

2.3.1 Uploading per Eurocode and part

As previously referred in section 1.3, the set of expected NDPs to be uploaded in the Database is calculated with reference to the National Annexes published by the 28 EU Member States plus Norway and Switzerland. Figure 8 presents the number of uploaded NDPs, the number of NDPs expected to be uploaded and the number of NDPs existing in each Eurocode, considering 30 countries. The NDPs existing in the Eurocodes are referred as "CEN NDPs" in this report.

By November 2018, the Database contained NDPs for all 58 Eurocodes parts and there was a total of 27 529 NDPs available, representing 71% out of all expected data (39 046) to be uploaded by the 30 mentioned countries (see Figure 8 and Figure 9).

Figure 8. Number of uploaded NDPs, number of NDPs expected to be uploaded and number of CEN NDPs, **per Eurocode** and for **all Eurocodes**, considering the 30 EU and EFTA MS

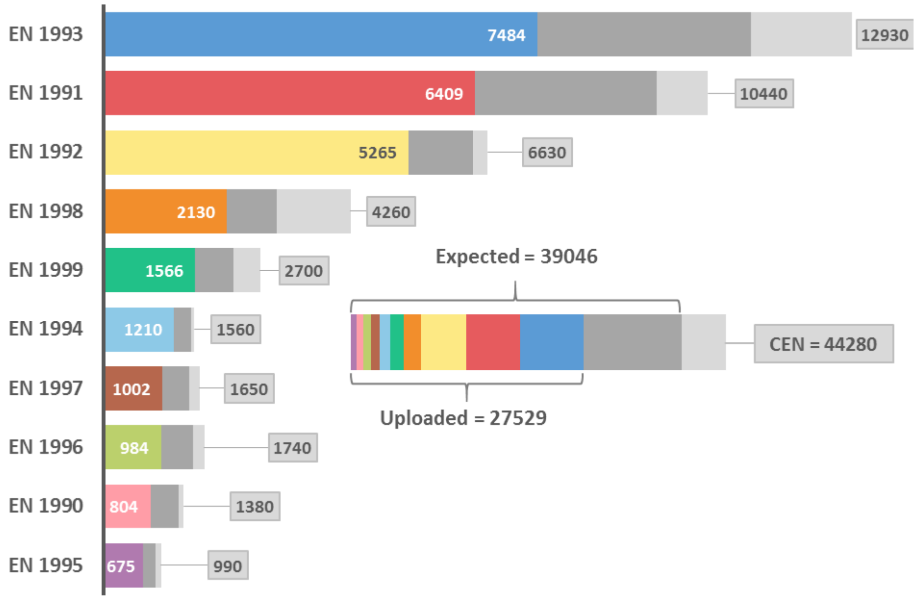
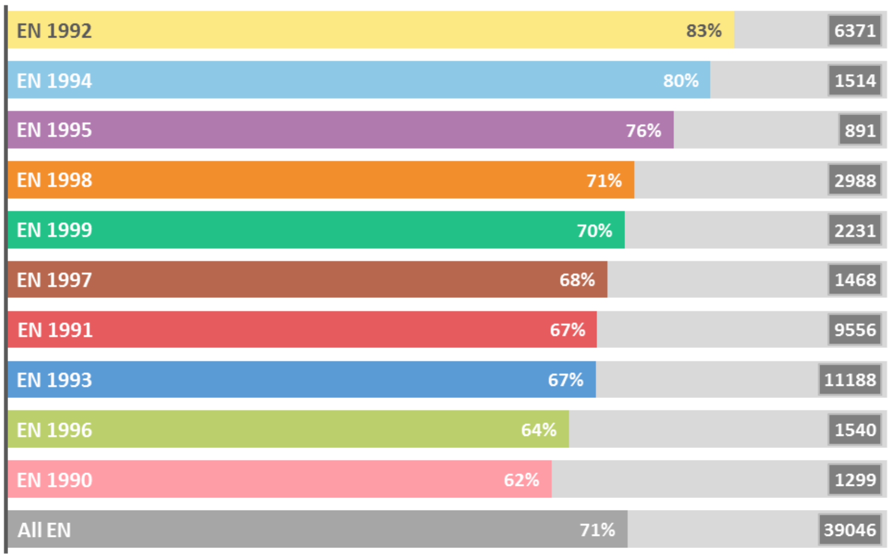


Figure 9. Percentage of uploaded NDPs (coloured labelled bars) and number of expected NDPs to be uploaded (grey labelled boxes) **per Eurocode**, and for **all Eurocodes**, considering the 30 EU and EFTA MS



Note that EN 1993 appears in the first position in terms of the number of NDPs uploaded, but it moves to the 8th place of the uploading percentage ranking. On the contrary, EN 1995 has the smallest number of NDPs uploaded in the Database, but appears at the very top place (3rd) when it comes to the uploading percentage ranking.

The progress of uploading in the NDPs Database, between 2007 and November 2018 is illustrated for all Eurocodes in Figure 10 and in Figure 11.

The Figures provide the status of the NDPs uploading in the Database as by November 2018. The date of uploading of each NDP, or the date of its last modification in the Database, was examined using an extraction made in November 2018. The Figures show that the percentage of uploading has steadily grown, having different pace for each Eurocode and year.

Figure 10. Progress of NDPs uploading **per Eurocode**

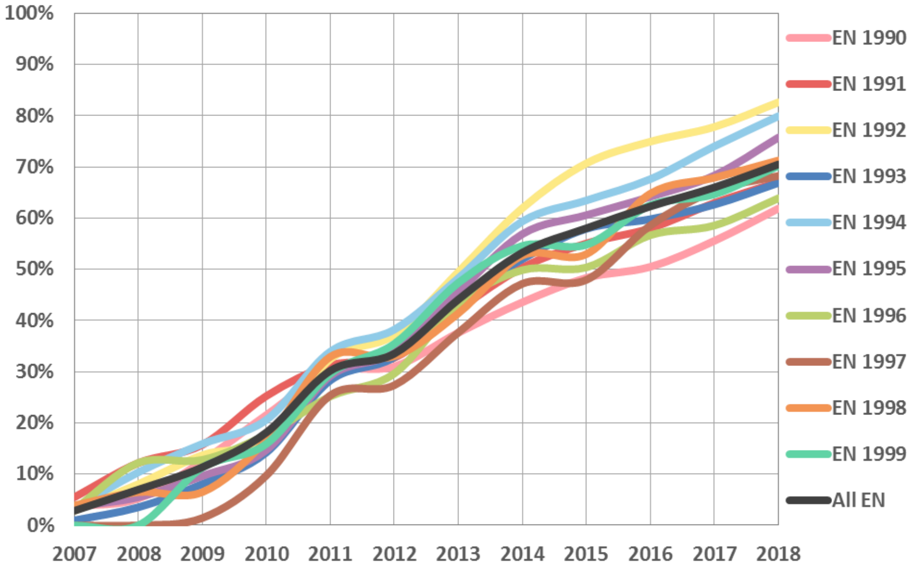
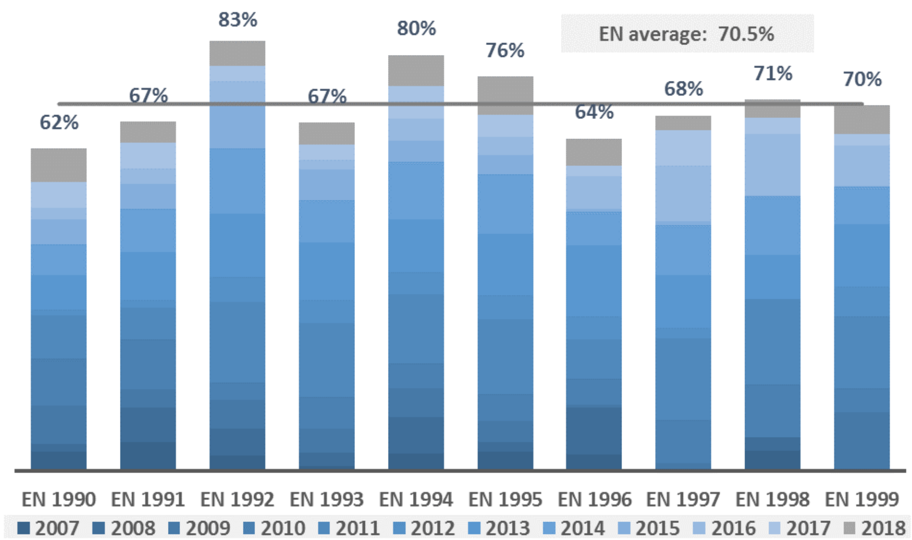


Figure 11 highlights, in the grey top part of the bars, the percentage of uploading in 2018 (till November), for each Eurocode. The grey horizontal line represents the average percentage of uploading for all Eurocodes, and the percentages on the top of the bars show the rate of uploading for each Eurocode, as by November 2018. The Figure shows that EN 1992, EN 1994, EN 1995 and EN 1998 have an uploading percentage above the average of 70.5%. In particular, EN 1992 presents the highest percentage of NDPs uploaded, reaching a value over 82%.

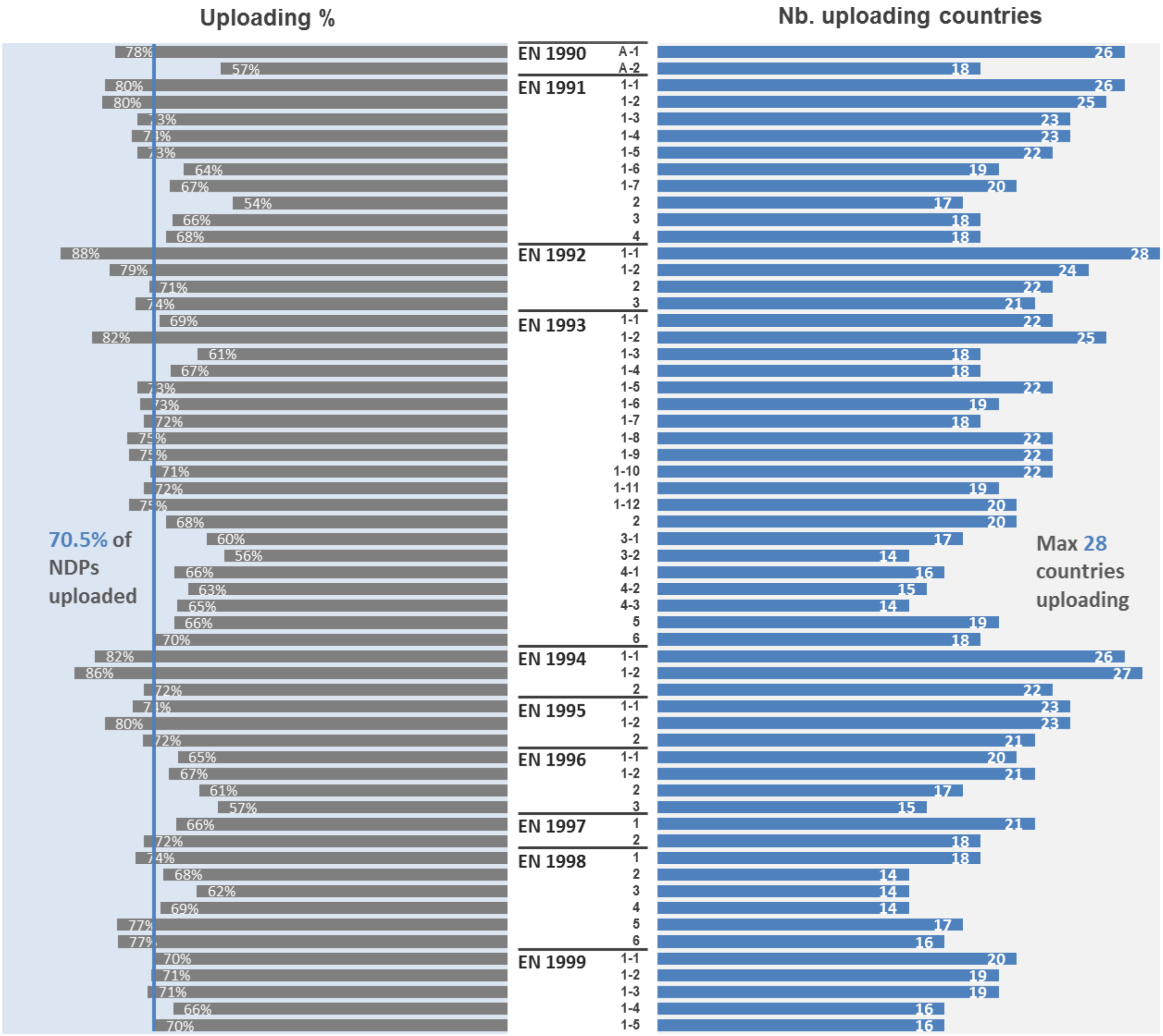
Figure 11. Progress of NDPs uploading **per Eurocode**, highlighting the percentage of uploading in 2018 and the current average for all Eurocodes



The percentage of NDPs uploaded in the Database for each Eurocode part is shown in the left part of Figure 12. The blue line in this figure marks the average percentage of NDPs uploaded in the Database (70.5%), calculated with reference to the expected data to be uploaded. The Eurocode part with the highest percentage of NDPs uploaded is EN 1992-1-1 (*Eurocode 2: Design of concrete structures - Part 1-1: General rules and rules for buildings*), with 88%, followed by EN 1994-1-2 (*Eurocode 4 - Design of composite steel and concrete structures - Part 1-2: General rules - Structural fire design*), with 86%. The part with the lowest percentage of NDPs uploaded is EN 1991-2 (*Eurocode 1: Actions on structures - Part 2: Traffic loads on Bridges*), with 54%.

Shown by the blue bars in the right part of Figure 12 is the number of countries that are uploading NDPs for each part. This is an important indicator for the representativeness of the results discussed in this report. The part that has the highest number of uploading countries is also EN 1992-1-1, with 28 out of 30 countries uploading NDPs.

Figure 12. Left: percentage of uploading **per Eurocode part**; right: number of uploading countries **per Eurocode part**

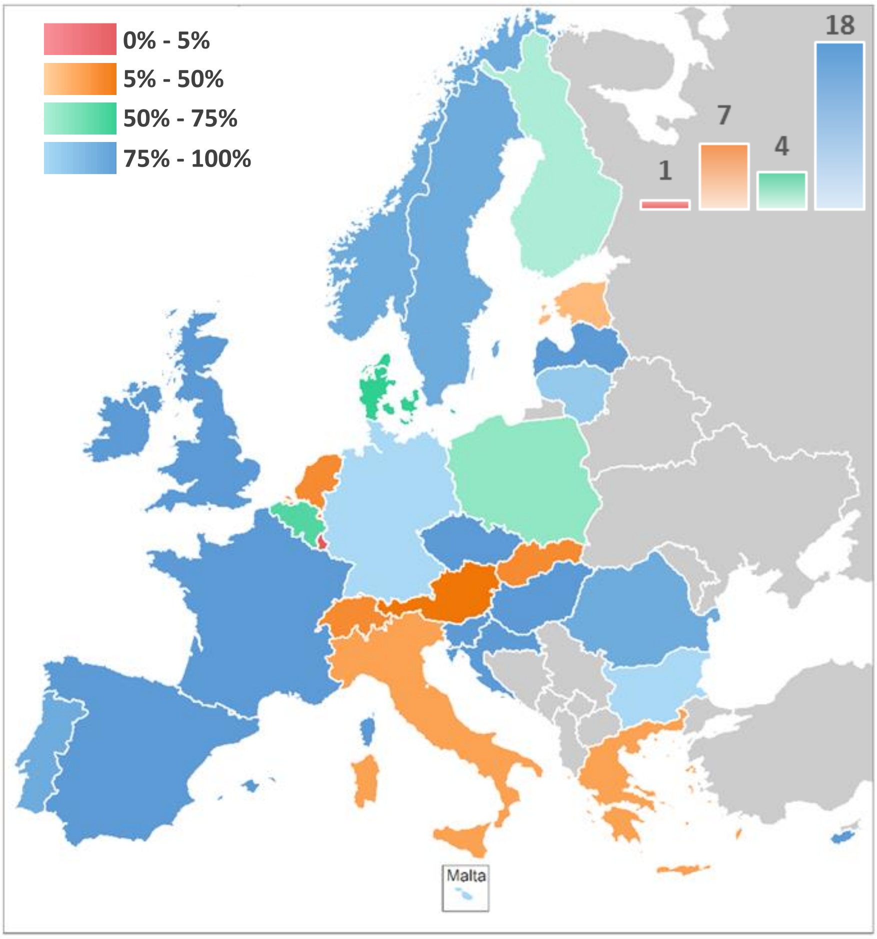


Currently, there are 5 parts uploaded by 14 countries that is the lowest number of uploading countries per part. Three of these parts belong to EN 1998, which can be explained by the fact that some countries have a low level of seismicity and are not implementing the Eurocodes parts related seismic design. On the other hand, there are 24 parts uploaded by more than 20 countries.

2.3.2 Uploading per country

Figure 13 illustrates the geographical distribution of the percentage of the NDPs uploaded in the Database, by November 2018. All 30 countries covered in the analysis are uploading data to the Database. The Figure shows that 18 countries uploaded more than 75% of their expected NDPs.

Figure 13. Percentage of NDPs uploading **per country**

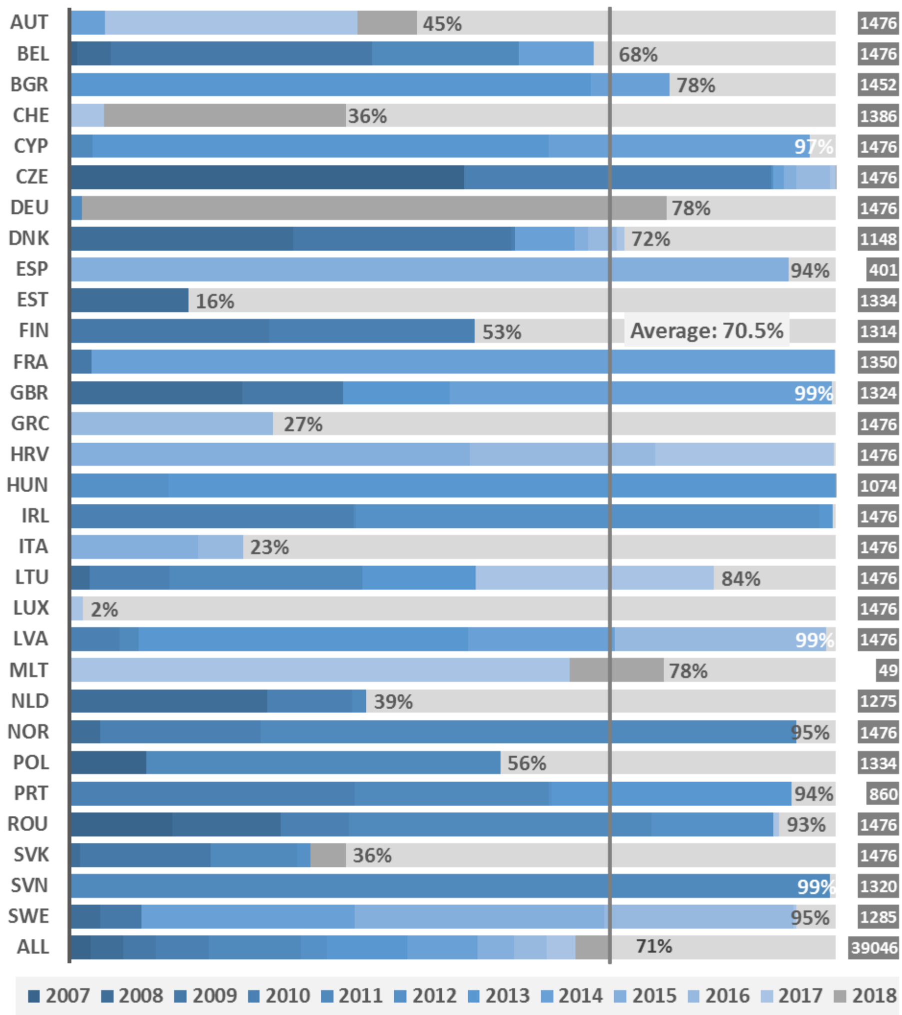


The progress of uploading between 2007 and November 2018, is illustrated for each country in Figure 14. The Figure also presents the expected number of NDPs to be uploaded, which is illustrated in the dark grey boxes in its right part. The Figure shows that the uploading percentage has constantly grown, with different variations for each country and year.

Figure 14 provides an overview of the uploading progress in the Database by country, as seen in November, 2018. Figure 14 also highlights, with the grey ending part of the bars, the uploading percentage during 2018. Countries like Belgium, Czechia, Poland, Romania and Slovakia started uploading the Database in 2007. On the other hand, countries like Austria, Germany, Malta and Switzerland uploaded a considerable number of NDPs during 2017 and 2018. In particular, Germany progressed very substantially with the upload of the NDPs, from 2%, in June 2017, to 78%, by early July 2018.

Moreover, Figure 14 indicates that there are three countries, Czechia, France and Hungary that have uploaded 100% of their expected NDPs. Croatia, Ireland, Latvia, Slovenia and the United Kingdom have, at least, uploaded 99% of their NDPs.

Figure 14. Progress of NDPs uploading **per country** and for **all Eurocodes** (average 70.5%), highlighting the percentage of uploading in 2018; expected number of NDPs to be uploaded by each country (grey labelled boxes)



2.3.3 Uploading per Eurocode and country

Figure 15 provides a global overview of the uploading state in the Database, by November 2018, for each Eurocode and for the 30 analysed countries. The grey vertical line in the Figure illustrates the average uploading percentage for all Eurocodes (70.5%), calculated with reference to the expected number of NDPs to be uploaded. The grey horizontal bar in the bottom of each small Figure presents the average uploading rate achieved by each country for all Eurocodes.

Figure 15 confirms that EN 1992 and EN 1994 are the most data-populated Eurocodes in the Database and that EN 1990 and EN 1996 are the least populated ones. The small size of the grey bar of Luxembourg reflects the low percentage of uploading of this country. Spain and Malta, although having a percentage of uploading higher than the average, have just uploaded NDPs for 3 Eurocodes, since they are not expected to publish National Annexes on most of the Eurocodes parts in the near future. EN 1991, illustrated by a red bar in the Figure, is being uploaded by all countries except Spain and Greece. The same occurs to EN 1992 and to EN 1994 that are being uploaded by all countries except two, which are Luxemburg and Malta for the former Eurocodes, and Greece and Luxembourg for the latter. EN 1998 is not being uploaded by 11 countries, although some of them are seismic prone countries, for instance Greece. EN 1999 is not being uploaded by 9 countries.

Figure 15. Uploading of NDPs **per Eurocode** and **country**

3 Analysis of the NDPs available in the Database

3.1 General

The previous chapter has shown that the data available for analysis reached almost 71% out of the expected data to be uploaded in the Database, *i.e.*, by November 2018, 27 529 NDP values were available in the NDPs Database out of the 39 046 expected to be uploaded. Given these numbers, the uploaded NDP values can be regarded as representative of the national implementation of the Eurocodes in EU and EFTA Member States, offering basic data to draw conclusions on the harmonised or divergent patterns of national choices.

The current chapter addresses the analysis of the NDPs uploaded in the Database, examining, in section 3.2, the acceptance of the NDP RVs, the acceptance of the Eurocodes text "as is" and the progress of acceptance of NDPs in recent years. Attempts to correlate the technical contents of the Eurocodes with the NDP types are also made in this section.

The harmonised use of NDPs for specific parts of the Eurocodes, like the fire or bridges parts, and the harmonised use of the NDPs relevant to the definition of climatic and seismic actions are addressed in section 3.3.

Section 3.4 is devoted to the assessment of the harmonisation level of specific NDPs, for instance, NDPs with high and low percentage of acceptance and pre-determined parameters with large divergence from the recommended values, in order to facilitate further harmonisation in the second generation of the Eurocodes.

The analysis is made across all Eurocodes, for each Eurocode and Eurocode part, per country, per Eurocode and country and per NDP type and Eurocode.

3.2 Analysis of NDPs of different types

3.2.1 NDPs with recommended values – acceptance analysis

3.2.1.1 Acceptance per Eurocode

First, this section deals with the availability of data in the Database concerning Nationally Determined Parameters with recommended values (NDPs with RV), to complement the analysis made in chapter 2 for all NDPs uploaded in the Database. Then, an analysis of the acceptance state of NDPs in the Database is performed.

By November 2018, the Database contained NDPs with RVs belonging to all 58 Eurocodes parts. Considering 30 EU and EFTA Member States, Figure 16 presents the number of uploaded NDPs with RVs (16 089), the number of NDPs with RVs expected to be uploaded (22 135) and the total number of NDPs with RVs existing in the Eurocodes (25 170), referred herein as CEN NDPs with RV. The colour labelled bars in the Figure represent the number of NDPs values accepted by the countries for each Eurocode, reaching a total of 11 813 values for all Eurocodes. This number represents a percentage of 73.4% out of all uploaded NDPs with RV. The Eurocodes in the Figure are ordered, from top to bottom, by decreasing order of number of accepted NDPs.

Figure 16. Number of accepted NDPs RVs and number of CEN NDPs with RV, **per Eurocode** and for **all Eurocodes**, considering the 30 EU and EFTA MS; total numbers of uploaded NDPs with RV and of NDPs with RVs expected to be uploaded

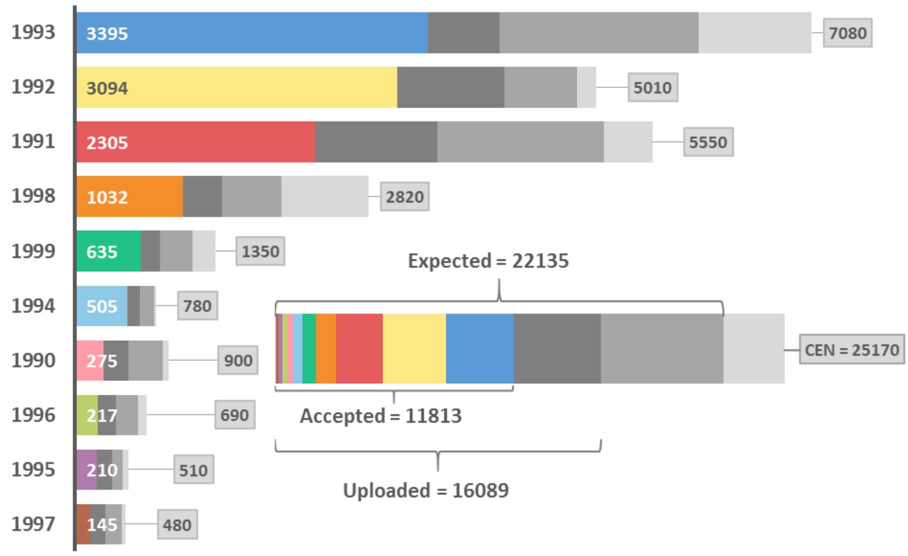


Figure 17 illustrates the percentage of uploading (colour labelled bars) and number of NDPs with RVs expected to be uploaded in the Database (grey labelled boxes) per Eurocode and for all Eurocodes, considering the 30 EU and EFTA MS. The Eurocodes in the Figure are ordered, from top to bottom, by decreasing order of uploading percentage of NDPs with RVs.

Figure 17. Percentage of uploading of NDPs with RVs (colour labelled bars) and number of NDPs with RVs expected to be uploaded (grey labelled boxes), **per Eurocode** and for **all Eurocodes**, considering the 30 EU and EFTA MS

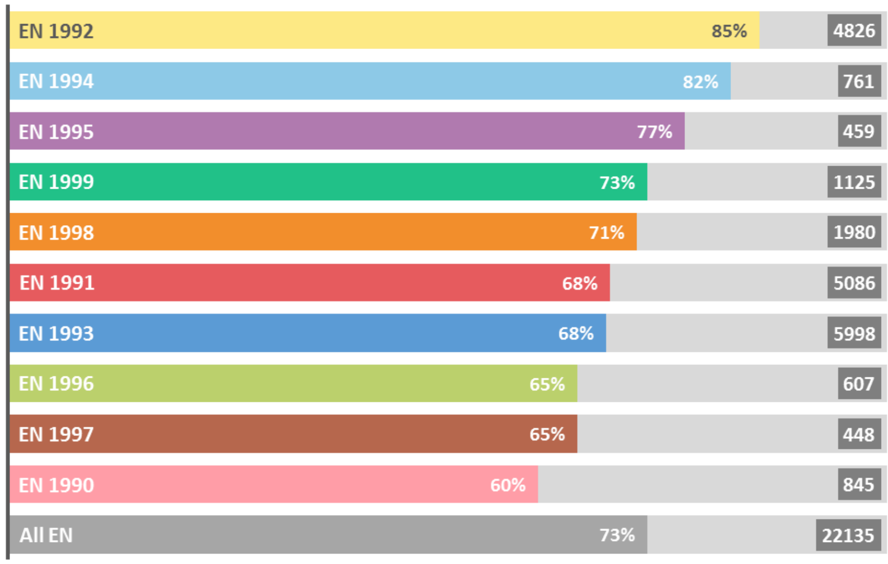
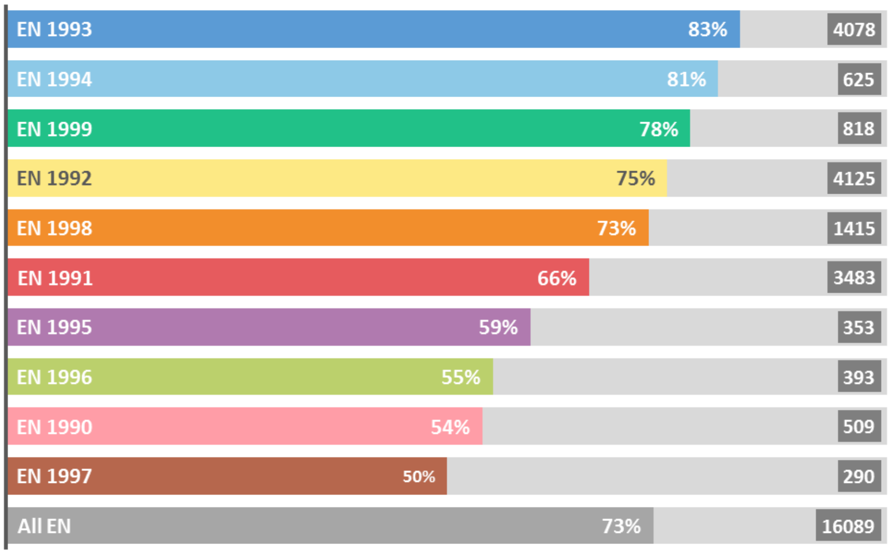


Figure 18 summarises the results of the acceptance analysis of NDPs with RVs, per Eurocode.

Figure 18. Percentage of acceptance (colour labelled bars) and number of uploaded NDPs with RVs (grey labelled boxes), **per Eurocode** and for **all Eurocodes**, considering the 30 EU and EFTA MS

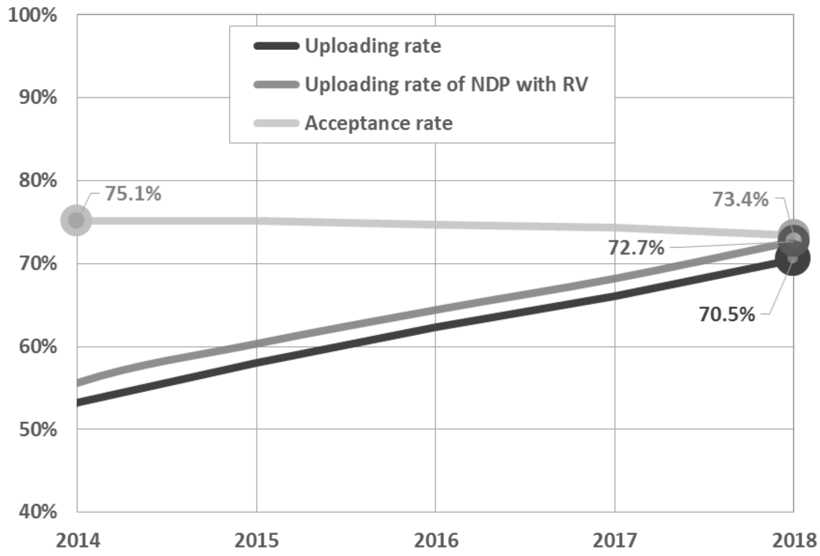


The analysis of the NDPs with RVs given showed that:

- The **uploading rate of NDPs with RVs** reached a value of **72.7%** that is slightly higher than the uploading rate for all NDPs (70.5%);
- The **mean percentage of acceptance of recommended values**, for all NDPs with RV, is **73.4%**, based on 72.7% of the expected data available;
- The Eurocodes with higher than the mean acceptance rate are EN 1993, EN 1994, EN 1999 and EN 1992 with 83.3%, 80.8%, 77.6% and 75.0% acceptance rate, respectively. These results indicate that a good harmonization level has been achieved in the national implementation of the most widely-used "material Eurocodes" that are EN 1992 and EN 1993, since they show an average acceptance rate of 79%, based on 76% of the expected data available. Those two Eurocodes also have the highest number of accepted NDP RVs.
- The Eurocode with the lowest percentage of acceptance of recommended values is EN 1997 with 50.0% of acceptance, closely followed by EN 1990 with 54.0% of acceptance rate. This result for EN 1997 can be explained by the fact that it introduces "a common language" in the field of geotechnical engineering design, in which the national practices are very different and should be further harmonised. As regards EN 1990, this Eurocode specifies the basic elements of structural safety (partial factors for actions, combination factors, choice of procedure for fundamental combination of actions, choice of the main variable action for accidental design situations, etc.), which are under national responsibility.

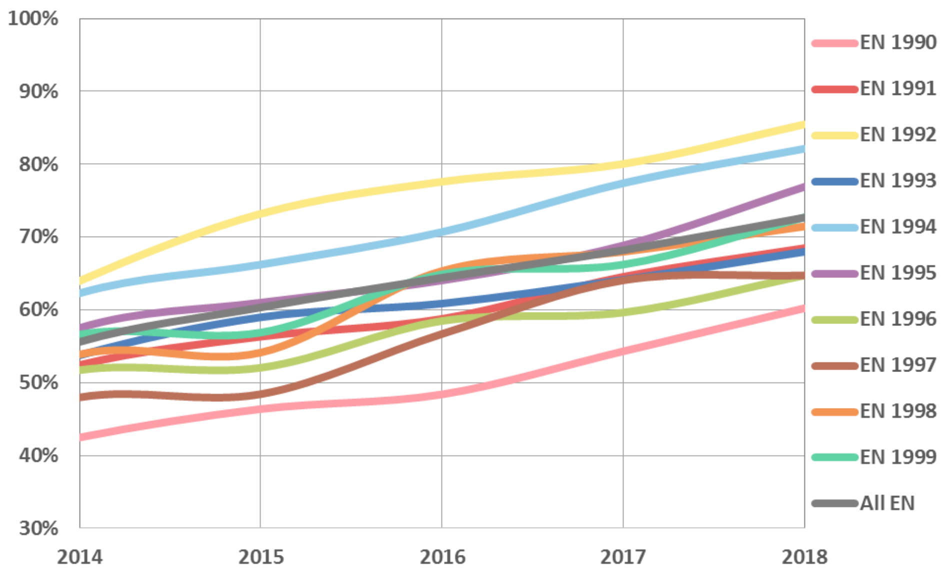
Based on an extraction from the Database made in November 2018, Figure 19 illustrates the progress of uploading of all NDPs, and of uploading and acceptance of NDPs with RV, between 2014 and November 2018, for all Eurocodes. A more limited period of time than the 11 years period analysed in Figure 10 (2007 to 2018) is being considered, since a reasonable amount of data is needed to perform the acceptance analysis. Figure 19 reveals that the mean percentage of RVs acceptance has remained approximately stable in recent years across all Eurocodes, despite the continuous increasing number of the NDPs uploaded in the Database. A slight downward trend is observed in the period, which initiates with an acceptance rate of 75.1% in 2014 and reaches an acceptance rate of 73.4%, late 2018. Moreover, the uploading rate of NDPs with RVs in the Database is always slightly higher than the uploading rate for all NDPs, with both rates keeping a constant distance of two percentage points during the analysed period.

Figure 19. Progress of uploading of all NDPs, of NDPs with RVs and progress of NDPs acceptance, across **all Eurocodes**, since 2014



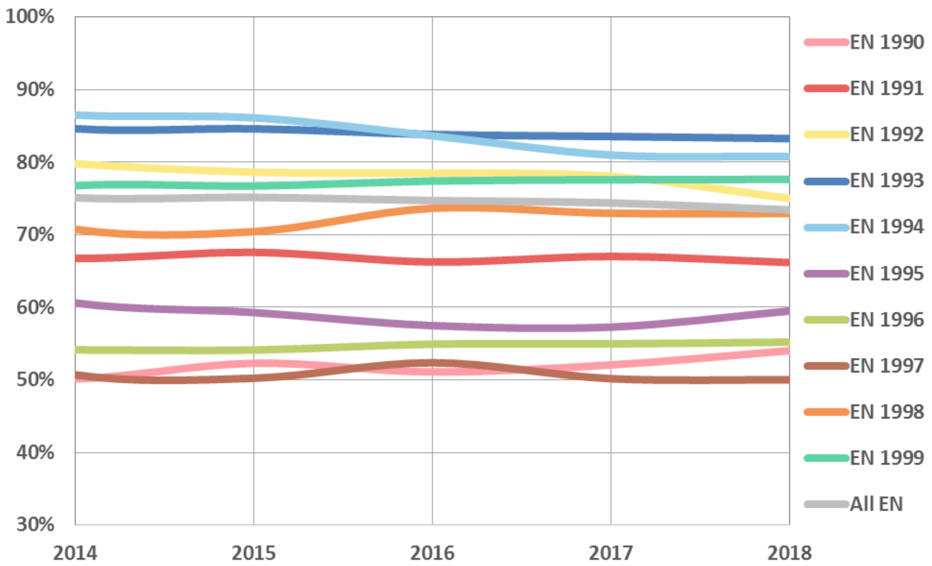
The progress of uploading of NDPs with RVs in the Database and the acceptance of the recommended values, per Eurocode, is illustrated in Figure 20 and in Figure 21, respectively.

Figure 20. Progress of uploading of NDPs with RVs **per Eurocode**, since 2014



It should be noted that the mean acceptance percentage of RVs for each Eurocode has also remained approximately stable in recent years. The Eurocode with the largest variation in the acceptance rate is EN 1994 with a variation range of six percentage points. EN 1991, EN 1993, EN 1996 and EN 1999 are the Eurocodes with the smallest variation of the acceptance rate in the period, staying within a variation range of one percentage point. No relevant upward or downward trends of acceptance rates are shown in the period, except for the downward trend of EN 1994 that started with an acceptance rate of 86.5% at the beginning of the analysed period, in 2014, and finished with an acceptance rate of 80.8% at the end of the analysed period, in 2017. On the contrary, EN 1990 showed a slight upward trend in the period, since its acceptance rate increased almost four percentage points.

Figure 21. Progress of acceptance of NDPs with RVs **per Eurocode**, since 2014



3.2.1.2 Acceptance per country

Figure 22 maps the geographic distribution of the acceptance percentage of the recommended values by country, as by November 2018. All countries present an acceptance percentage of recommended values over 40%; there are 12 countries having an acceptance rate between 60% and 80% and 11 countries with an acceptance percentage of recommended values over 80%.

Figure 22. Acceptance percentage of NDPs with RVs **per country**

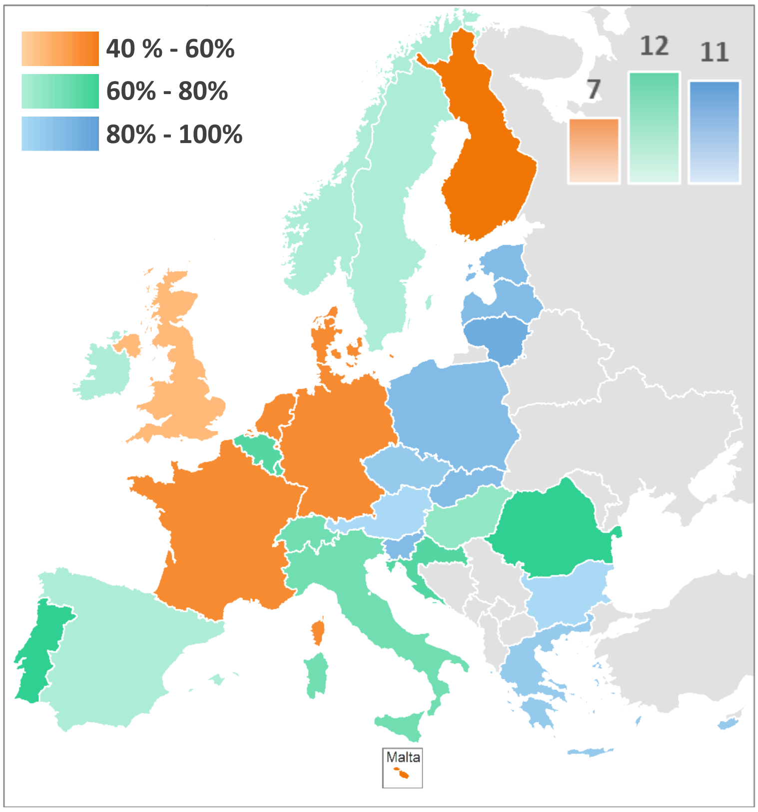


Figure 23 compares the number of accepted recommended values (blue colour bars) and the number of uploaded NDPs with RVs (dark grey colour boxes) for each country. The country with the highest number of accepted NDPs is Latvia that accepted 753 NDPs recommended values. Cyprus, Czechia and Lithuania also have accepted more than 700 RVs.

Figure 23. Number of accepted NDP RVs (blue colour bars) and number of uploaded NDPs with RV (grey labelled boxes), **per country**

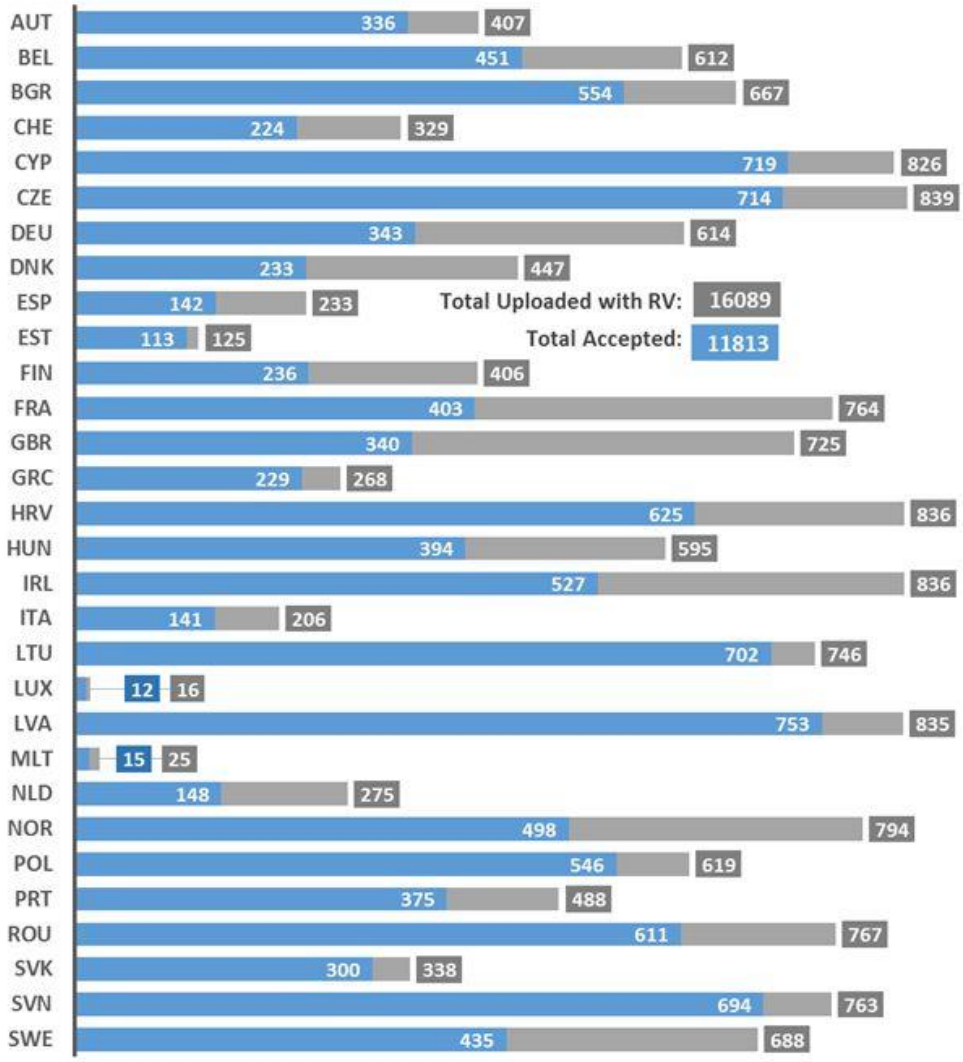
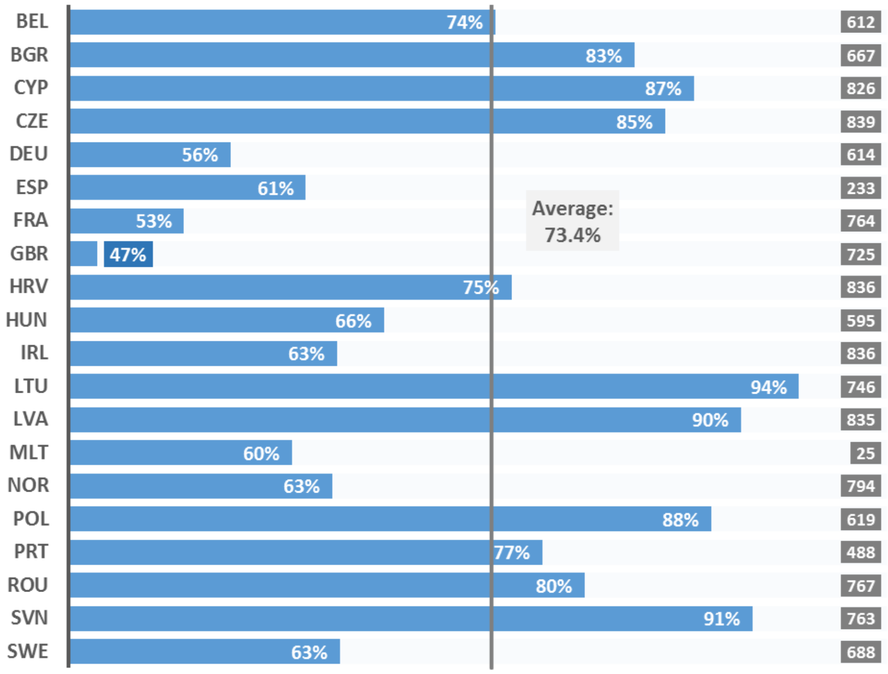


Figure 24 shows the acceptance percentage of NDPs, across all Eurocodes, for the 20 countries with an uploading rate higher than the average (72.7%). Also shown in the right part of the Figure is the number of NDPs with RVs expected to be uploaded.

Among the 20 countries that uploaded more than 73% of their NDPs with RVs, 11 have an acceptance rate higher than the average. They are Belgium, Bulgaria, Cyprus, Czechia, Croatia, Lithuania, Latvia, Poland, Portugal, Romania and Slovenia. The country with the highest acceptance of RVs is Lithuania with 94%, followed by Slovenia and Latvia with 91% and 90%, respectively. The United Kingdom has the lowest rate of acceptance of RVs, achieving 47%, followed by France, with 53%.

Figure 24. Acceptance percentage of NDP RVs (blue bars) for the **countries** with an uploading rate higher than the average (72.7%); number of NDPs with RV expected to be uploaded (grey labelled boxes)



3.2.1.3 Acceptance per Eurocode and country

Figure 25 illustrates the acceptance percentage of NDPs with RV, per Eurocode and country, as by November 2018. The grey vertical line in the Figure illustrates the average acceptance percentage for all Eurocodes (73.4%), calculated with reference to the number of NDPs uploaded. The grey horizontal bar in the bottom of each small Figure presents the average acceptance rate by each country for all Eurocodes.

The Figure shows that EN 1994 is the Eurocode with the highest number of countries (eight) that have accepted all RVs (100%) of the NDPs they have uploaded. These eight countries are Cyprus, Czechia, the Netherlands, Poland, Portugal, Romania, Slovakia and Slovenia. EN 1994 is also the Eurocode with the highest number of accepted RVs by France and the United Kingdom, with an acceptance rate of 73% and 77%, respectively. These high percentages of acceptance are probably due to the fact that EN 1994 is devoted to a field of design where national traditions were not strongly established. The Eurocodes with the lowest percentage of acceptance per country are EN 1995 for Denmark, with an acceptance rate of 7%, and EN 1996 for the United Kingdom with an acceptance rate of 9%.

Figure 25. Acceptance of NDPs per **Eurocode** and **countries**

3.2.1.4 Acceptance per NDPs type and Eurocode

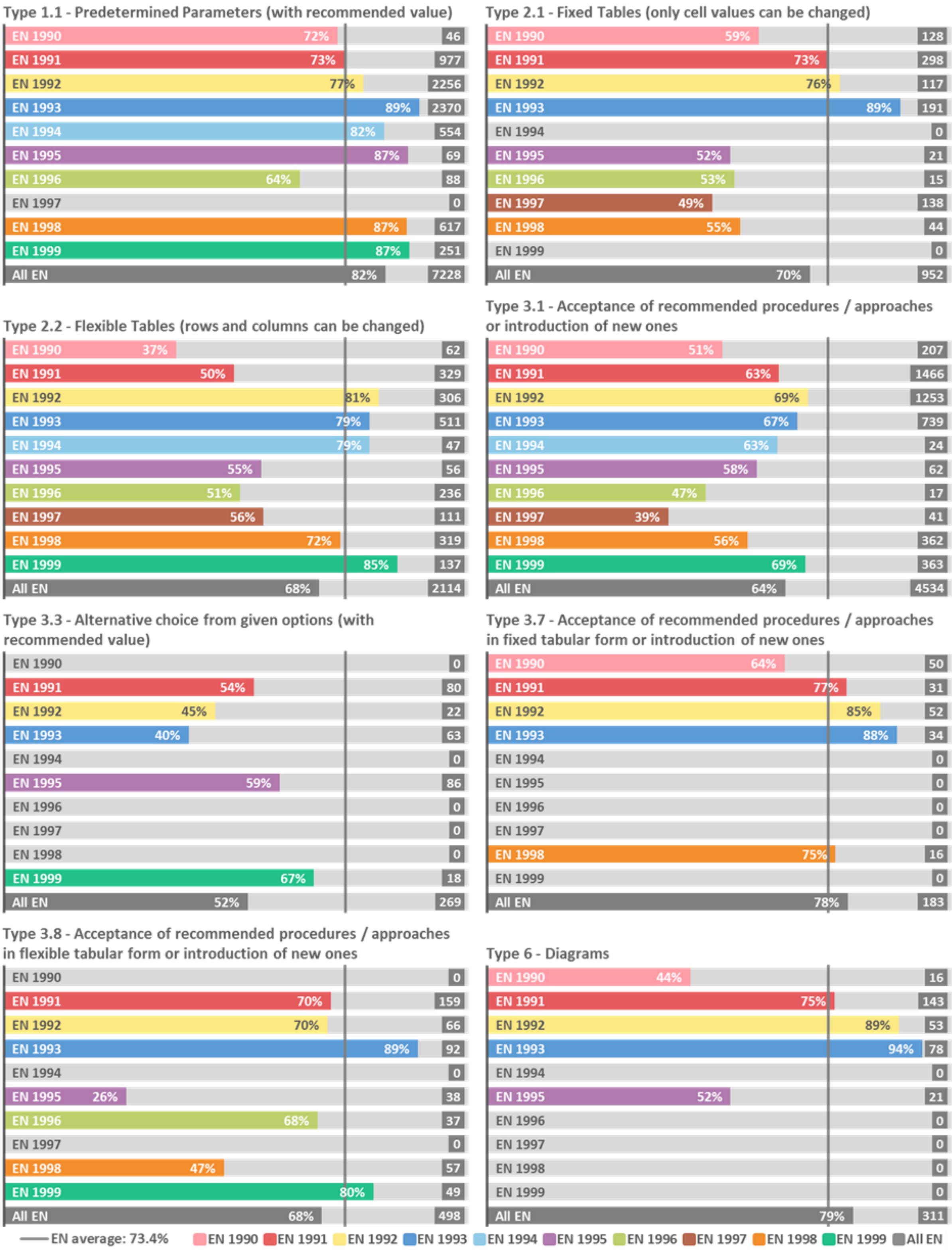
This section makes use of the classification of NDPs in different types, created when the NDPs Database was originally developed (Mehr et al., 2007) with the aim to evaluate the degree of harmonisation of the Eurocodes technical contents in the national implementation by the EU and EFTA countries.

The NDPs considered in the analysis presented in this section are the ones with RVs given, i.e., NDPs of type 1.1, 2.1, 2.2, 3.1, 3.3, 3.7, 3.8 and 6, which description is also presented in Figure 26. The dark grey rectangles in the right part of the Figure depict the number of NDP values uploaded in the Database. The grey vertical line in the Figure illustrates the average percentage of acceptance for all Eurocodes (73.4%), calculated with reference to the number of NDPs uploaded in the Database. The grey horizontal bar in the bottom of each small figure presents the average acceptance rate for all Eurocodes, per NDP type.

Attempts were made to correlate the technical contents of the Eurocodes with the NDP types. For instance, the NDPs of type 1.1 *(Predetermined parameters with RV)*, are mainly related to the determination of actions for the design, the material properties of the structure and to its geometric data. NDPs of type 2.1 and 2.2 (*Fixed and Flexible tables with RV*, respectively), mainly address characteristic load values, partial factors for material properties of structures, limit states requirements, combination factors, shape coefficients and geometric data of structures, and classifications of categories for the design. NDPs of type 3.3 (*Alternative choice from given options with RV*) provide an opportunity to the countries to choose among given design procedures (*e.g.* to determine actions and material properties) and to choose rules for the detailing of structural members, optional factors or given classes for the design. NDPs of types 3.1, 3.7 and 3.8 (having in common the following partial description: *Acceptance of recommended procedures / approaches*) are related to design procedures or approaches, having a recommended procedure given in the standards. Finally, NDPs of type 6 correspond to *Diagrams* plotting design procedures, but also equations, limits of application and flow charts for the design, among others.

Figure 26 presents the acceptance rate of NDPs with RVs per NDP type and Eurocode. NDPs of type 1.1 *(Predetermined parameters with RV)* have the highest acceptance rate (82%) among all the NDPs types. The NDPs of type 6 (*Diagrams)*, also have a high acceptance rate (79%), mainly because of the 94% acceptance achieved in EN 1993. This is the highest acceptance rate achieved for all NDP types and Eurocodes. As seen before (Figure 18), EN 1993 is generally well harmonised in the national choices for most NDPs types with RV. An exception is observed for NDPs of type 3.3 (*Alternative choice from given options with RV*), where the acceptance rate of the uploaded values is 40%. Globally, the NDPs of type 3.3 have the lowest acceptance rate (52%) among all the NDPs types.

Figure 26. NDPs acceptance rate per **NDP type** and **Eurocode**



3.2.1.5 Acceptance per NDPs type and Eurocode part

Table 3 presents the percentage of acceptance of RVs for different types of NDPs, per Eurocode and part. Percentages of acceptance lower than 50% are highlighted in red in this Table, whereas percentages of acceptance greater than the mean (74.3%) are marked in green. Also highlighted in black bold in the first column of Table 3 are the parts that achieved a very good national consensus having an acceptance rate greater than or equal to 90%. There are eight parts in this situation that are: parts 1-4, 1-6, 1-11, 4.1 and 4-3 in EN 1993, parts 4 and 5 in EN 1998 and part 1-5 in EN 1999. In particular, parts 1-6[16], 1-11[17] and 4-3[18] in EN 1993 reached an acceptance rate greater than or equal to 95%.

The lowest and highest acceptance rate per Eurocode part and NDP type are highlighted in bold in Table 3. The lowest acceptance rate achieved a value of 19% and belongs to the NDPs of type 2.2 in EN 1991-1-1[19]. The highest acceptance rate reached 100% and goes to the NDPs of type 3.8 in EN 1993-1-6[11], which was uploaded by 19 out of the 26 countries that are expected to upload this part. However, there is a single NDP of type 3.8 in EN 1993-1-6 (NDP *8.4.2 (3) Values for the out-of-roundness tolerance parameter* $U_{r,max}$), meaning that it was accepted by 100% of the uploading countries.

Table 3 also shows that 103 parts and NDPs types have acceptance rates higher than the mean, 24 parts and NDPs types have an acceptance rate greater or equal to 90% and 30 parts and NDPs types have an acceptance rate lower or equal to 50%.

16 EN 1993-1-6 - *Design of steel structures - Part 1-6 Strength and stability of shell structures.*

17 EN 1993-1-11 - *Design of steel structures – Part 1-11 Design of structures with tension components*

18 EN 1993-4-3 - *Design of steel structures – Part 4-3 Pipelines*

19 EN 1991-1-1 - *Actions on structures* – Part 1-1 *General actions - Densities, self-weight, imposed loads for buildings.*

Table 3. Acceptance percentage of different **types** of NDPs with RVs **per Eurocode** and **part**

EN & Part	NDP Type								All considered types
	Type 1.1 Predetermined parameters (with RV)	Type 2.1 Fixed tables	Type 2.2 Flexible tables	Type 3.1 Acceptance of recommended procedures / approaches or introduction of new ones	Type 3.3 Alternative choice from given options (with RV)	Type 3.7 Acceptance of recommended procedures / approaches in fixed tabular form or introduction of new ones	Type 3.8 Acceptance of recommended procedures / approaches in flexible tabular form or introduction of new ones	Type 6 Diagrams	
EN 1990	**72%**	**59%**	**37%**	**51%**	**N/A**	**64%**	**N/A**	**44%**	**54%**
A-1	N/A	54%	35%	73%	N/A	48%	N/A	N/A	50%
A-2	72%	60%	44%	48%	N/A	76%	N/A	44%	55%
EN 1991	**73%**	**73%**	**50%**	**63%**	**54%**	**77%**	**70%**	**75%**	**66%**
1-1	75%	N/A	**19%**	60%	N/A	N/A	52%	N/A	44%
1-2	N/A	N/A	N/A	56%	38%	N/A	N/A	N/A	52%
1-3	58%	58%	N/A	41%	N/A	N/A	25%	N/A	51%
1-4	73%	88%	62%	68%	67%	N/A	N/A	81%	72%
1-5	76%	67%	70%	61%	N/A	N/A	N/A	59%	70%
1-6	69%	65%	83%	59%	N/A	N/A	N/A	N/A	64%
1-7	80%	64%	71%	66%	N/A	76%	77%	N/A	72%
2	66%	N/A	49%	62%	43%	79%	84%	50%	63%
3	94%	87%	72%	N/A	N/A	N/A	N/A	N/A	87%
4	94%	72%	N/A	89%	N/A	N/A	94%	N/A	88%
EN 1992	**77%**	**76%**	**81%**	**69%**	**45%**	**85%**	**70%**	**89%**	**75%**
1-1	76%	77%	83%	70%	N/A	85%	38%	89%	75%
1-2	86%	N/A	79%	60%	45%	N/A	N/A	N/A	73%
2	81%	71%	72%	69%	N/A	N/A	N/A	N/A	74%
3	90%	N/A	N/A	N/A	N/A	N/A	88%	N/A	89%

Acceptance > 74.3%	**Acceptance < 50%**

EN & Part	NDP Type								All considered types
	Type 1.1 Predetermined parameters (with RV)	Type 2.1 Fixed tables	Type 2.2 Flexible tables	Type 3.1 Acceptance of recommended procedures / approaches or introduction of new ones	Type 3.3 Alternative choice from given options (with RV)	Type 3.7 Acceptance of recommended procedures / approaches in fixed tabular form or introduction of new ones	Type 3.8 Acceptance of recommended procedures / approaches in flexible tabular form or introduction of new ones	Type 6 Diagrams	
EN 1993	**89%**	**89%**	**79%**	**67%**	**40%**	**88%**	**89%**	**94%**	**83%**
1-1	75%	N/A	81%	63%	N/A	N/A	N/A	N/A	72%
1-2	89%	N/A	N/A	33%	N/A	N/A	N/A	N/A	67%
1-3	83%	N/A	81%	73%	N/A	N/A	N/A	N/A	81%
1-4	94%	N/A	N/A	89%	N/A	N/A	N/A	N/A	**93%**
1-5	87%	N/A	90%	70%	59%	N/A	N/A	N/A	78%
1-6	95%	97%	N/A	83%	N/A	N/A	**100%**	N/A	**95%**
1-7	89%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	89%
1-8	N/A	76%	N/A	45%	N/A	N/A	N/A	N/A	60%
1-9	N/A	N/A	57%	50%	N/A	N/A	N/A	N/A	53%
1-10	N/A	N/A	N/A	76%	29%	N/A	N/A	N/A	45%
1-11	97%	89%	95%	N/A	N/A	94%	N/A	N/A	**95%**
1-12	95%	N/A	80%	75%	N/A	N/A	N/A	N/A	83%
2	87%	N/A	77%	78%	N/A	N/A	85%	94%	85%
3-1	80%	87%	71%	70%	N/A	81%	N/A	N/A	76%
3-2	87%	93%	82%	85%	N/A	N/A	N/A	N/A	85%
4-1	91%	78%	88%	94%	N/A	N/A	N/A	N/A	**91%**
4-2	88%	N/A	77%	86%	N/A	N/A	N/A	N/A	84%
4-3	96%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**96%**
5	87%	N/A	80%	28%	N/A	N/A	N/A	N/A	77%
6	85%	N/A	75%	72%	N/A	N/A	88%	N/A	79%
1994	**82%**	**N/A**	**79%**	**63%**	**N/A**	**N/A**	**N/A**	**N/A**	**81%**
1-1	81%	N/A	81%	N/A	N/A	N/A	N/A	N/A	81%
1-2	85%	N/A	N/A	63%	N/A	N/A	N/A	N/A	78%
2	82%	N/A	76%	N/A	N/A	N/A	N/A	N/A	81%

Acceptance > 74.3%	**Acceptance < 50%**

EN & Part	NDP Type								All considered types
	Type 1.1 Predetermined parameters (with RV)	Type 2.1 Fixed tables	Type 2.2 Flexible tables	Type 3.1 Acceptance of recommended procedures / approaches or introduction of new ones	Type 3.3 Alternative choice from given options (with RV)	Type 3.7 Acceptance of recommended procedures / approaches in fixed tabular form or introduction of new ones	Type 3.8 Acceptance of recommended procedures / approaches in flexible tabular form or introduction of new ones	Type 6 Diagrams	
1995	**87%**	**52%**	**55%**	**58%**	**59%**	**N/A**	**26%**	**52%**	**59%**
1-1	N/A	52%	53%	48%	53%	N/A	26%	52%	47%
1-2	87%	N/A	N/A	62%	77%	N/A	N/A	N/A	80%
2	N/A	N/A	57%	65%	N/A	N/A	N/A	N/A	60%
1996	**64%**	**53%**	**51%**	**47%**	**N/A**	**N/A**	**68%**	**N/A**	**55%**
1-1	60%	N/A	62%	N/A	N/A	N/A	68%	N/A	62%
1-2	86%	53%	N/A	47%	N/A	N/A	N/A	N/A	64%
2	N/A	N/A	50%	N/A	N/A	N/A	N/A	N/A	50%
3	43%	N/A	32%	N/A	N/A	N/A	N/A	N/A	34%
1997	**N/A**	**49%**	**56%**	**39%**	**N/A**	**N/A**	**N/A**	**N/A**	**50%**
1	N/A	49%	56%	39%	N/A	N/A	N/A	N/A	50%
2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1998	**87%**	**55%**	**72%**	**56%**	**N/A**	**75%**	**47%**	**N/A**	**73%**
1	84%	43%	62%	45%	N/A	75%	27%	N/A	66%
2	86%	79%	85%	60%	N/A	N/A	86%	N/A	75%
3	91%	N/A	62%	N/A	N/A	N/A	54%	N/A	80%
4	91%	N/A	89%	N/A	N/A	N/A	N/A	N/A	**90%**
5	94%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**94%**
6	81%	N/A	71%	79%	N/A	N/A	N/A	N/A	77%
1999	**87%**	**N/A**	**85%**	**69%**	**67%**	**N/A**	**80%**	**N/A**	**78%**
1-1	88%	N/A	83%	68%	67%	N/A	82%	N/A	76%
1-2	89%	N/A	N/A	61%	N/A	N/A	N/A	N/A	71%
1-3	83%	N/A	94%	75%	N/A	N/A	N/A	N/A	81%
1-4	91%	N/A	N/A	N/A	N/A	N/A	73%	N/A	85%
1-5	91%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**91%**
EN Total	**82%**	**70%**	**68%**	**64%**	**52%**	**78%**	**68%**	**79%**	**73%**

Acceptance > 74.3%	**Acceptance < 50%**

The list of the 24 parts and NDPs types with an acceptance rate greater or equal to 90% is presented in Table 4. Most of those parts (14) belong to EN 1993 and the most frequent NDP type is 1.1.

The parts and NDPs types that have achieved a notable consensus among the countries have a great potential to be further harmonised in the next generation of the Eurocodes.

Table 4. Parts and NDPs types with **acceptance rate greater or equal to 90%**

EN	Part	NDP type	% of Uploading	% of Acceptance
1991	3	1.1	65%	94%
	4	1.1	69%	94%
		3.8	69%	94%
1992	3	1.1	73%	90%
1993	1-4	1.1	67%	94%
	1-5	2.2	73%	90%
	1-6	1.1	72%	95%
		2.1	72%	97%
		3.8	73%	100%
	1-11	1.1	72%	97%
		2.2	73%	95%
		3.7	69%	94%
1993	1-12	1.1	74%	95%
	2	6	67%	94%
	3-2	2.1	56%	93%
	4-1	1.1	68%	91%
		3.1	68%	94%
	4-3	1.1	68%	96%
1998	3	1.1	60%	91%
	4	1.1	67%	91%
	5	1.1	74%	94%
1999	1-3	2.2	69%	94%
	1-4	1.1	64%	91%
	1-5	1.1	67%	91%

Finally, the number of countries uploading a given NDP with recommended value, the number of cases when the recommended value was accepted, and the percentage of acceptance of the NDP recommended value is shown in the Annex B to this report.

3.2.2 Pre-determined parameters with recommended values

The convergence of the national choices for the NDPs described as *Predetermined parameters with RV* (type 1.1) is analysed in the current section. Among the 839 NDPs with RVs in the Eurocodes, 369 (43.9%) are of type 1.1. The NDPs of this type are composed by a single numeric value or by multiple numeric values. A concrete example may be given using the NDP 6.1.6(1) in EN1991-1-5 described as *Values for the differences in the uniform temperature component* that is composed of three values: *Values for the differences in the uniform temperature* (i) *between main structural elements (e.g. tie and arch)*, (ii) *for light colour respectively between suspension/stay cables and deck (or tower)* and (iii) *for dark colour respectively between suspension/stay cables and deck (or tower)* with three different recommended values of 15°C, 10°C and 20°C, respectively.

The analysis made in the current section is based on the values of the NDPs type 1.1 uploaded in the Database by November 2018. In order to analyse the level of convergence of national choices, the NDP uploaded values were normalized by the respective RVs. NDP values that were not uploaded in the Database in the format required by the Eurocodes were discarded in the analysis. Moreover, three NDPs in EN 1992 with RVs equal to zero were also not considered in the analysis.

Figure 27 and Figure 28 illustrate the normalized values of NDPs type 1.1 for all Eurocodes, and the divergence of national choices. The identification of the NDPs is performed by the numbers in sequential order shown in the Figures and the corresponding list is presented in Annex C to this report.

The blue circles in the Figures represent the mean value for each NDPs based on the values uploaded by the countries in the Database and normalized with respect to the NDPs recommended values, *i.e.*, $\overline{NDP / RV} = \overline{NDP} / RV$. EN 1997 is not shown because it does not include NDPs of type 1.1. The range of deviation of the uploaded values is illustrated by the red dashes in the Figures, representing the minimum and maximum values uploaded by the countries, normalized by the RV of the NDPs. The standard deviation of the ratio *NDP/RV*, is summed, with positive or negative signs, to its mean value, *i.e.*, $\overline{NDP} / RV \pm \sigma_{NDP/RV}$, being illustrated by the small red bullets in Figure 27 and in Figure 28.

Notice that the drawings are plotted in different vertical scales, indicating that higher normalized deviations from the recommended values are present for NDPs type 1.1 for EN 1992 and EN 1998 than in the remaining analysed Eurocodes (EN 1990, EN 1991, EN 1993 to EN 1996 and EN 1999). Furthermore, EN 1999 stands out among the others Eurocodes due to the overall low level of divergence from the recommended values of the NDPs type 1.1, closely followed by EN 1995. By contrast, EN 1992 and EN 1998 have NDPs type 1.1 with large divergences from the RVs. In particular, a value 25 times higher than the recommended was uploaded for EN 1998. The value is out of the Figure range, so it is ticked by a broken line (⁄\⁄) and the specific label values are shown.

The analysis of the NDPs with the largest deviation from the RVs is presented in section 3.4.2.

Figure 27. Mean value, standard deviation, maximum and minimum value of NDP/RV for NDPs type 1.1 of EN 1990 to EN 1993

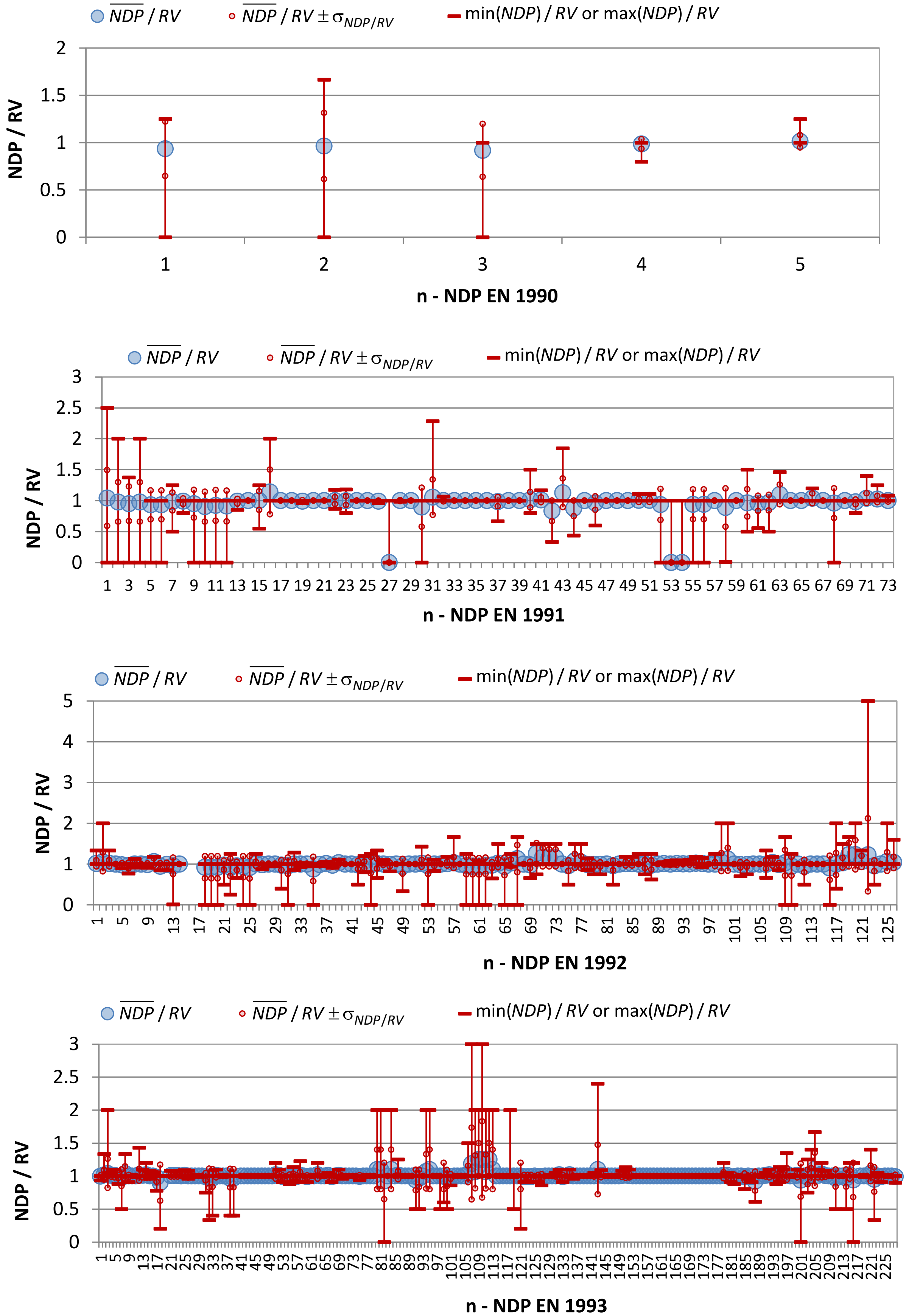
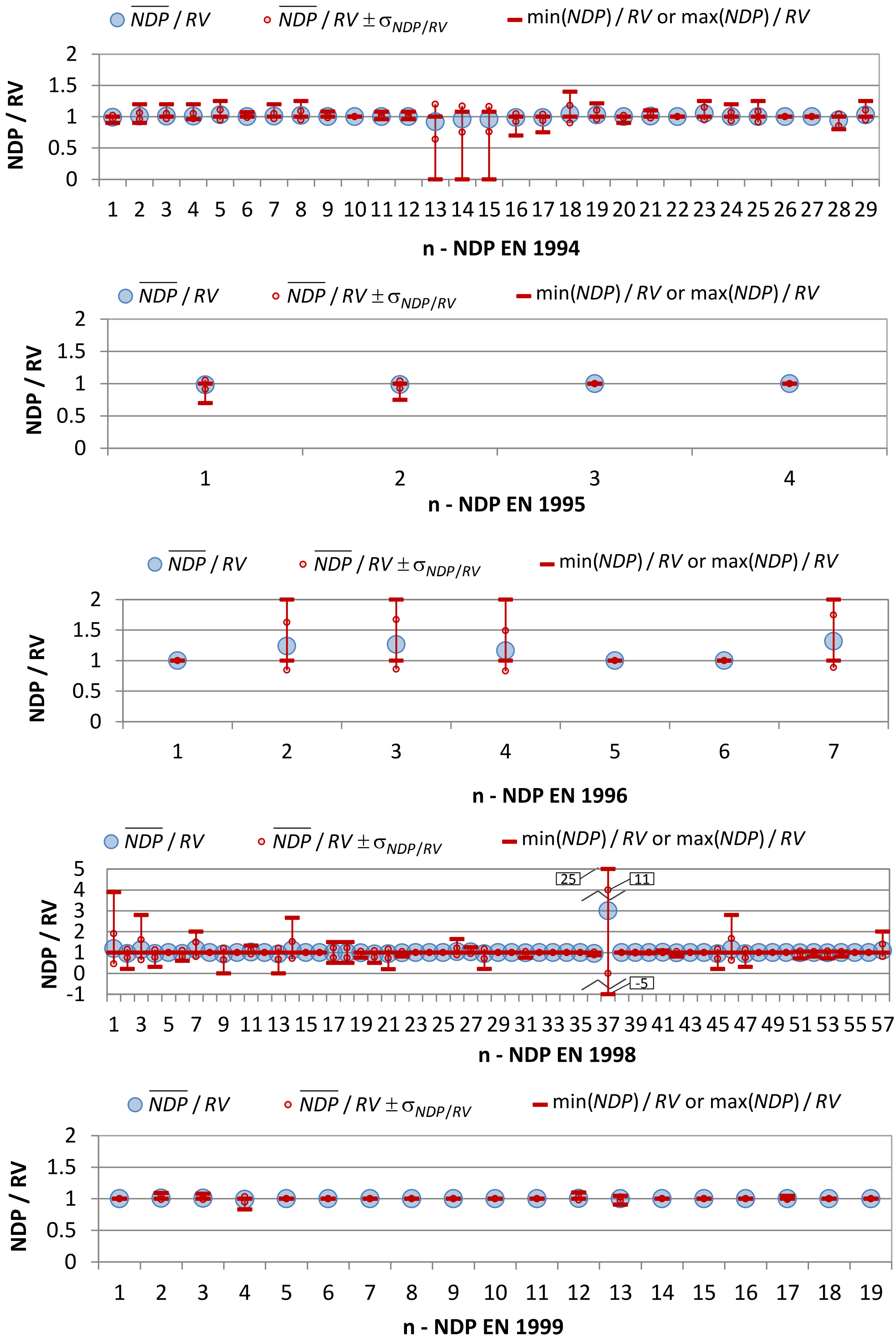


Figure 28. Mean value, standard deviation, maximum and minimum value of NDP/RV; NDPs type 1.1 of EN 1994 to EN 1996, EN 1998 and EN 1999



3.2.3 NDPs where the EN text may be accepted as is

For certain NDP types, with or without RVs, the NDP Database provides the user the possibility to accept the NDPs EN text as it is proposed in the standards, in order to consider the cases in which countries do not wish to make their own choices. These specific NDP types were identified in the fifth column of Table 2. The NDPs for which the EN text may be accepted as it is in the standards constitute 71% of all NDPs, meaning that, in addition to the 56% NDPs with RVs given, another 15% of the total number of NDPs may have the EN text accepted as is.

Table 5 presents, per Eurocode part and NDP type, the acceptance percentage of the Eurocodes text as it is for NDPs without RV.

This group of NDPs has a total acceptance rate of 46%, while the total acceptance rate of the NDPs with RVs is 73%.

Within this group there are 212 NDPs that can be an important source for further harmonisation, since they mostly concern further refinement or adjustment of methods and procedures. They include *Predetermined parameters without RV* (type 1.2), *No predetermined parameters* (type 1.3) and *Country procedures / approaches* (type 3.2). To recall, NDPs type 1.2 are defined in the Eurocodes as a set of predetermined parameters for which no specific values are given, therefore a recommended value is not available. NDPs type 1.3 also do not have recommended values available, but in some cases an Excel file is given in the Database and may be used as reference by the user when uploading the NDPs. The rate of "acceptance as is" of NDPs types 1.2, 1.3 and 3.2 varies between 11% and 87% for different Eurocodes parts. However, among them, certain NDPs have achieved a good national consensus among the countries. For instance, the NDP 9.2.1(2) in EN 1993-1-6, *The partial factor for resistance to fatigue* γ_{Mf}, which is type 1.2, has the respective EN text accepted by 100% of the countries that uploaded this NDP in the Database (currently 13 countries).

The NDPs of types 1.2 and 3.2 that exhibit a good national consensus for certain Eurocodes parts, namely a percentage of acceptance greater than the overall mean (73.4%), are highlighted in the following:

- The NDPs of type 1.2, *Predetermined parameters without RV*, achieved a mean "acceptance as is" of 79%, 81% and 87% in EN 1991-1-1, EN 1991-1-7 and EN 1993-1-6, respectively;
- The NDPs of type 3.2, *Country procedures / approaches*, achieved a mean "acceptance as is" of 76% in EN 1999-1-3.

Moreover, the NDPs of type 7, *References to non-contradictory complementary information*, achieved a percentage of 83% and 79% in EN 1992-1-1 and in EN 1998-3, respectively, and the NDPs of type 9, *Provision of further more detailed information*, achieved a percentage of 82% and 83% in EN 1993-1-4 and in EN 1999-1-3, respectively.

Table 5. **Acceptance percentage** of the EN text "**as is**", per **Eurocode** and **part**

EN & Part	NDP types							All considered types
	Type 1.2 Predetermined Parameters (without RV)	Type 1.3 No Predetermined Parameters	Type 3.2 Country procedures/ approaches	Type 4 Country specific data	Type 5 National charts or tables	Type 7 References to non-contradictory complementary information	Type 9 Provision of further, more detailed information	
1990	**N/A**	**71%**	**42%**	**N/A**	**N/A**	**N/A**	**59%**	**49%**
A-1	N/A	N/A	26%	N/A	N/A	N/A	N/A	26%
A-2	N/A	71%	46%	N/A	N/A	N/A	59%	53%
1991	**75%**	**61%**	**37%**	**17%**	**67%**	**36%**	**36%**	**38%**
1-1	79%	72%	42%	N/A	N/A	N/A	N/A	64%
1-2	N/A	N/A	37%	N/A	N/A	N/A	N/A	37%
1-3	N/A	N/A	41%	13%	N/A	N/A	27%	27%
1-4	N/A	N/A	26%	34%	67%	43%	39%	38%
1-5	N/A	58%	N/A	11%	N/A	N/A	N/A	30%
1-6	N/A	50%	33%	N/A	N/A	N/A	73%	37%
1-7	81%	N/A	34%	N/A	N/A	30%	24%	37%
2	50%	62%	38%	N/A	N/A	63%	N/A	42%
3	N/A	N/A	41%	N/A	N/A	N/A	N/A	41%
4	N/A	N/A	47%	N/A	N/A	N/A	N/A	47%
1992	**30%**	**N/A**	**47%**	**N/A**	**N/A**	**83%**	**71%**	**57%**
1-1	12%	N/A	N/A	N/A	N/A	83%	N/A	63%
1-2	55%	N/A	50%	N/A	N/A	N/A	N/A	51%
2	N/A	N/A	40%	N/A	N/A	N/A	71%	59%
3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Acceptance > 74.3%	Acceptance < 50%

EN & Part	NDP types							All considered types
	Type 1.2 Predetermined Parameters (without RV)	Type 1.3 No Predetermined Parameters	Type 3.2 Country procedures/ approaches	Type 4 Country specific data	Type 5 National charts or tables	Type 7 References to non-contradictory complementary information	Type 9 Provision of further, more detailed information	
1993	**87%**	**69%**	**47%**	**28%**	**N/A**	**31%**	**55%**	**51%**
1-1	N/A	N/A	31%	30%	N/A	N/A	26%	29%
1-2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1-3	N/A	69%	63%	N/A	N/A	N/A	54%	58%
1-4	N/A	N/A	65%	N/A	N/A	N/A	82%	74%
1-5	N/A	N/A	41%	N/A	N/A	N/A	59%	54%
1-6	87%	N/A	59%	N/A	N/A	N/A	N/A	69%
1-7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1-8	N/A	N/A	23%	N/A	N/A	13%	60%	39%
1-9	N/A	N/A	37%	N/A	N/A	N/A	56%	46%
1-10	N/A	N/A	30%	N/A	N/A	N/A	N/A	30%
1-11	N/A	N/A	49%	N/A	N/A	N/A	42%	46%
1-12	N/A	N/A	47%	N/A	N/A	N/A	N/A	47%
2	N/A	N/A	39%	24%	N/A	N/A	52%	48%
3-1	N/A	N/A	65%	N/A	N/A	N/A	63%	63%
3-2	N/A	N/A	73%	N/A	N/A	N/A	64%	66%
4-1	N/A	N/A	65%	N/A	N/A	N/A	N/A	65%
4-2	N/A	N/A	71%	N/A	N/A	N/A	71%	71%
4-3	N/A	N/A	38%	N/A	N/A	62%	N/A	46%
5	N/A	N/A	44%	N/A	N/A	N/A	N/A	44%
6	N/A	N/A	32%	N/A	N/A	N/A	N/A	32%
1994	**N/A**	**33%**	**41%**	**N/A**	**N/A**	**55%**	**51%**	**45%**
1-1	N/A	33%	36%	N/A	N/A	N/A	48%	38%
1-2	N/A	N/A	39%	N/A	N/A	N/A	N/A	39%
2	N/A	N/A	50%	N/A	N/A	55%	55%	53%

Acceptance > 74.3%	**Acceptance < 50%**

EN & Part	NDP types							All considered types
	Type 1.2 Predetermined Parameters (without RV)	Type 1.3 No Predetermined Parameters	Type 3.2 Country procedures/ approaches	Type 4 Country specific data	Type 5 National charts or tables	Type 7 References to non-contradictory complementary information	Type 9 Provision of further, more detailed information	
1995	**27%**	**N/A**	**60%**	**N/A**	**N/A**	**N/A**	**48%**	**41%**
1-1	27%	N/A	N/A	N/A	N/A	N/A	48%	34%
1-2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	N/A	N/A	60%	N/A	N/A	N/A	N/A	60%
1996	**N/A**	**13%**	**34%**	**56%**	**N/A**	**61%**	**N/A**	**37%**
1-1	N/A	11%	19%	56%	N/A	N/A	N/A	23%
1-2	N/A	15%	52%	N/A	N/A	N/A	N/A	44%
2	N/A	N/A	N/A	N/A	N/A	61%	N/A	61%
3	N/A	N/A	38%	N/A	N/A	N/A	N/A	38%
1997	**N/A**	**N/A**	**9%**	**N/A**	**N/A**	**21%**	**N/A**	**11%**
1	N/A	N/A	9%	N/A	N/A	21%	N/A	11%
2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1998	**25%**	**38%**	**37%**	**28%**	**N/A**	**59%**	**47%**	**39%**
1	25%	N/A	30%	28%	N/A	53%	47%	35%
2	N/A	N/A	43%	N/A	N/A	N/A	N/A	43%
3	N/A	38%	N/A	N/A	N/A	79%	N/A	59%
4	N/A	N/A	64%	N/A	N/A	N/A	N/A	64%
5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1999	**N/A**	**N/A**	**71%**	**N/A**	**N/A**	**N/A**	**74%**	**71%**
1-1	N/A	N/A	70%	N/A	N/A	N/A	58%	68%
1-2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1-3	N/A	N/A	76%	N/A	N/A	N/A	83%	77%
1-4	N/A	N/A	60%	N/A	N/A	N/A	73%	63%
1-5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
EN Total	**53%**	**53%**	**43%**	**23%**	**67%**	**51%**	**53%**	**46%**

Acceptance > 74.3%	Acceptance < 50%

3.2.4 Countries decisions on the application of Informative Annexes

3.2.4.1 Introduction

The analysis of data on the countries' decisions on the application of the informative annexes was firstly performed in 2017 aiming at supporting the decision-making process of CEN TC250 and the Project Teams for the standardization works under M/515 on the presentation of the annexes in the Second Generation of the Eurocodes.

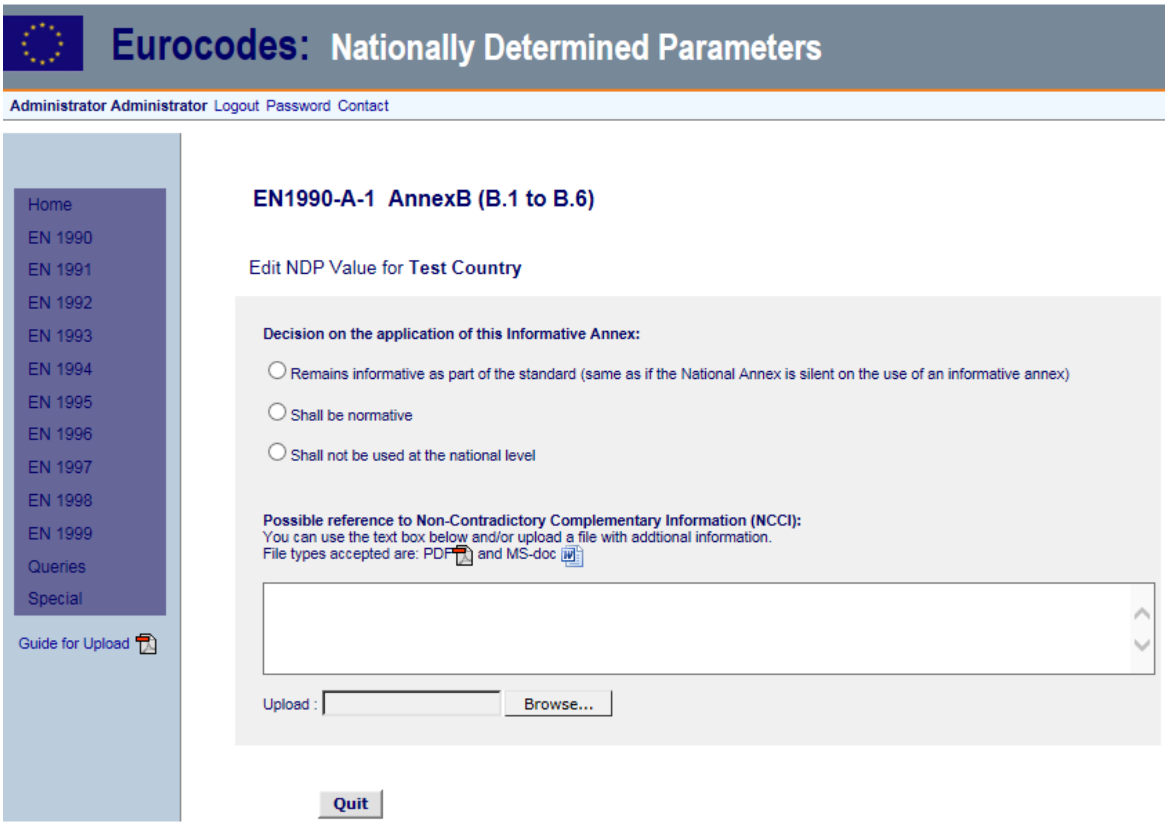
The current section updates the analysis performed in 2017 using data extracted from the NDPs Database by November 2018.

The National Annexes (NAs) to the Eurocodes may contain the Member States decisions on the application of informative annexes in the following way:

- The informative annex 'X' remains informative as part of the standard (same as if the National Annex is silent on the use of an informative annex);
- The informative annex 'X' shall be normative;
- The informative annex 'X' shall not be used at the national level.

Figure 29 shows an example of the upload page for the decision on the application of the informative annex B to EN 1990-A-1 in the NDPs Database. Possible reference to non-contradictory complementary information can also be uploaded.

Figure 29. Example of the NDPs Database upload page for the decision on the application of an informative annex



3.2.4.2 Statistics of uploading

Currently, the Eurocodes encompass 249 informative annexes, belonging to 51 out of the 58 existing parts. Figure 30 shows that the Eurocode with the largest number of informative annexes is EN 1993, with 20% of the total number, *i.e.*, 49 out 249, and that EN 1998 contains the smallest number of informative annexes, *i.e.*, 3 out of 249 or 1% of the total number.

Figure 30. Percentage and number of informative annexes **per Eurocode**

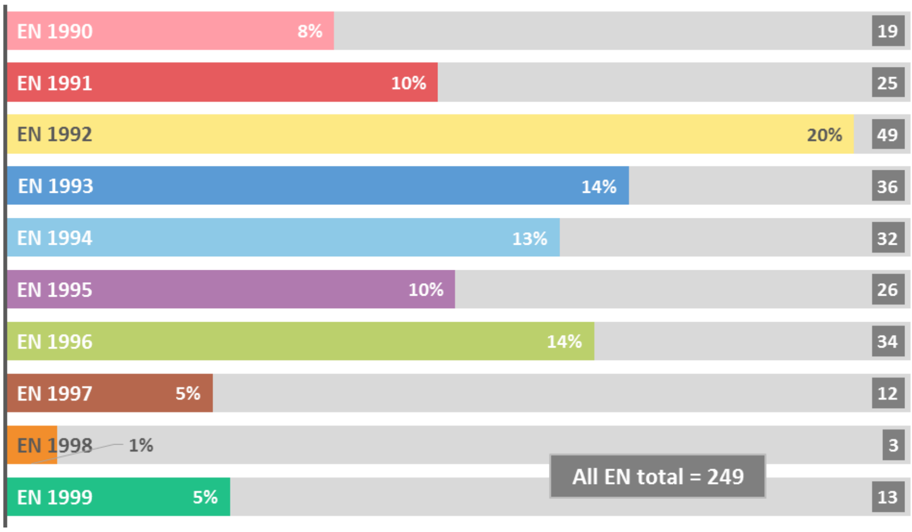


Figure 31 presents the number and percentage of the upload decisions on the application of informative annexes in the NDPs Database, as by November 2018, representing 70% of the total number of decisions (6 517) that is expected to be uploaded in the Database. The set of expected decisions to be uploaded is calculated with reference to the National Annexes published by the 28 EU Member States plus the two EFTA Member States that are registered in the Database, i.e., Norway and Switzerland.

Figure 31. State of uploading of the decisions on the application of informative annexes for **all Eurocodes**

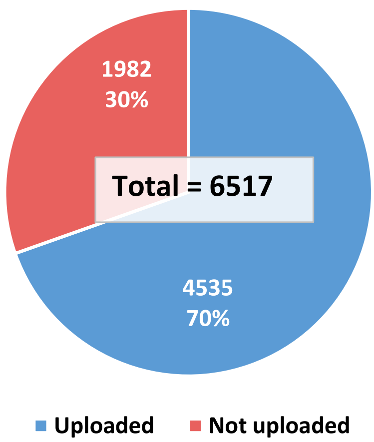
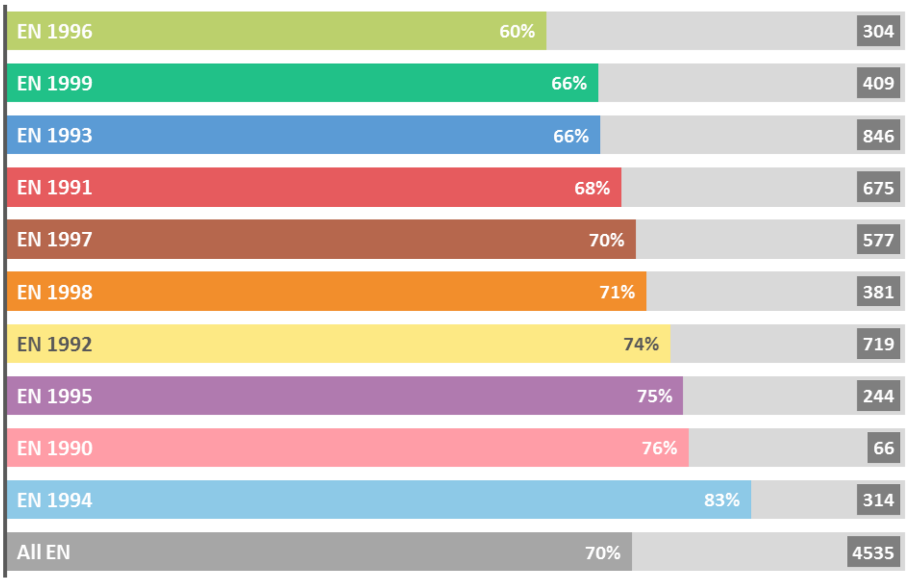


Figure 32 presents the percentage of uploaded decisions on the application of informative annexes per Eurocode. The average percentage of uploading is 70% and EN 1996 is the Eurocode with the smallest percentage (60%) of uploaded decisions, whereas EN 1994 leads the ranking with 83% of the uploaded decisions.

Figure 32. Percentage and number of the uploaded decisions on the application of informative annexes **per Eurocode**



3.2.4.3 Analysis of countries decisions

Figure 33 illustrates, for all Eurocodes parts, the percentage of decisions regarding the three possible choices for the informative annexes: (i) to remain informative as part of the standard, (ii) to become normative, or (iii) not to be used at the national level. In most cases, it was decided that the informative annexes shall remain informative (91% of the uploaded decisions), whereas near 4% of the decisions stated that the annexes shall be normative, and the remaining 5% prescribed that the annexes shall not be used at the national level.

Figure 33. Percentage and number of uploaded decisions on the application of informative annexes for the three given options, for **all Eurocodes**

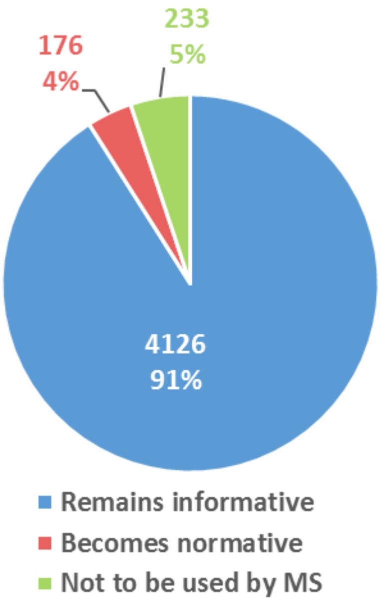


Figure 34 presents, for each country, the number of decisions uploaded in the NDPs Database distributed by the three possible choices for the informative annexes, together with the number of decisions not uploaded yet.

The maximum number of decisions on the application of informative annexes considering all Eurocodes parts is 249. The maximum number of decisions expected to be uploaded differs from country to country and depends on the number of NAs published, or expected to be published, by each country. For instance, Malta is expected to upload decisions on 8 informative annexes, whereas there are 15 countries, Austria, Belgium, Croatia, Cyprus, Czechia, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Norway, Romania and Slovakia that are expected to upload decisions on all the 249 informative annexes.

Figure 34. Number of decisions on the application of informative annexes for the three given options, **per country**

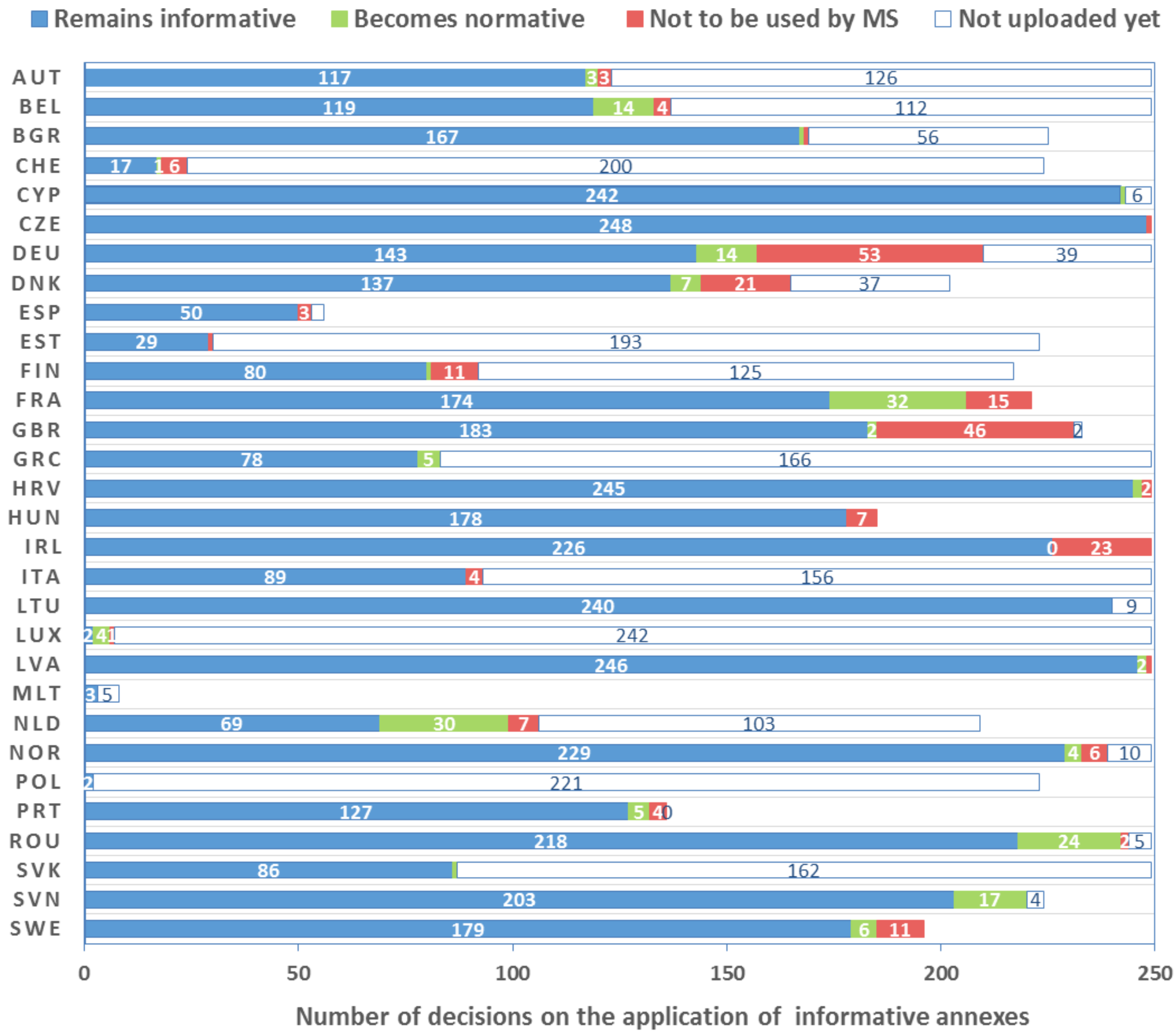


Figure 35 depicts for each country, the percentage of uploaded decisions distributed by the three possible options for the informative annexes.

Figure 34 and Figure 35 show that 3 countries, Lithuania, Malta and Poland, decided that all annexes (100%) shall remain informative. However, Malta and Poland uploaded till now a small number of decisions on the informative annexes, i.e., 3 (38%) and 2 (1%), respectively. Cyprus, Czechia, Estonia and Slovakia decided that all, except one annex, shall remain informative.

Figure 35. Percentage of decisions on the application of informative annexes for the three given options**, per country**

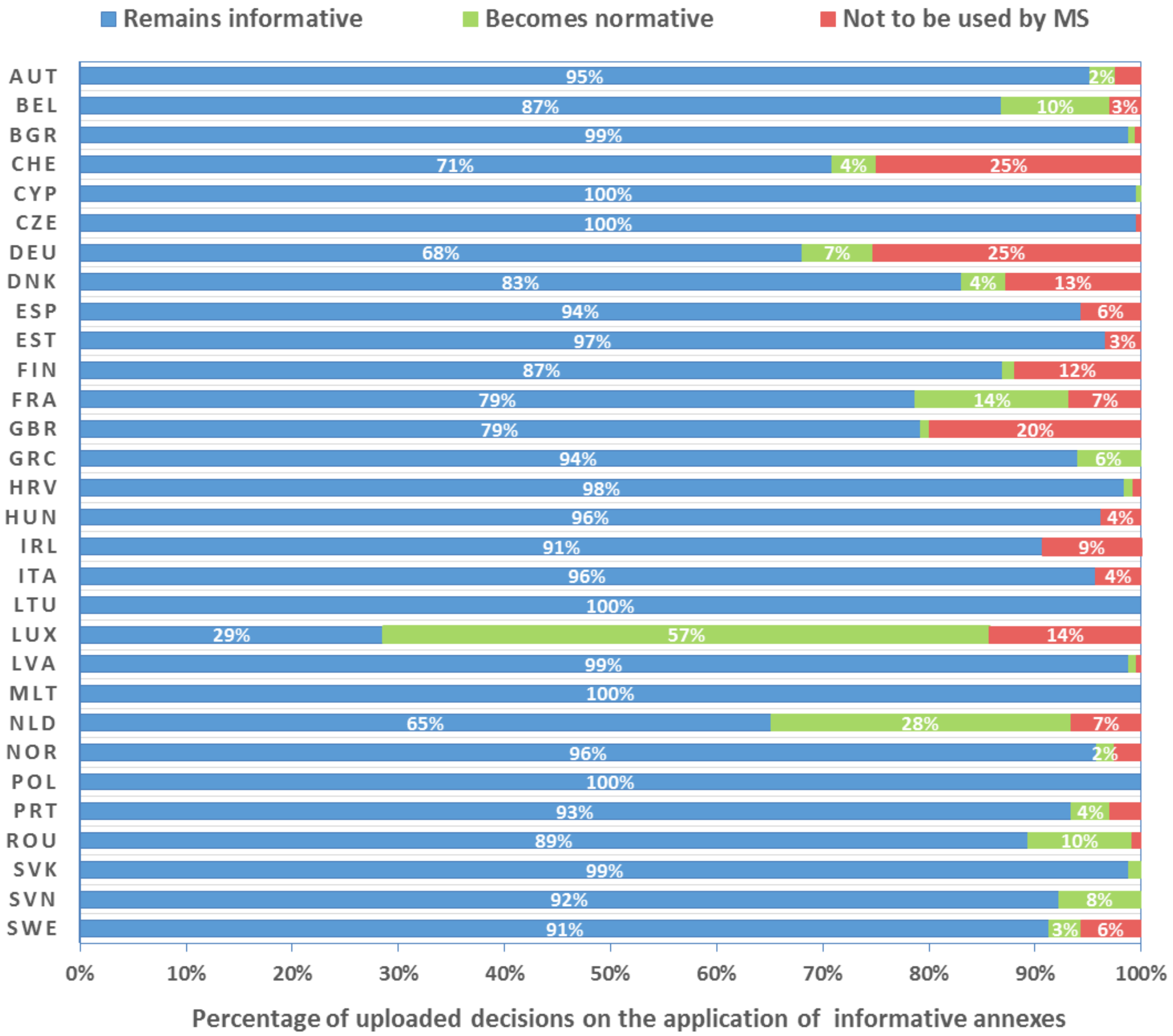


Figure 35 also indicates that 20 countries uploaded more than 90% of decisions on the use of the annexes as informative. The 20 countries are Austria, Bulgaria, Croatia, Cyprus, Czechia, Estonia, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Norway, Poland, Portugal, Slovakia, Slovenia, Spain and Sweden. For Cyprus, Greece, Malta, Poland, Slovakia and Slovenia all annexes shall be either informative, or normative, *i.e.*, those countries decided that all the informative annexes should be used. France and the Netherlands are the countries with the highest number of normative annexes, respectively, 32 (14%) and 30 (28%). Finally, Germany and the United Kingdom stand out from the rest of the countries, since they decided that 53 (25%) and 46 (20%) of the informative annexes should not to be used in their countries. The percentage of the informative annexes not to be used at the national level is also high for Switzerland, reaching 25% of the uploaded decisions, but one shall take into account that this country has uploaded only 12% of the expected decisions on the status of their informative annexes.

Figure 36 shows, for each Eurocode part, the number of decisions uploaded in the NDPs Database distributed by the three possible choices for the application of informative annexes, together with the number of decisions not uploaded yet.

Figure 36. Number of decisions on the application of informative annexes for the three given options, **per Eurocode part**.

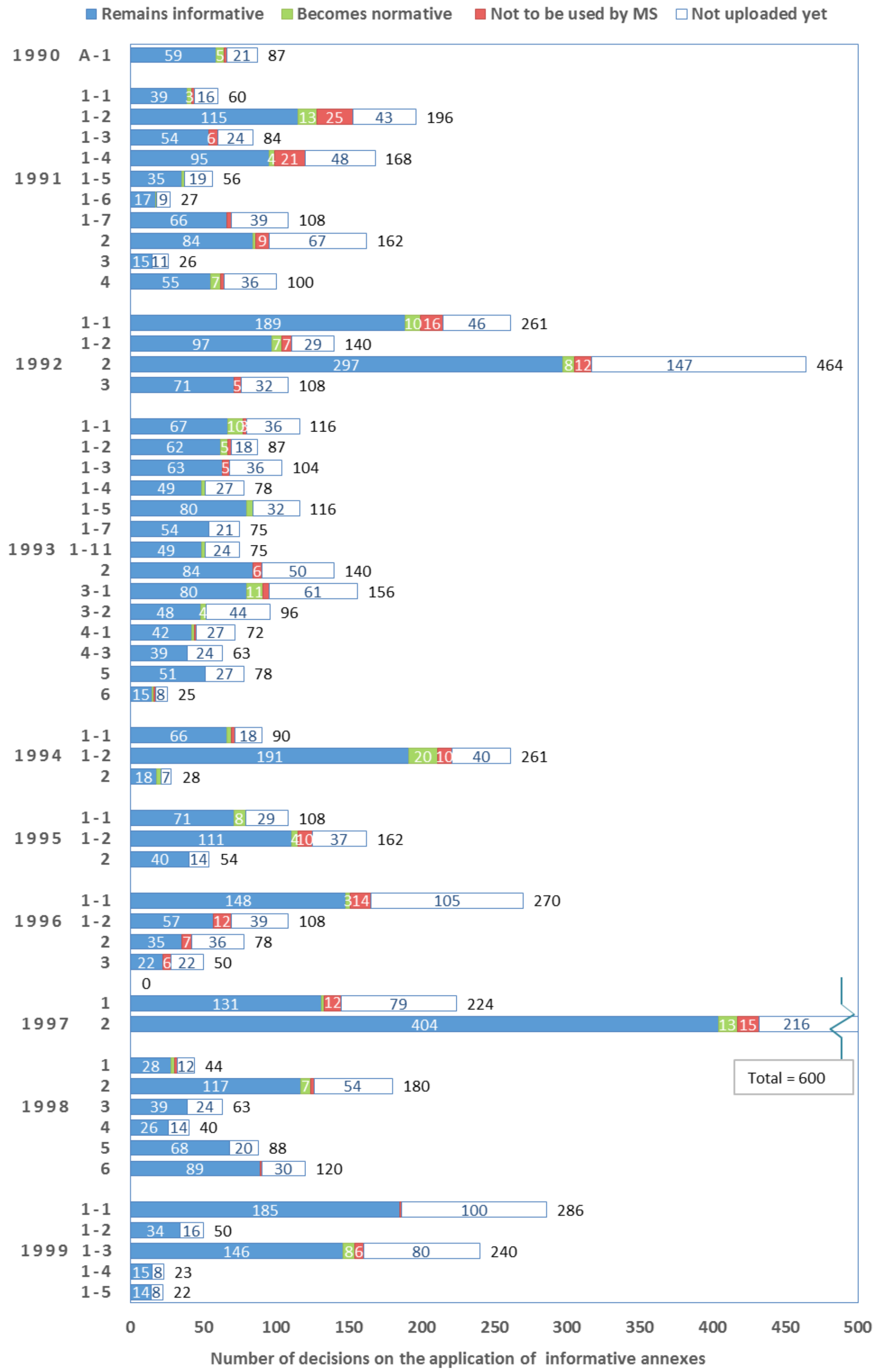


Figure 37 presents, for each Eurocode part, the percentage of uploaded decisions distributed by the three possible options for the informative annexes.

Figure 37. Percentage of **uploaded** decisions on the application of informative annexes for the three given options, **per Eurocode part**

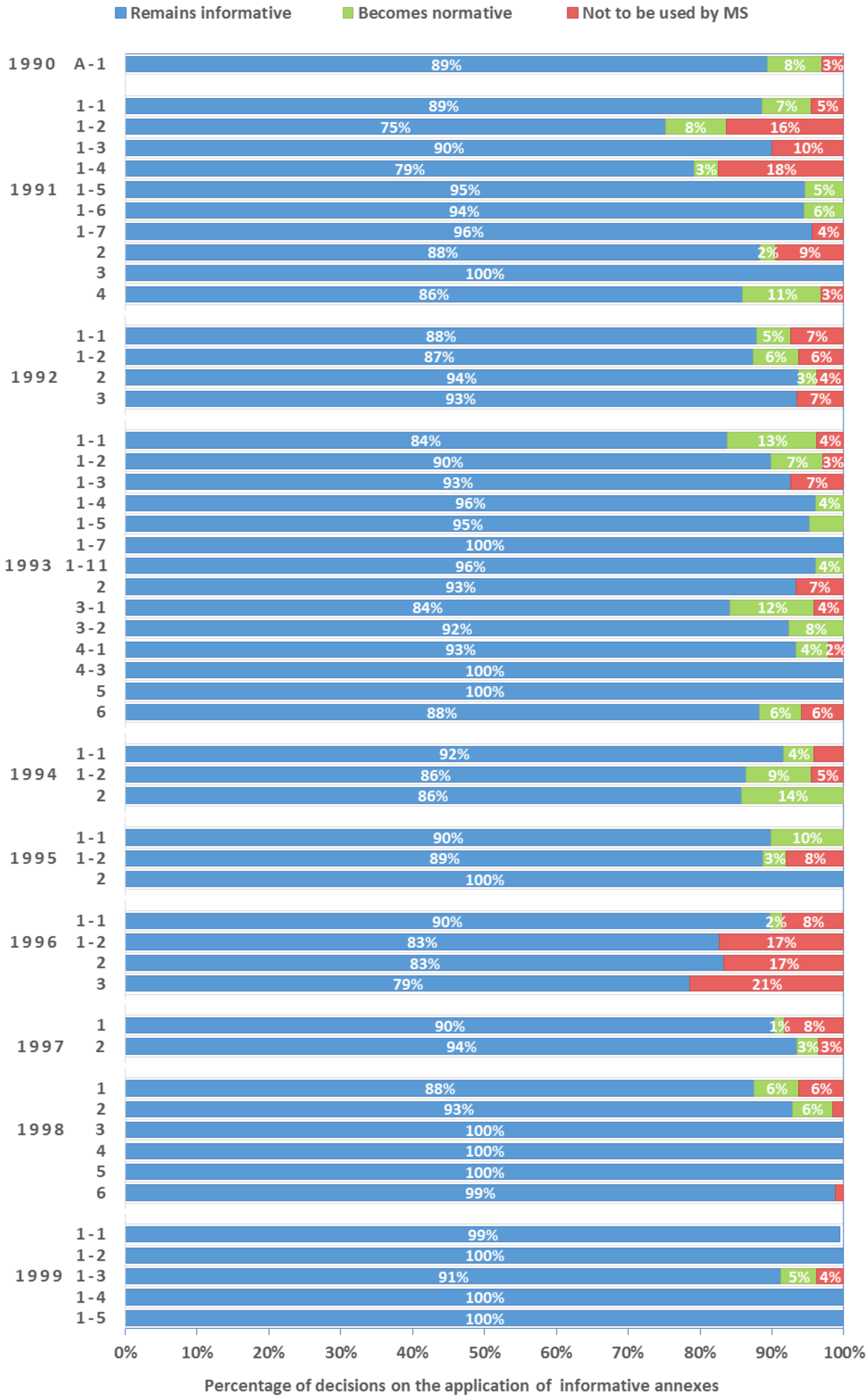


Figure 37 confirms that the number of decisions for maintaining the informative status of the annexes is generally high. The above results show that there are 11 parts where 100% of the uploaded decisions are for the annexes to remain informative and there are 30 parts where more than 90% of the decisions are similar.

Part EN 1991-1-2 (fire design) has the lowest rate of acceptance (75%) of the informative status of the annexes. In relation to this part, 13 (8%) of the uploaded decisions indicate that the informative annexes shall become normative and 25 (16%) shall not be used at the national level.

There are 5 parts where more than 10% of the uploaded decisions are for the informative annexes becoming normative (EN 1991-4; EN 1993-1-1, 3-1; EN 1994-2 and EN 1995-1-1).

There are also 6 parts where more than 10% of the uploaded decisions indicate that the informative annexes shall not be used at the national level (EN 1991-1-2, 1-3, 1-4 and EN 1996-1-2, 2, 3), with the causes explained as follows:

- the rejection of the use of informative annexes in EN 1991-1-2 and EN 1996-1-2 is probably due to the existence of established national practices related to loading and structural fire design;
- in EN 1991-1-3, six countries decided to do not use Annex C, most likely because they adopted national choices for their snow actions maps, in place of the European snow load map (Annex C);
- in EN 1991-1-4, Annex C (*Procedure 2 for determining the structural factor* c_sc_d) nine countries decided to do not use the annex at a national level, preferring instead the alternative Annex B (*Procedure 1 for determining the structural factor* c_sc_d);
- in EN 1996-2, the rejection of the use of Annex B (*Acceptable specifications of masonry units and mortar for durable masonry in various exposure conditions*) and of Annex C (*Selection of material and corrosion protection specifications for ancillary*) by three and by four countries, respectively, is probably due to the traditional use of specific materials and different exposure conditions.

The Eurocode part with the highest number of expected decisions to be uploaded (600) is EN 1997-2. Among the decisions uploaded so far for EN 1997-2, 94% (404) correspond to maintaining the informative status of the annexes. Also Part 2 of EN 1992 presents a high number of expected decisions to be uploaded (464) and among the decisions uploaded, 94% (297) correspond to accepting the informative status of the annexes.

Figure 38 to Figure 47 illustrate the uploaded decisions on the application of each informative annex, per Eurocode. The figures bring out the details of the uploaded decisions per informative annex, showing that:

- 89 informative annexes were decided to remain informative by 100% of the considered countries;
- the number of informative annexes raises to 159 (out of 249) when the decisions to remain informative is made by more than 90% of the considered countries, instead of being made by all (100%) the countries;
- 25 informative annexes shall be normative for more than 10% of the considered countries;
- 45 informative annexes shall not be applied at the national level for more than 10% of the considered countries.

Figure 38. Decisions on the application of each informative annex in **EN 1990**

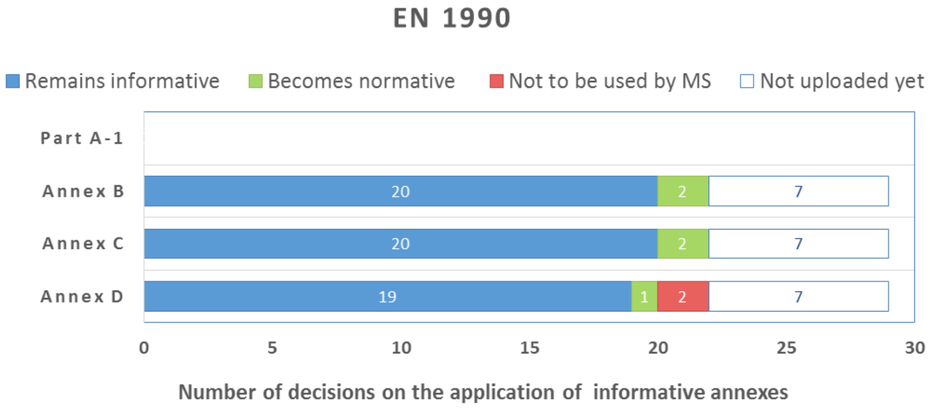


Figure 39. Decisions on the application of each informative annex in **EN 1991**

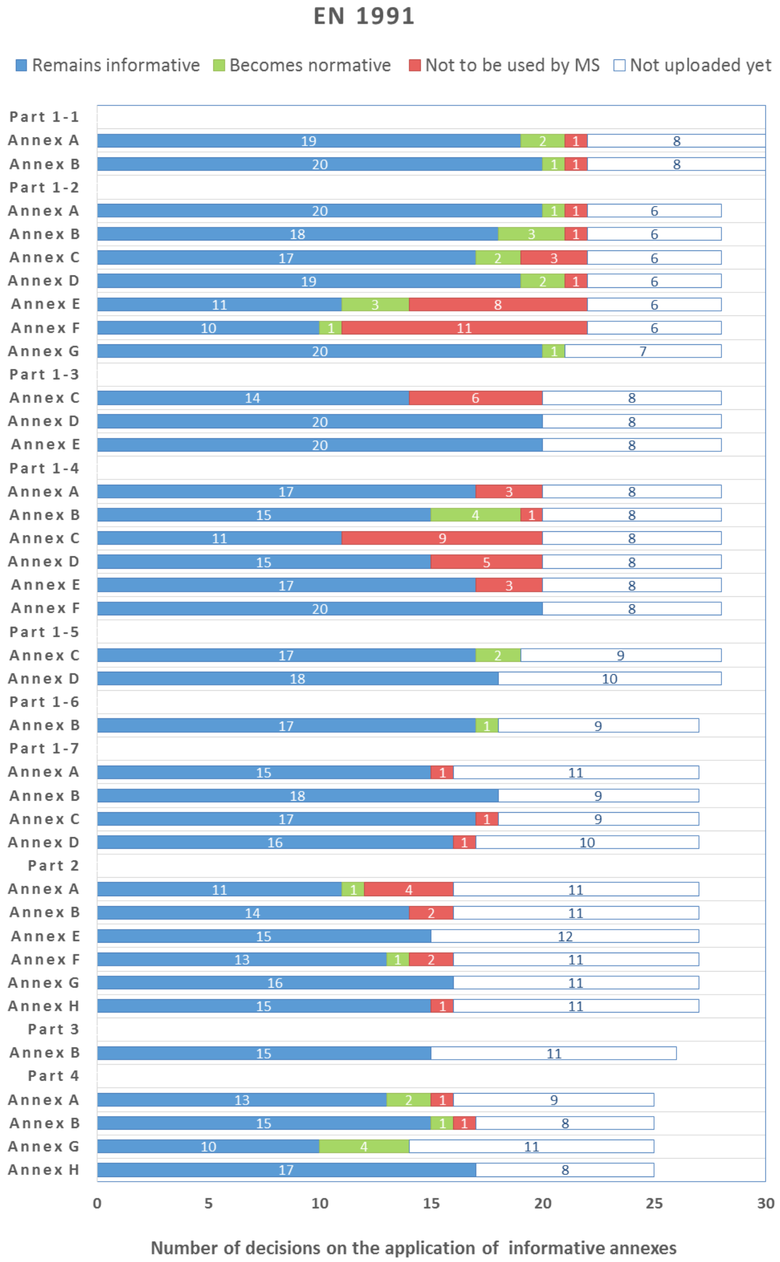


Figure 40. Decisions on the application of each informative annex in **EN 1992**

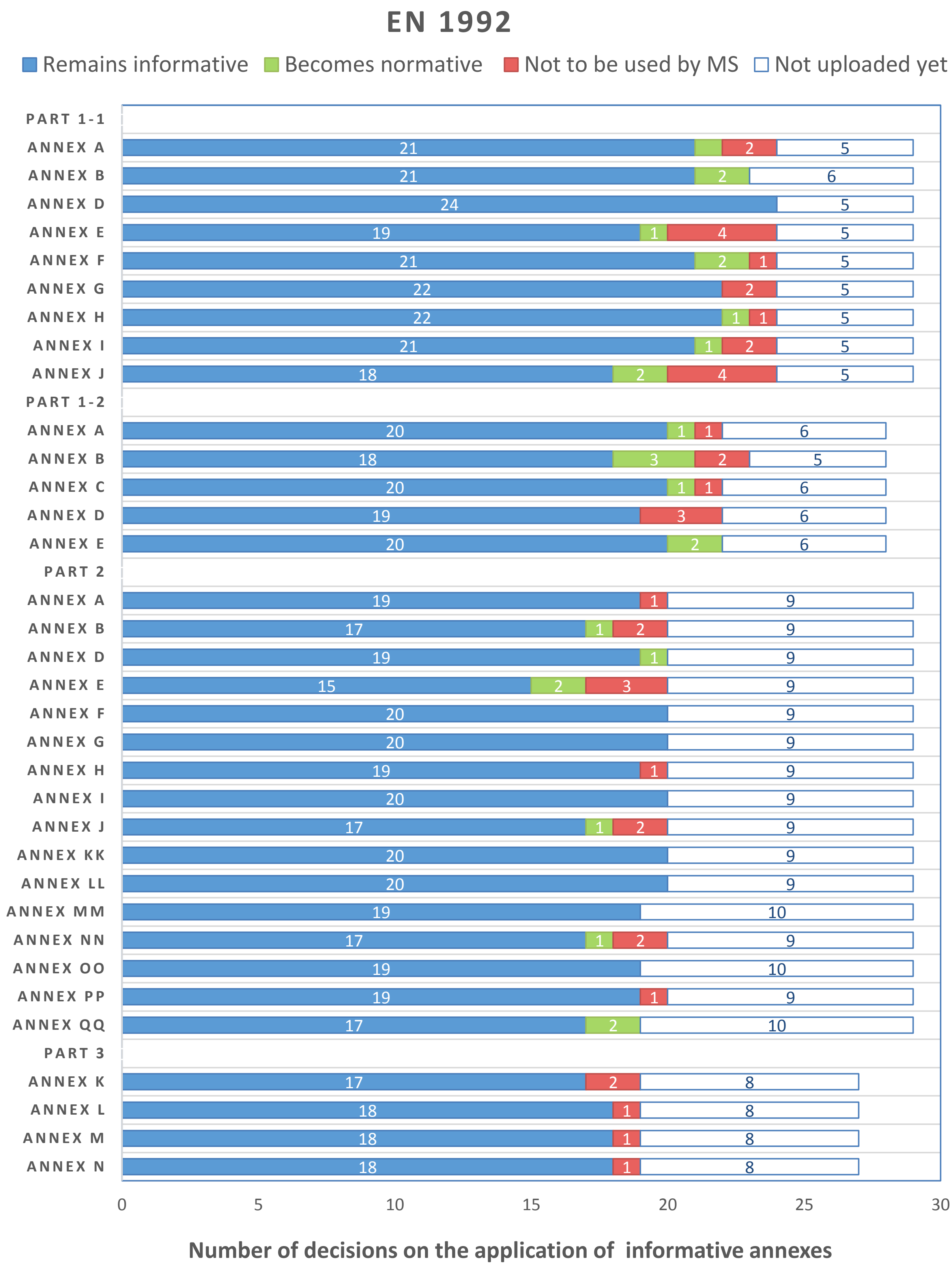


Figure 41. Decisions on the application of each informative annex in **EN 1993**

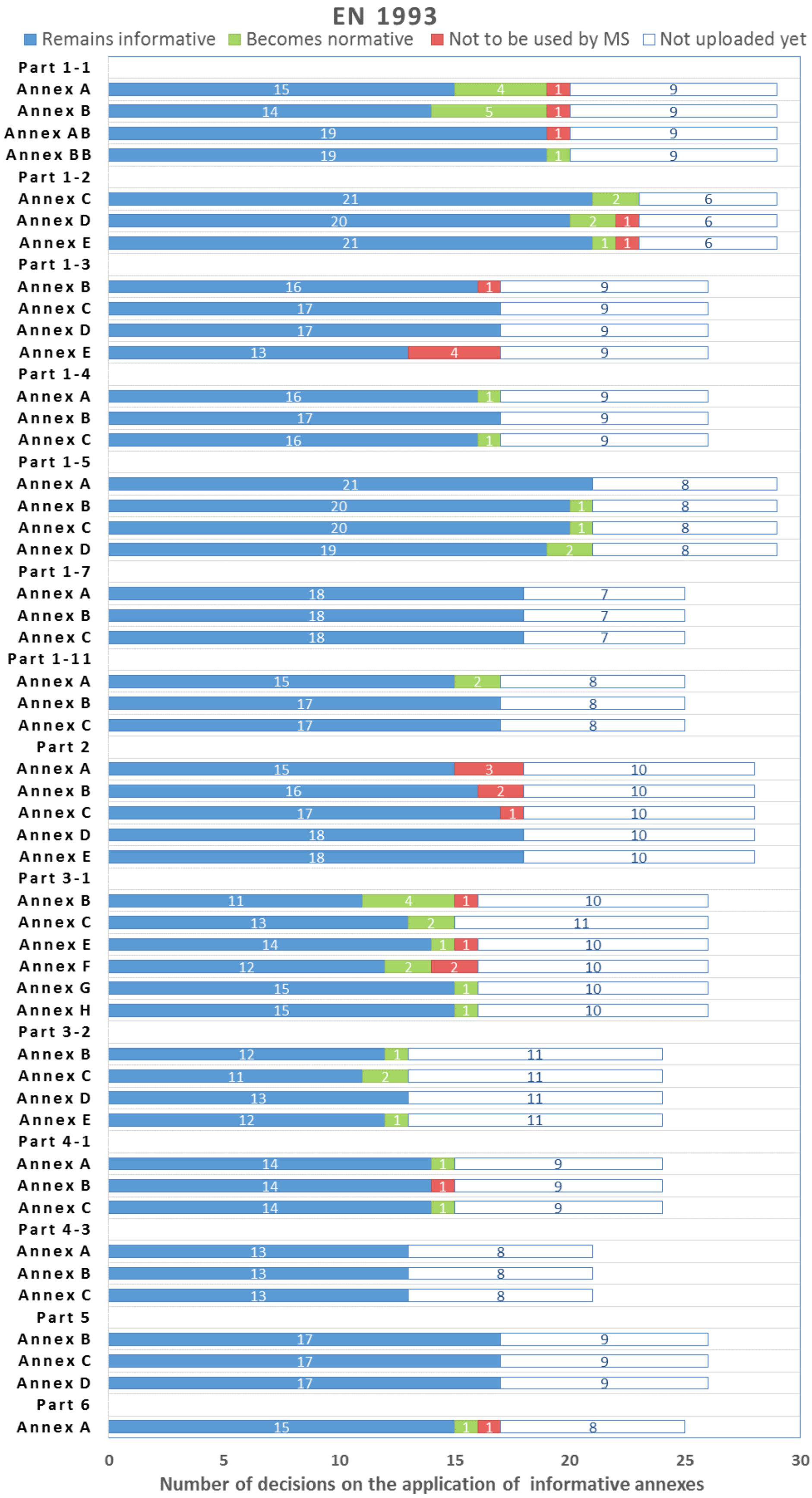


Figure 42. Decisions on the application of each informative annex in **EN 1994**

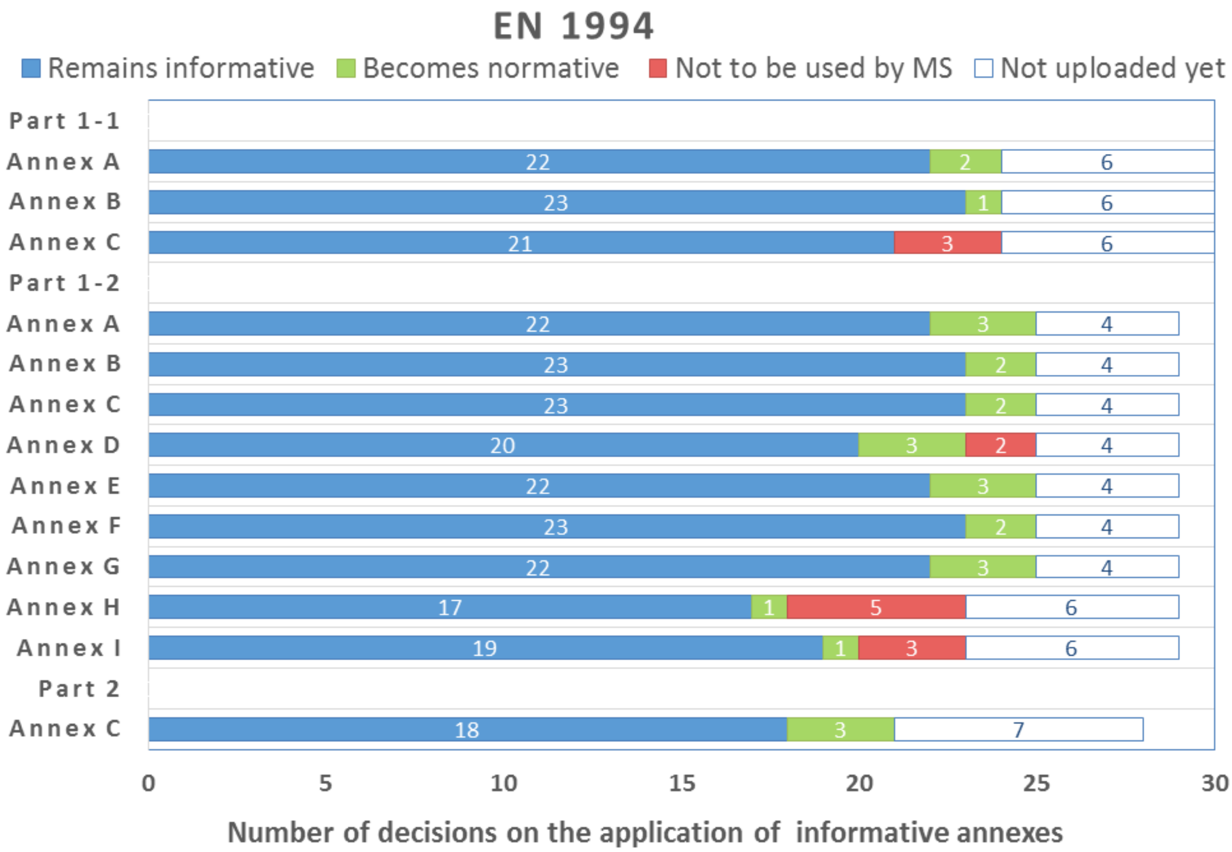


Figure 43. Decisions on the application of each informative annex in **EN 1995**

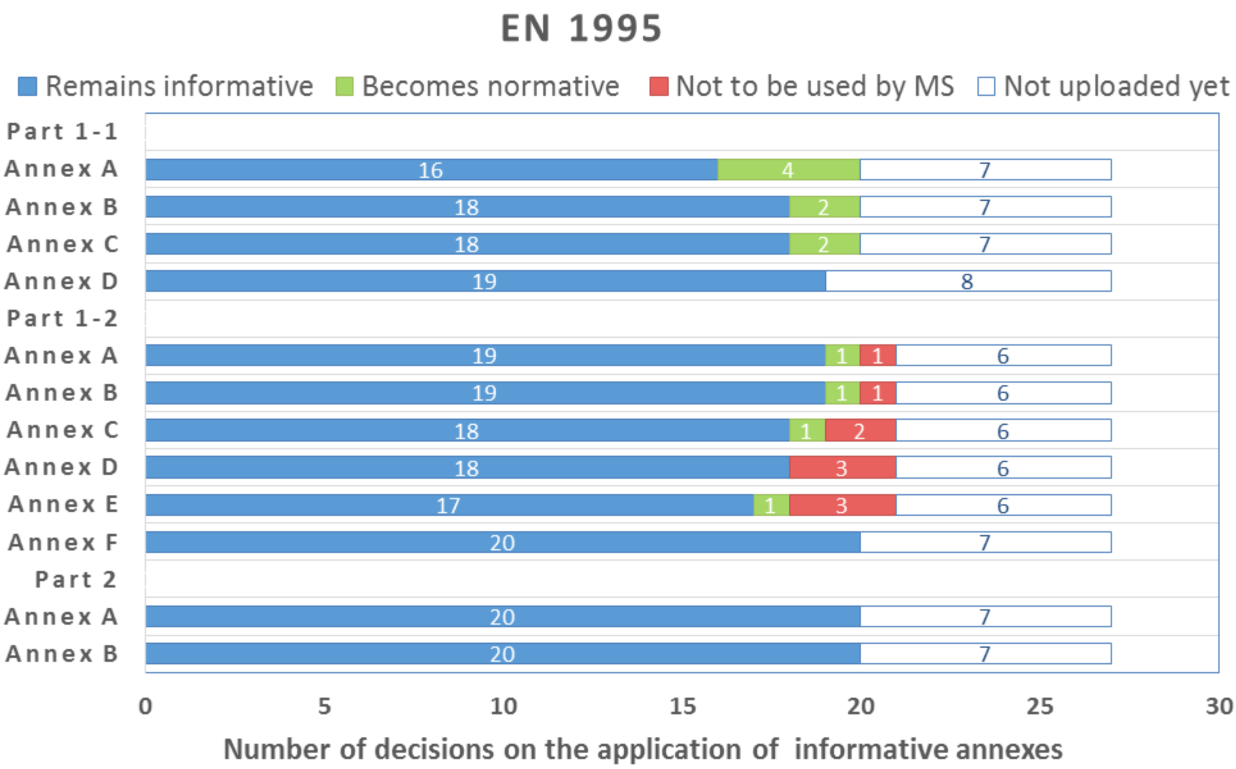


Figure 44. Decisions on the application of each informative annex in **EN 1996**

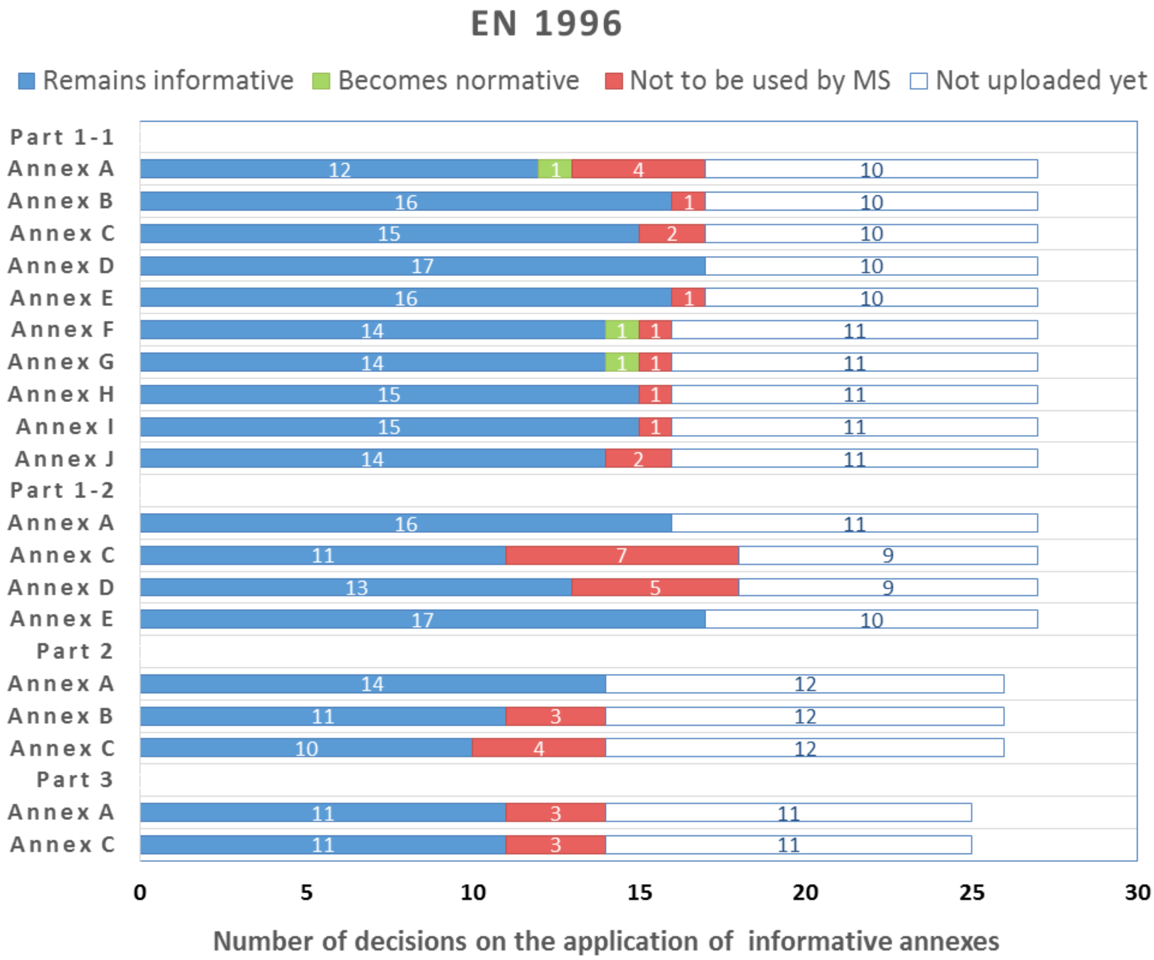


Figure 45. Decisions on the application of each informative annex in **EN 1997**

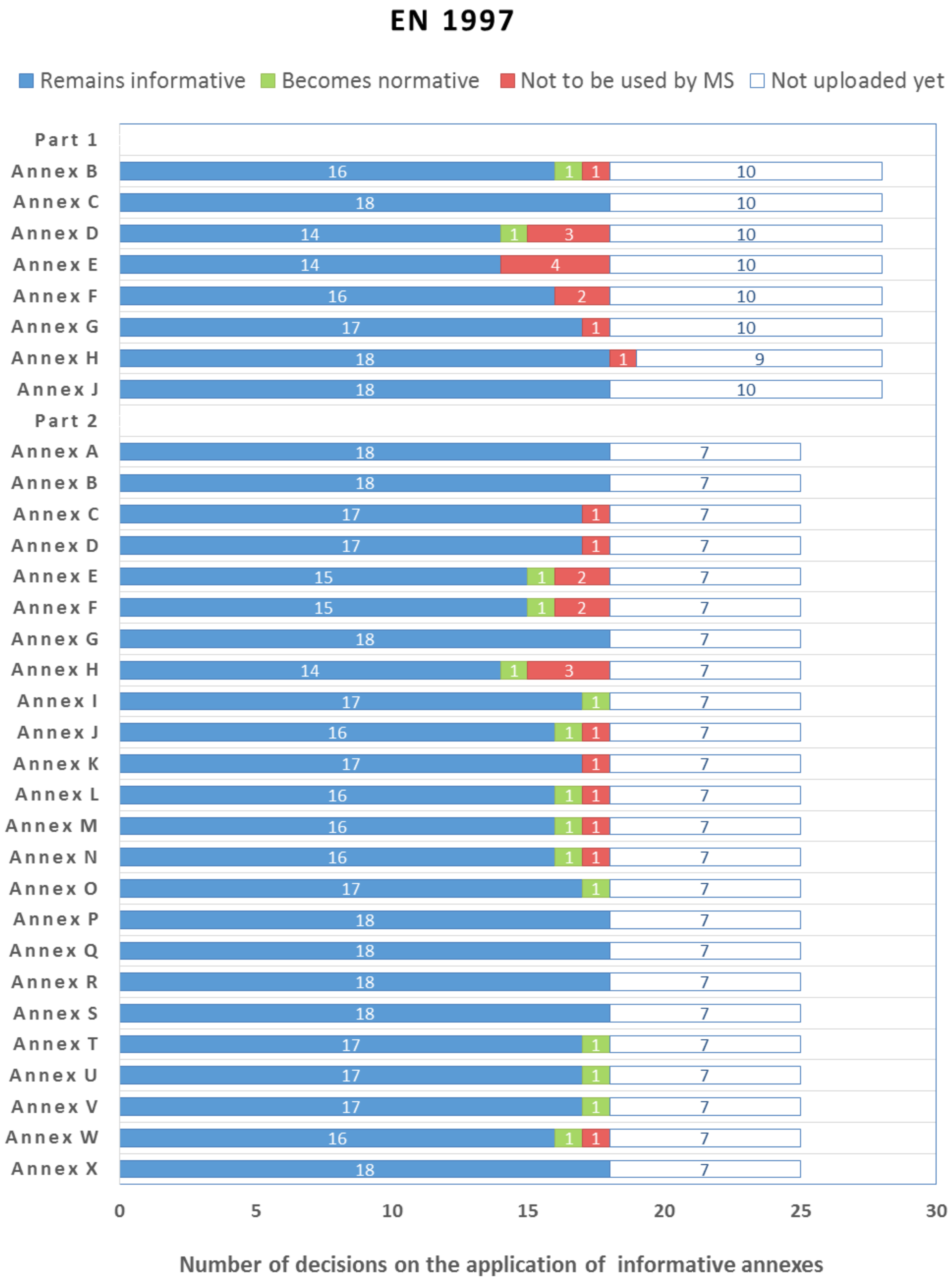


Figure 46. Decisions on the application of each informative annex in **EN 1998**

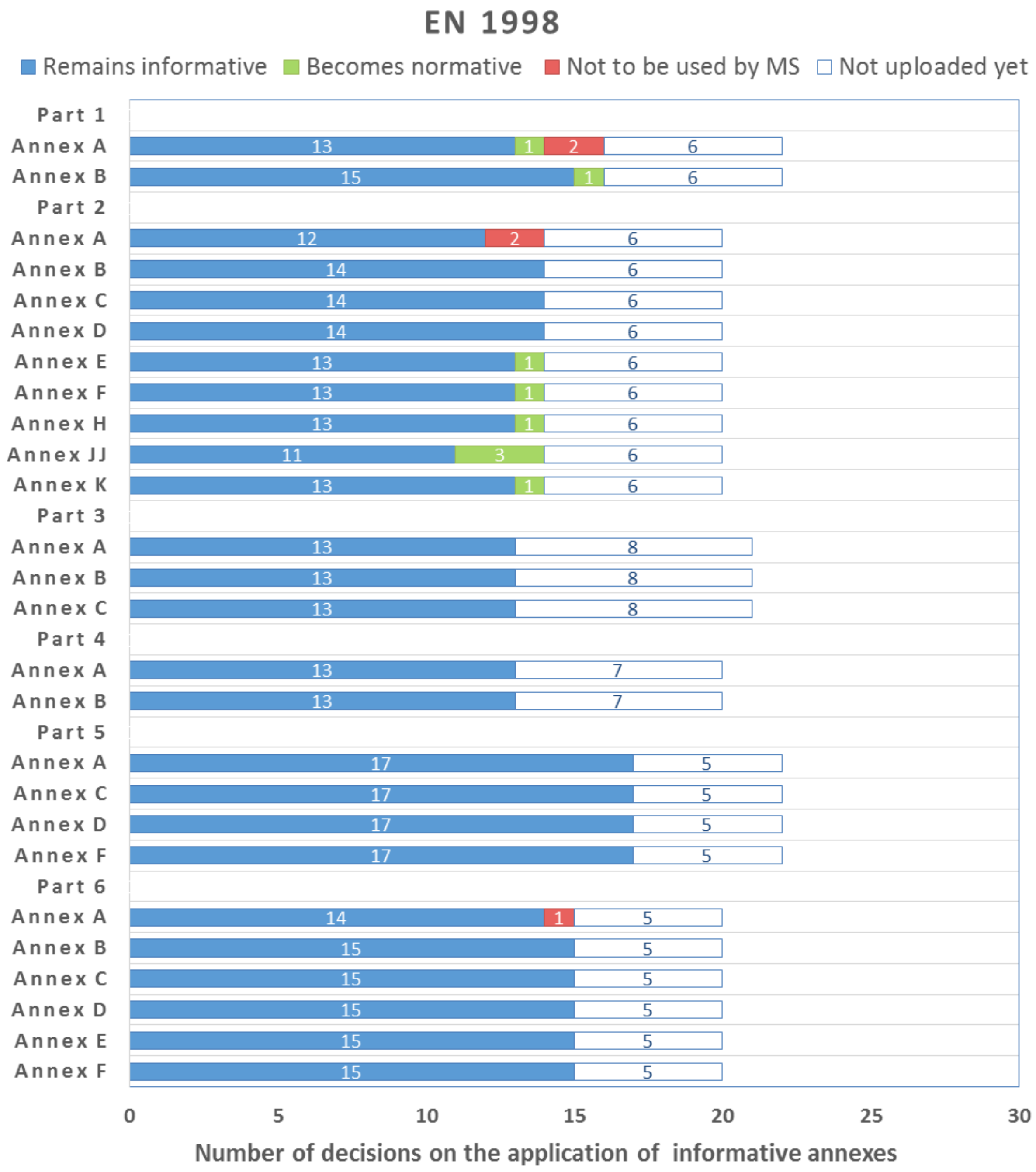
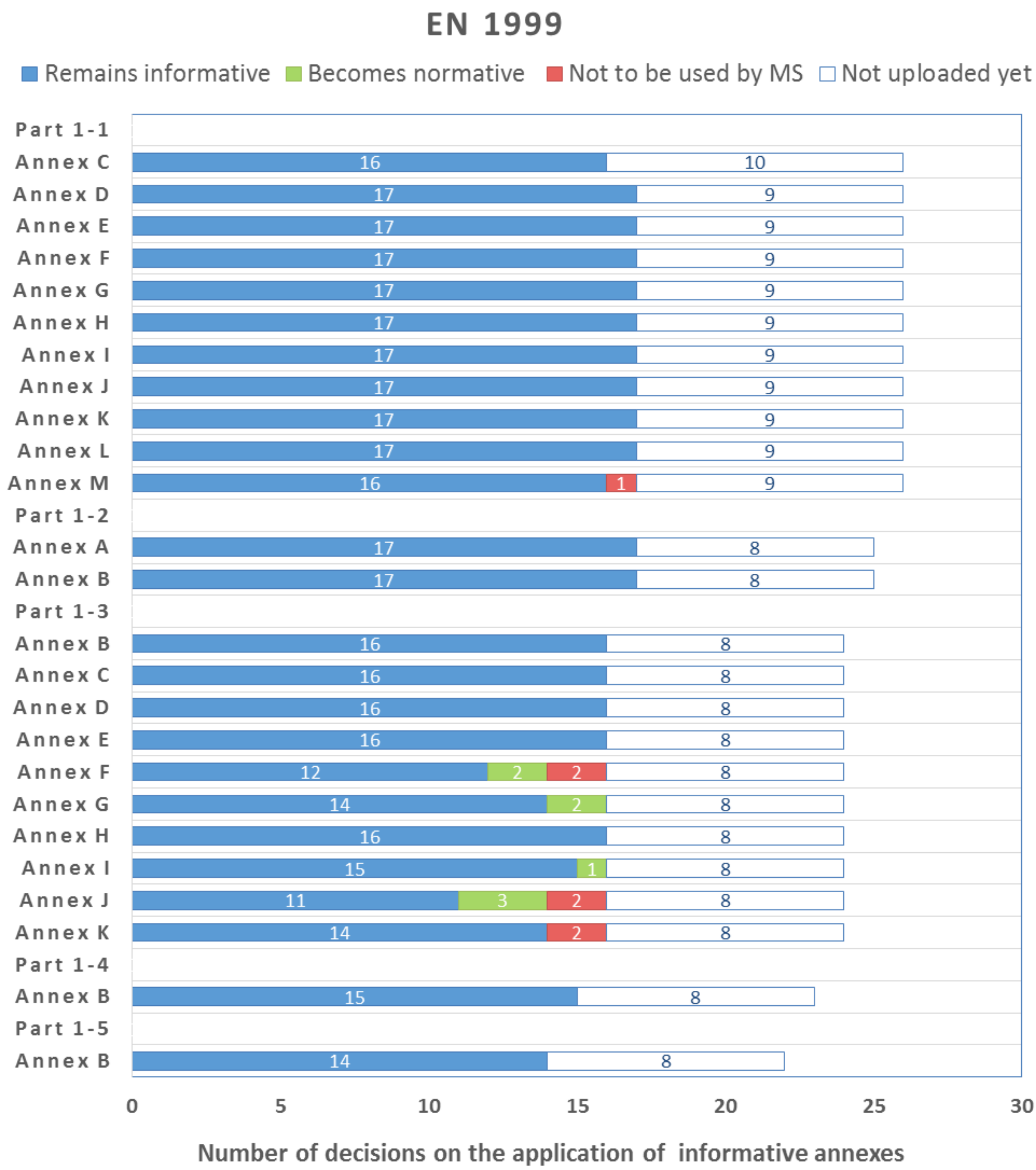


Figure 47. Decisions on the application of each informative annex in **EN 1999**



Finally, Table 6 and Table 7 highlight the informative annexes for which a high percentage (greater than 20%) of considered countries decided that the annexes shall not remain informative. Those tables reveal that:

- 4 informative annexes shall be normative for more than 20% of the considered countries;
- 16 informative annexes shall not be applied at the national level for more than 20% of the considered countries;
- Annex G of EN 1991-4 is highlighted in bold in Table 6 because it is the informative annex with the highest percentage (29%, 4 out of 14) of countries that have decided that it shall become normative;

- Annex F of EN 1991-1-2 is highlighted in bold in Table 7, because it is the informative annex with the highest percentage (50%, 11 out of 22) of considered countries that have decided that it shall not be used at the national level. In fact, this annex is also the one with the lowest percentage of decisions (45%) on maintaining its informative status.

Table 6. Informative annexes that become normative for more than 20% of the considered countries.

EN	Part	Informative annex	Percentage of uploading decision = normative	No. countries decision = normative
1991	**4**	**Annex G**	**29%**	**4**
1993	1-1	Annex B	25%	5
	3-1	Annex B	25%	4
1998	2	Annex JJ	21%	3

Table 7. Informative annexes not to be applied at the national level for more than 20% of the considered countries

EN	Part	Informative annex	Percentage of uploading decision = not to be used by MS	No. countries decision = not to be used by MS
1991	**1-2**	Annex E	36%	8
		Annex F	**50%**	**11**
	1-3	Annex C	30%	6
	1-4	Annex C	45%	9
		Annex D	25%	5
	2	Annex A	25%	4
1993	1-3	Annex E	24%	4
1994	1-2	Annex H	22%	5
1996	1-1	Annex A	24%	4
	1-2	Annex C	39%	7
		Annex D	28%	5
	2	Annex B	21%	3
		Annex C	29%	4
	3	Annex A	21%	3
		Annex C	21%	3
1997	1	Annex E	22%	4

3.2.4.4 Main results

The analysis presented in this section is based on the set of national decisions on the application of informative annexes uploaded in the NDPs Database, as by November, 2018, representing 70% of the total number of decisions (6 517) that is expected to be uploaded by 30 countries. Considering that 70% of the expected data is available for analysis, the uploaded decisions on the application of informative annexes are considered representative of the choices of the EU and EFTA Member States on this matter.

The main results of the analysis considering **all the Eurocodes,** are:

- most of the uploaded decisions (91%) point out that the annexes shall remain informative;
- the percentage of informative annexes that shall become normative is 4%, being close to the percentage of informative annexes (5%) that shall not be used at the national level.

The analysis of the uploaded decisions by **country** shows that:

- 20 countries decided to maintain informative more than 90% of the informative annexes;
- France and the Netherlands are the countries with the highest number of normative annexes, respectively, 32 (14%) and 30 (28%);
- 7 countries decided that none of the informative annexes shall not to be used at the national level;
- Germany and the United Kingdom are the countries with the largest number of informative annexes that are not going to be used in the countries, *i.e.*, 53 (25%) and 46 (20%), respectively. The percentage of informative annexes that are not going to be used at the national level is high also for Switzerland, reaching 25% of the decisions.

Looking at the uploaded decisions in terms of **Eurocodes parts** it was found that:

- the number of the decisions for maintaining the informative status of the annexes is generally high and is equal or higher than 75%, for each Eurocodes part;
- there are 11 parts where 100% of the uploaded decisions indicate that the annexes shall remain informative;
- Part EN 1991-1-2 exhibits the lowest percentage (75%) of decisions on maintaining the informative status of the annexes, among the set of decisions on the application of the informative annexes uploaded in the Database;
- in 5 Eurocodes parts, more than 10% of the uploaded decisions indicate that the annexes shall become normative. The parts are: EN 1991-4; EN 1993-1-1, 3-1; EN 1994-2 and EN 1995-1-1;
- there are also 6 Eurocodes parts where more than 10% of the uploaded decisions are for the informative annexes not being used at the national level. The parts are: EN 1991-1-2, 1-3, 1-4 and EN 1996-1-2, 2, 3.

Finally, the detailed analysis **per informative annex** revealed that:

- for 89 informative annexes it was decided to remain informative by 100% of the considered countries;
- the number of annexes decided to remain informative raises to 159 (out of 249) when the decisions are made by at least 90% of the considered countries, instead of being made by all (100%) the countries;

- more than 20% of the considered countries decided that 4 informative annexes shall become normative. The annexes are: Annex G of EN 1991-4, Annex B of EN 1993-1-1, Annex B of EN 1993-3-1 and Annex JJ of EN 1998-2;
- more than 20% of the considered countries decided that 16 informative annexes shall not be applied at the national level. The annexes are: Annexes E and F of EN 1991-1-2, Annex C of EN 1991-1-3, Annexes C and D of EN 1991-1-4, Annex A of EN 1991-2, Annex E of EN 1993-1-3, Annex H of EN 1994-1-2, Annex A of EN 1996-1-1, Annexes C and D of EN 1996-1-2, Annexes B and C of EN 1996-2, Annexes A and C of EN 1996-3 and Annex E of EN 1997-1;
- Annex G of EN 1991-4 is the annex with the highest percentage (29%, 4 out of 14) of considered countries that have decided that it shall become normative;
- Annex F of EN 1991-1-2 is the informative annex with the highest percentage (50%, 11 out of 22) of considered countries that have decided that it shall not be used at the national level. In fact, this annex is also the one with the lowest percentage of decisions (45%) on maintaining its informative status.

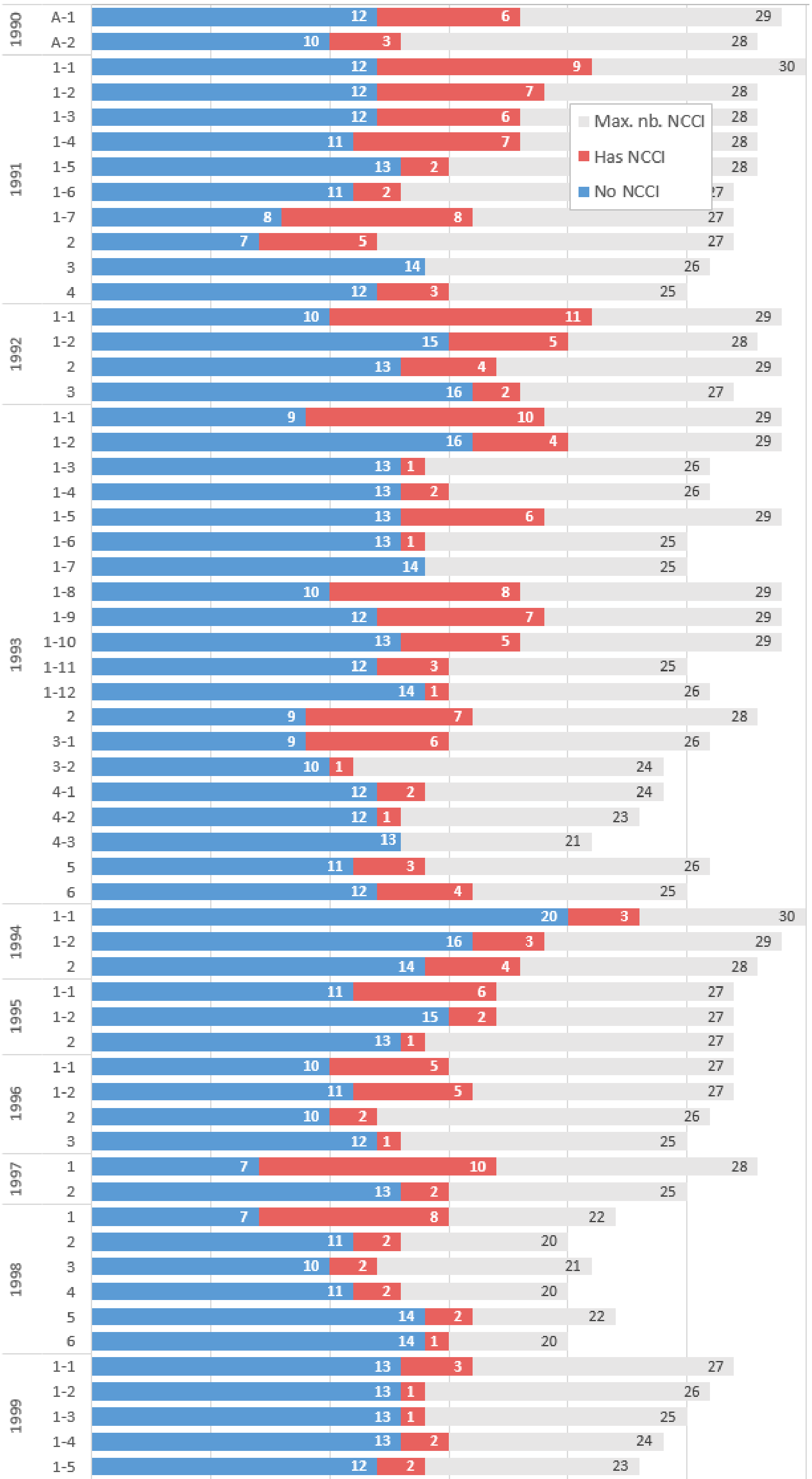
3.2.5 NCCI

Besides the information on the Nationally Determined Parameters, the National Annexes may also contain references to other Non-Contradictory Complementary Information (NCCI) not explicitly allowed in the text of the Eurocodes, when some guidance on the same subject as that contained in the National Annex is required to assist the designers.

Figure 47 illustrates, per Eurocode part, the number of countries that uploaded references to NCCIs and the number of countries that declared in the Database to have no references to NCCIs, by November 2018. Globally, 933 entries related to NCCIs were uploaded in the Database. Among them, 711 correspond to statements on the absence of NCCIs, representing a percentage of 76%.

The data extracted from the Database related to the NCCIs reveals the existence of a significant number of parts where the percentage of countries that have declared to do not have references to NCCI is over 90%. In those cases, particular emphasis should be made to part 3 of EN 1991 and to parts 1-7 and 4-3 of EN 1993, where all uploading countries (100%) have declared to do not have references to NCCIs. On the other hand, in parts EN 1992-1-1, EN 1993-1-1, EN 1997-1 and EN 1998-1, more than 50% of the countries uploaded references to NCCIs.

Figure 48. Number of countries that declared having and not having references to NCCIs and maximum possible number of **NCCI**s per part, considering 30 EU and EFTA MS



3.3 Analysis of NDPs of Eurocodes specific parts

3.3.1 NDPs of the fire parts

Each Eurocode (except EN 1990) is divided into a number of parts covering specific aspects of structural design. EN 1991 and all of the Eurocodes relating to materials (EN 1992 to EN 1996 and EN 1999) have Part 1-2 for structural fire design, as presented in Table 8.

The fire design parts of the Eurocodes deal with specific aspects of passive fire protection in terms of designing structures and parts thereof for adequate load bearing resistance that could be needed for safe evacuation of occupants, fire rescue operations and for limiting fire spread as relevant. Required functions and levels of performance are generally specified by the national authorities.

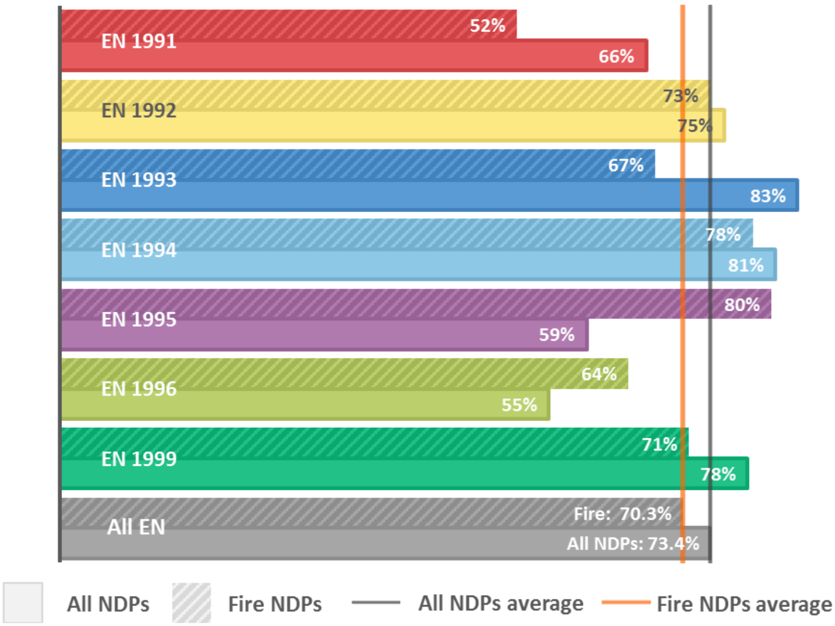
The number of NDPs existing in the Eurocodes Parts (1-2) that cover aspects related to fire design, and the percentage of uploading by November 2018 of these NDPs, are listed in Table 8. As shown in the Table the fire design parts include 99 NDPs that represent 7% of the total number of the NDPs in the Eurocodes.

Table 8. Eurocodes parts relevant to **fire design**; number of NDPs and percentage of uploading in the NDPs Database

EN	Title of EN	Part	Title of Part	Nb of NDPs	% NDPs uploaded
1991	Actions on structures	1-2	General actions - Actions on structures exposed to fire	20	67%
1992	Design of concrete structures	1-2	General rules - Structural fire design	22	88%
1993	Design of steel structures	1-2	General rules - Structural fire design	8	92%
1994	Design of composite steel and concrete structures	1-2	General rules - Structural fire design	17	73%
1995	Design of timber structures	1-2	General - Structural fire design	11	90%
1996	Design of masonry structures	1-2	General rules - Structural fire design	13	76%
1999	Design of aluminium structures	1-2	Structural fire design	8	84 %

Figure 49 illustrates the acceptance percentage of RVs, for each Eurocode, distinguishing the percentages obtained for all NDPs and for the parts relevant to fire design. The former are represented by plain bars and the latter by bars having a pattern with diagonal lines. The Figure represents the acceptance percentages for the Eurocodes containing parts relevant to fire design.

Figure 49. Comparison of the acceptance percentage of NDPs with RVs in the **fire parts** with the acceptance percentage for **all NDPs with RVs** in the correspondent Eurocode



The post-processing of NDPs with RVs relevant to fire design shows that:

- A total of 547 recommended values have been accepted among the 778 NDPs uploaded in the parts related to fire design. Therefore, the mean rate of acceptance of the NDPs related to fire design is 70%, slightly below the average acceptance rate of 73% for all Eurocodes. However, when checked per Eurocode, there are significant differences between the rate of acceptance in some fire parts and the global acceptance in the correspondent Eurocode.
- Particularly, for EN 1995, *Design of timber structures* the acceptance rate of the NDPs of the parts related to fire design is 21 percentage points greater than the mean obtained considering all NDPs of EN 1995. On the other hand, the acceptance rates of the NDPs for EN 1991 and for EN 1993 are below the mean obtained for all NDPs in the parts related to fire design, with differences of 14 and 16 percentage points, respectively. EN 1993 is generally well harmonised for all NDPs, but when it comes to fire design the national traditions seem to have a stronger influence than in the other Eurocodes parts. In what concerns EN 1991 the national safety requirements also seem to have a strong influence on the choice of NDPs for the fire part.

3.3.2 NDPs relevant to bridges

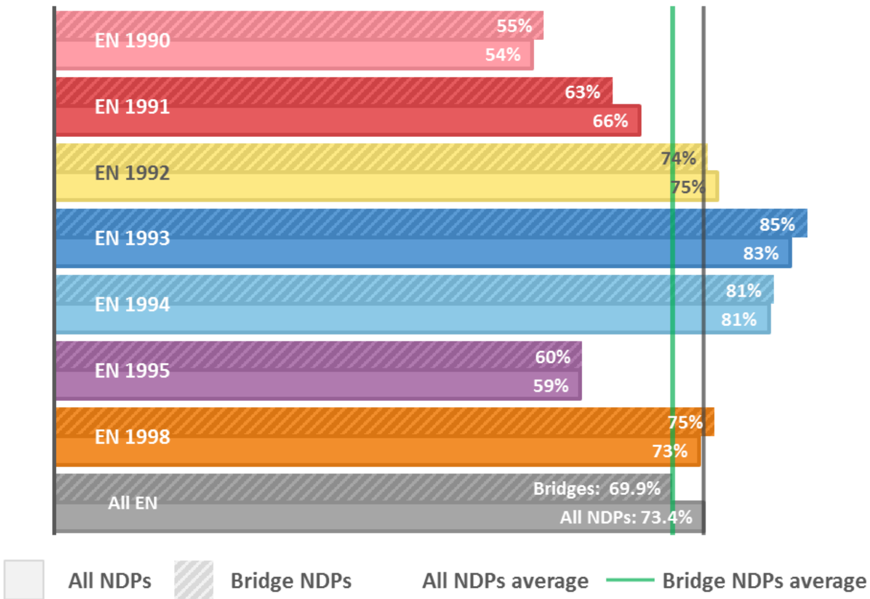
The number of NDPs existing in the Eurocodes parts that cover aspects related to bridge design, and the percentage of uploading by November 2018 of the NDPs in these parts, are listed in Table 9. As shown in the Table, the bridge design is mainly covered by Parts 2 of EN 1991 to EN 1995 and of EN 1998 and by the normative Annex 2 of EN 1990. As seen in Table 9, the NDPs relevant to bridge design are 318, representing 21% of the total number of the NDPs in the Eurocodes.

Figure 50 illustrates the acceptance percentage of RVs, for each Eurocode, distinguishing the percentages obtained for all NDPs and for the parts relevant to bridge design. The former are represented by plain bars and the latter by bars having a pattern with diagonal lines. The Figure only represents the acceptance percentages for the Eurocodes containing parts relevant to bridge design.

Table 9. Eurocodes parts relevant to **bridge design**; number of NDPs and percentage of uploading in the NDPs Database

EN	Title of EN	Part	Title of Part	Nb of NDPs	% NDPs uploaded
1990	Basis of structural design	A-2	Annex A2 : Application for bridges (Normative)	35	76%
1991	Actions on structures		Traffic loads on Bridges	98	77%
1992	Design of concrete structures		Concrete bridges - Design and detailing rules	55	89%
1993	Design of steel structures		Steel bridges	63	90%
1994	Design of composite steel and concrete structures	2	General rules and rules for bridges	16	88%
1995	Design of timber structures		Bridges	6	89%
1998	Design of structures for earthquake resistance		Bridges	38	80
Other NDPs				7	91%

Figure 50. Comparison of the acceptance percentage of NDPs with RVs for **bridge** parts with the acceptance percentage for **all NDPs with RVs** in the corresponding Eurocode



The analysis of the NDPs with RVs relevant to bridge design shows that:

- A total of 1 966 recommended values have been accepted among the 2 812 NDPs uploaded in the Database related to bridge design. Therefore, the mean rate of acceptance of the NDPs related to bridge design is 70%, slightly below the average acceptance rate of 73% for all Eurocodes.
- EN 1993, *Design of steel structures*, is the Eurocode with the highest acceptance rate of NDPs related to bridge design (85%), being 12 percentage points over the acceptance mean achieved for all NDPs (73%) and 2 percentage points over the acceptance mean achieved for all NDPs in EN 1993 (83%).
- EN 1992, EN 1993, EN 1994 and EN 1998 present an acceptance rate of the NDPs related to bridge design over the acceptance average obtained for all Eurocodes (73%) and for all NDPs related to bridge design (70%).
- All parts relevant to bridge design exhibit an acceptance rate close to the acceptance rates obtained for the corresponding Eurocodes.

3.3.3 NDPs relevant to the definition of climatic and seismic actions

3.3.3.1 Background of the analysis performed

The current section provides the analysis of the state of harmonised use of the NDPs relevant to the definition of climatic and seismic actions. Many of the NDPs considered in this section take into account country differences in geographical, geological and climatic conditions. While no similar values are expected for the different countries, a cross-border convergence of the maps for climatic and seismic actions is considered as an indicator for harmonised use of data and methods for derivation of these maps.

While section 3.3.3.2 deals with analysis of the harmonised use of all NDPs relevant to the definition of climatic and seismic actions, an assessment of the state of harmonisation of country maps and the convergence between country borders is presented in sections 3.3.3.3 to 3.3.3.6. A table with the copyright of the maps displayed in sections 3.3.3.3 to 3.3.3.6 is presented in Annex D to this report.

In a previous publication (Formichi *et al.*, 2016), aiming at supporting the Balkan countries in the elaboration of maps for climatic and seismic actions for structural design, the JRC identified 139 NDPs relevant to the definition of those actions. The concerned NDPs are distributed in 3 parts of EN 1991 and in 2 parts of EN 1998, as shown in Table 10. Annex E to this report lists the NDPs used in the analysis performed in section 3.3.3.

Table 10. Number of NDPs, per Eurocode and part, related to the **definition of climatic and seismic actions**

Eurocode and Part	NDPs Number
EN 1991: Actions on structures Part 1-3: General Actions - Snow loads	32
EN 1991: Actions on structures Part 1-4: General Actions - Wind actions	67
EN 1991: Actions on structures Part 1-5: General Actions - Thermal actions	28
EN 1998: Design of structures for earthquake resistance Part 1: General rules, seismic actions and rules for buildings	11
EN 1998: Design of structures for earthquake resistance Part 3: Assessment and retrofitting of buildings	1
Total	**139**

It should be noted that all NDPs in EN 1991-1-3, 1-4 and 1-5 were considered relevant to the definition of the climatic actions, whereas in what concerns EN 1998, only a number of NDPs, listed in Annex E, was considered relevant to the definition of the seismic action.

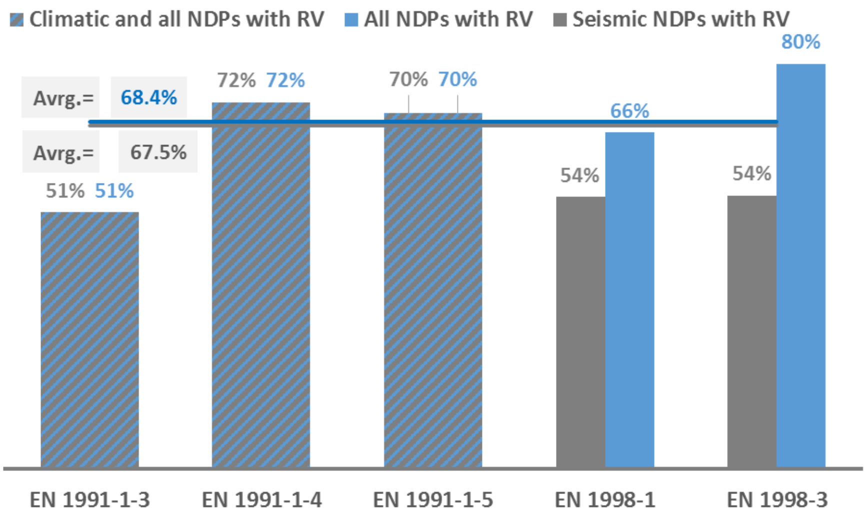
Besides the evaluation of the harmonized use of the Eurocodes parts dealing with the definition of climatic and seismic actions, the material provided in section 3.3.3 is deemed to be also useful for the Project Teams under Mandate M/515 working on revision and update of EN 1991-1-3 on snow loads, EN 1991-1-4 on wind actions, EN 1991-1-5 on thermal actions, and EN 1998-1 on seismic actions.

3.3.3.2 NDPs with recommended values - acceptance analysis

The analysis of the acceptance of NDPs with RVs related to the definition of climatic and seismic actions led to the following results (see Figure 51):

- A good consensus was achieved among the uploading countries for the NDPs with RVs that belong to Parts 1-4 and 1-5 of EN 1991, with an average acceptance percentage of 72% and 70%, respectively;
- The NDPs with RVs that belong to Parts 1-3 of EN 1991 have the lowest acceptance rate, 52%, immediately followed by the NDPs relevant to the definition of seismic actions in parts 1 and 3 of EN 1998 that have an acceptance rate of 54%. Note that for EN 1998-3, a single NDP[20] was considered in the analysis, so the acceptance rate presented in Figure 51 reflects this NDP acceptance rate.
- the set of NDPs with RVs relevant to the definition of climatic and seismic actions presents an average acceptance rate (67.5%) slightly lower than the acceptance rate for all NDPs with RVs for the same Eurocodes parts (68.4%). The difference is due to the NDPs belonging to EN 1998, since all the NDPs in EN 1991-1-3, 1-4 and 1-5 parts were considered relevant to the definition of the climatic actions; in other words, for the three parts of EN 1991 the two compared sets are composed of the same NDPs.

Figure 51. Acceptance percentage of NDPs with RVs relevant to the definition of **climate and seismic actions** and acceptance percentage of **all NDPs with RVs** in the same Eurocodes parts



3.3.3.3 Characteristic snow load maps adopted by Member States

This section analyses the national choices for the maps of snow actions, which are regulated by the NDP 4.1 (1) NOTE 1 of EN 1991 part 1-3. The NDP is described as *the*

[20] The NDP is: 2.1 (3) *Return period of seismic actions under which the Limit States should not be exceeded.*

characteristic value of snow load on the ground (s_k). EN 1991-1-3 provides further explanation for this NDP stating that:

The characteristic value of snow load on the ground (s_k) should be determined in accordance with section 4.1.2 (7) of EN 1990, and to the definition given in section 1.6.1 of EN 1991-1-3. To cover unusual local conditions, the client and the relevant authority may be additionally allowed to agree upon a different characteristic value from that specified for an individual project.

According to 4.1.2 (7) NOTE 2 of EN 1990 *the characteristic value of climatic actions is based upon the probability of 0.02 of its time varying part being exceeded for a reference period of one year. This is equivalent to a mean return period of 50 years for the time-varying part.* The definition given in section 1.6.1 of EN 1991-1-3 states that the snow load on the ground is *based on an annual probability of exceedance of 0.02, excluding exceptional snow loads*.

Moreover, EN 1991-1-3 provides an informative annex, Annex C, containing the European Ground Snow Load Map prepared in the framework of studies funded by the European Commission (ESLRP, 1998). Annex C also presents Altitude-Snow Load relationships to be applied in each climatic region defined in the Ground Snow Load Map. The informative Annex C aims to help the National Authorities preparing their national maps and to establish harmonised procedures to produce snow maps, with the final goal of eliminating, or reducing, inconsistencies of snow load values among Member States and at countries borderlines.

Figure 52 gives an overview of the snow load information that was uploaded in the Database or found in other sources, as described in the paragraph below. Figure 53 provides zoomed snow load maps for Croatia and Slovenia and Figure 54 for Bulgaria and Romania, since they were not easily readable in the previous Figure.

By November 2018, Bulgaria, Croatia, Czechia, France, Ireland, Latvia, Lithuania, Poland, Portugal, Romania, Slovenia, Sweden and the United Kingdom have uploaded the Database with snow load maps for the NDP 4.1 (1) NOTE 1, or have uploaded the Database with the National Annex to EN 1991-1-3 containing those maps. Most countries present a load-altitude correction formula to calculate the additional snow load to be taken into account for the effects of altitude. The altitude is denoted by *A* or *H* in Figure 52. Other countries, such as Cyprus, Hungary and Luxembourg have uploaded a load-altitude correction formula, but not a map. Sweden has uploaded its snow load map in the Database and stated that the informative Annex C of EN 1991-1-5 must not be applied to its territory. In return, it stated that *Snow loads at altitudes above 1,500 m above sea level should be determined for each separate project where this is relevant with regard to the prevailing conditions.* Denmark and the Netherlands have agreed on a constant snow load value for the whole territory not depending on the altitude. Austria has uploaded a reference on where to find its snow map. Finland's snow map is available at the website of Finnish Ministry of Environment; Slovak snow map was obtained in a publication dedicated to the Slovak National Annex of EN 1991-1-3 (Sadovský, 2012). Italian snow map was obtained from a presentation[21] and confirmed in a publication by Formichi *et al.* (2016), both produced in the framework of JRC workshops dedicated to training on the use of the Eurocodes.

[21] https://eurocodes.jrc.ec.europa.eu/doc/WS2008/EN1991_3_Formichi.pdf.

Figure 52. Snow load maps adopted by the **Member States** (see copyrights of maps in Annex D)

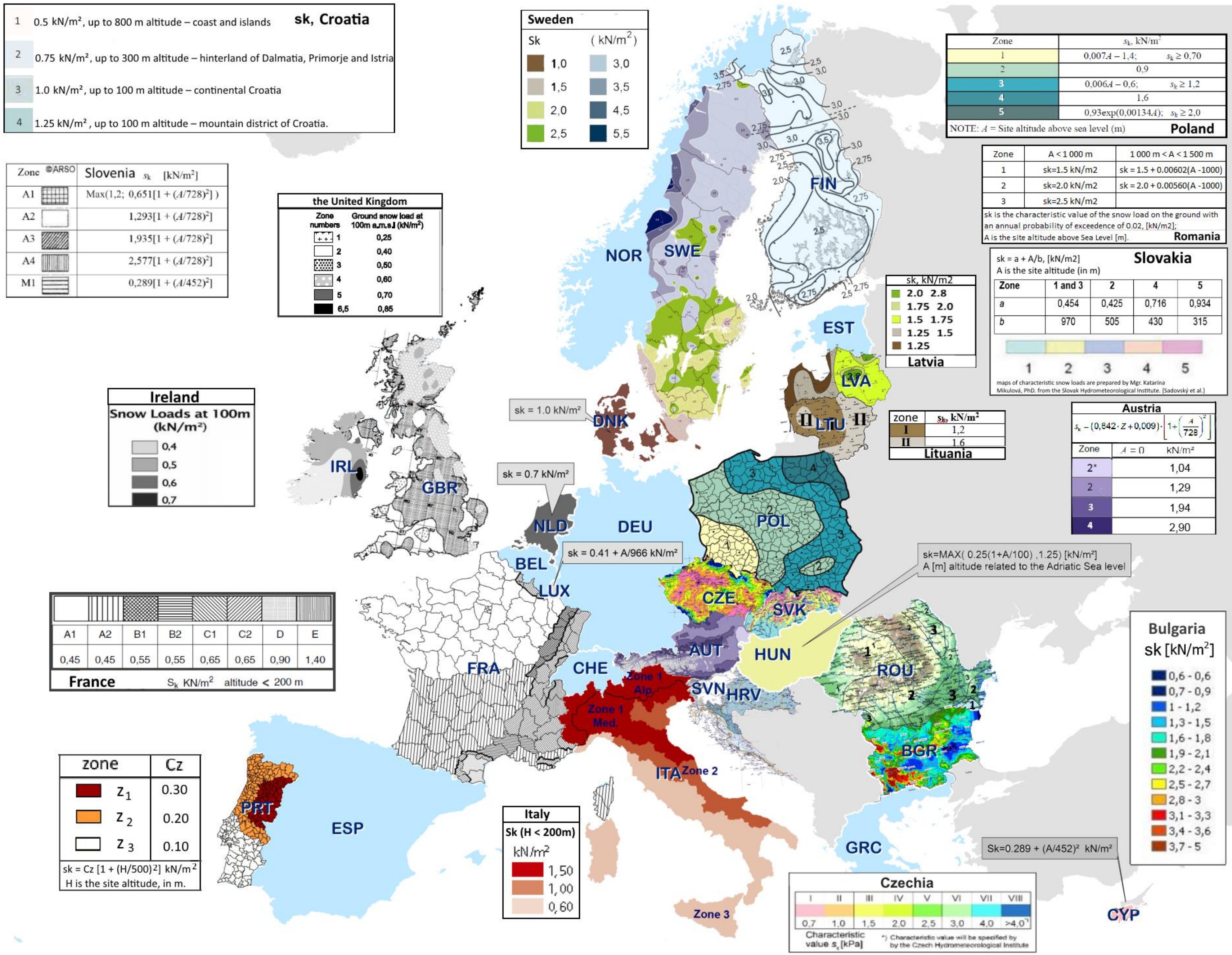
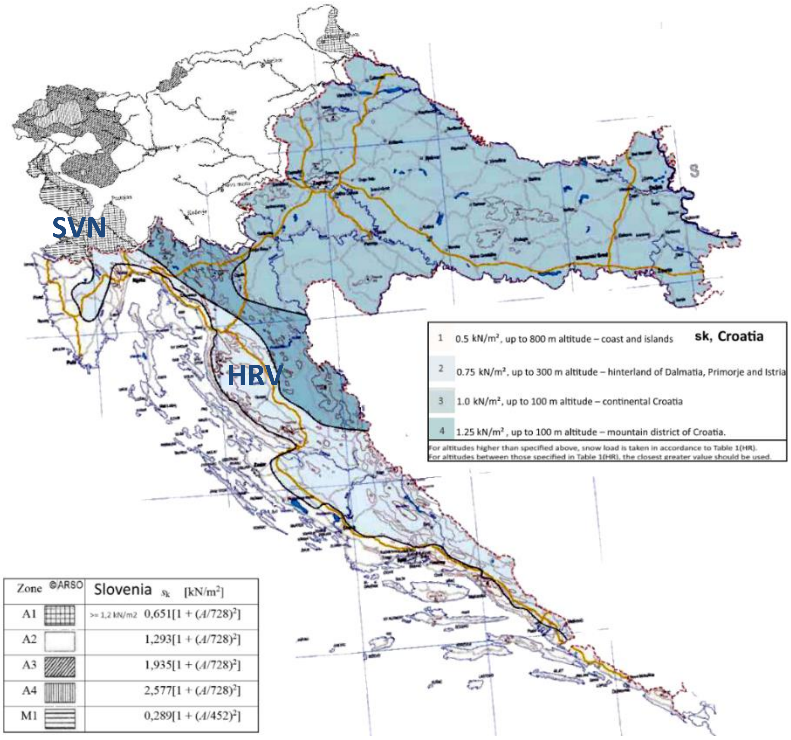


Figure 53. Snow load maps adopted by **Croatia** and **Slovenia** (see copyrights of maps in Annex D)



For comparative purposes, the maps for the 21 countries above referred were accommodated in a single Figure. Therefore, for some countries only part of the information related to the NDP 4.1 (1) NOTE 1 is shown. For instance, the legends presented in Figure 52 for France and Italy shall be valid only for altitudes under 200 m; further altitude-snow load relationships are provided in the National Annexes of these countries.

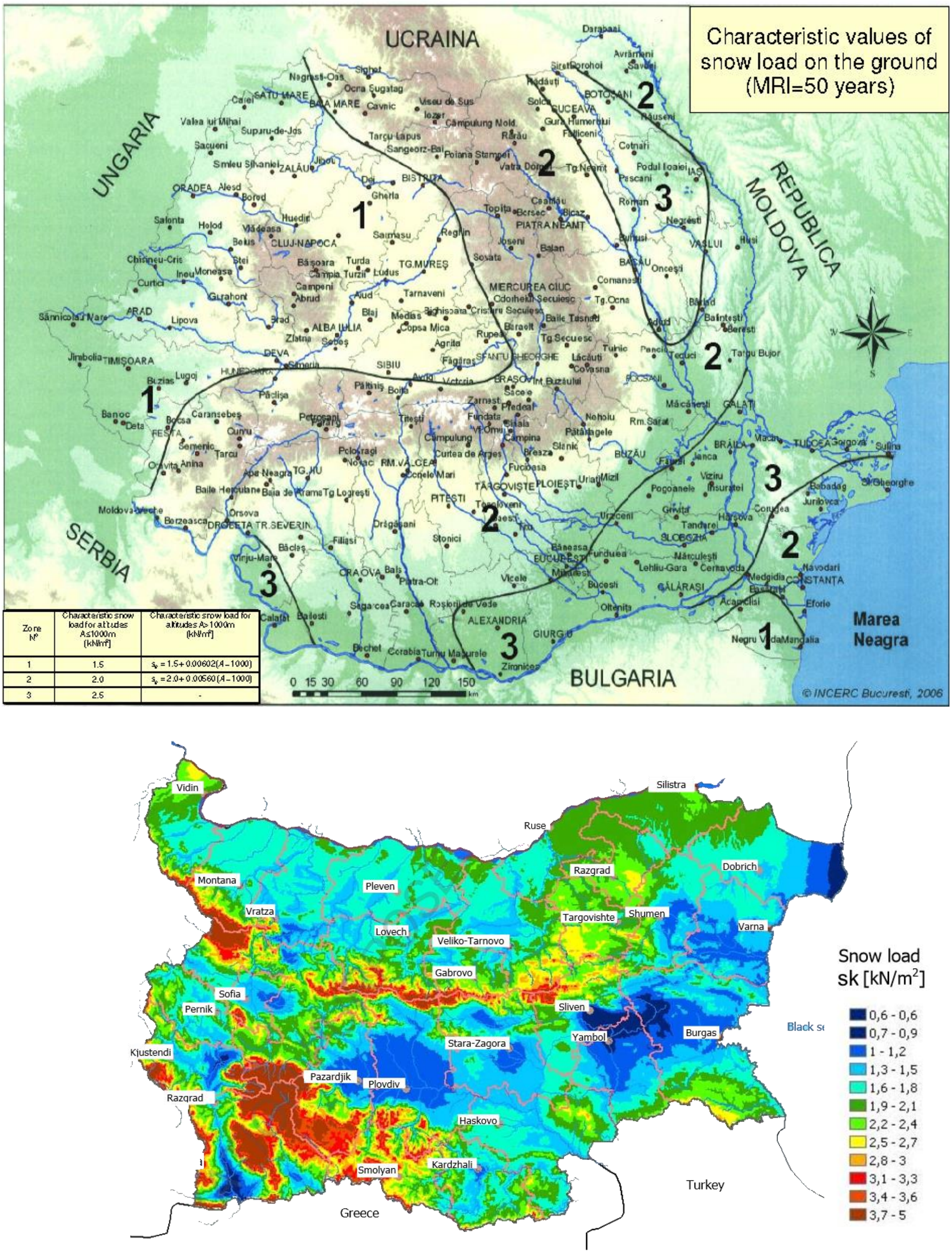
Figure 52 reveals that the collected maps present very different layouts and therefore do not facilitate the comparison of national choices for snow actions in neighbouring areas. Moreover, the range of altitudes for which the maps apply vary considerably, going from the sea level to altitudes less than 1 500 m. For that range of altitudes, the countries shown in Figure 52 adopted values varying from 0.1 KN/m^2, in the south part of Portugal, to 5.5 KN/m^2 in Sweden.

An example of inconsistencies of snow load values at the borderlines occurs between France and Italy, where at an altitude lower than 200 m, the Italian map in the Alpine Zone 1 prescribes a snow load equal to 1.5 KN/m, whereas the French map in the departments classified as C1 has a value equal to 0.65 KN/m^2, which is less than half the value of the Italian zone. Applying countries' load-altitude correction formulas to an altitude of 1000 m, a relative load ratio was obtained for Italy and France (3.6 KN/m^2 vs 1.7 KN/m^2) similar to the ratio of snow load at an altitude lower than 200 m (1.5 KN/m^2 vs 0.65 KN/m^2).

Nevertheless the discussed above differences, in general terms, a good level of harmonisation of the snow load values was obtained in most of the EU countries borderlines. For instance, Denmark map displays the same snow load value as the southern part of the Sweden map (1.25 KN/m^2). In the regions next to the border between the United Kingdom and Ireland, the countries maps present a similar snow load value equal to 0.5 KN/m^2. The Latvian snow load values at the border with Lithuania, range from 1.25 to 1.75 KN/m^2, whereas the Lithuania values vary between 1.2 and 1.6 KN/m^2. Note that the Latvian and Lithuanian snow maps were coloured for the purposes of this report. In their common border, the snow load maps of Lithuania and Poland share the same value of 1.6 KN/m^2. At the border area near Hungary, Romania adopted a snow load value of 1.5

KN/m², close to the fixed snow load value equal to 1.25 KN/m².adopted in the Hungarian territory. Finally, Figure 53 shows that at the Croatian side of the border with Slovenia, in regions up to 100 m altitude, the snow load values mainly range from 1 to 1.25 KN/m², whereas in the Slovenian side, the snow load value mainly equals the value 1.29 KN/m², at the see level.

Figure 54. Snow load maps adopted by **Bulgaria** (bottom) and **Romania** (top) (see copyrights of maps in Annex D)



Zone N°	Characteristic snow load for altitudes A≤1000m [kN/m²]	Characteristic snow load for altitudes A>1000m [kN/m²]
1	1.5	$s_k = 1.5 + 0.00602(A-1000)$
2	2.0	$s_k = 2.0 + 0.00560(A-1000)$
3	2.5	-

3.3.3.4 *Fundamental value of the basic wind velocity adopted by the Member States*

The map for the wind action is determined in the NDP 4.2(1) NOTE 2 of EN 1991 part 1-4. The NDP is described as *the fundamental value of the basic wind velocity,* $v_{b,0}$. EN 1991-1-4 provides further explanation for this NDP stating that: *the fundamental value of the basic wind velocity,* $v_{b,0}$*, is the characteristic 10 minutes mean wind velocity, irrespective of wind direction and time of year, at 10 m above ground level in open country terrain with low vegetation such as grass and isolated obstacles with separations of at least 20 obstacle heights.*

By November 2018, Cyprus, Croatia, Czechia, Ireland, Sweden and the United Kingdom have uploaded the Database with contour wind maps for the NDP 4.2(1) NOTE 2, or have uploaded the National Annexes to EN 1991-1-4 containing these maps. In addition, France uploaded a map where the country administrative regions were classified in four different zones for the fundamental value of the basic wind velocity; Austria chose to list the fundamental value of the basic wind velocity for different locations. Other countries, such as Denmark, Estonia, Finland, Hungary, Latvia, Luxembourg and Portugal, have uploaded a single or a double value for the fundamental value of the basic wind velocity in their territories. Norway, Slovenia and Switzerland have decided to accept the EN text as is in the Eurocode.

Figure 55 gives an overview of the wind maps adopted by the 15 countries previously referred. For comparative purposes, the wind maps for the 15 countries were accommodated in a single Figure. Therefore, for some countries only part of the information related to the NDP 4.2(1) NOTE 2 is shown; for instance, Portugal provided two values for $v_{b,0}$, *i.e.,* 27 m/s for Portugal mainland in general, and 30 m/s for coastal regions located up to 5 km distance from the shoreline or for regions at altitudes above 600 m. Full information can be found in the countries' National Annexes.

Contour maps have also been uploaded by Bulgaria and Romania, but rather than $v_{b,0}$, the maps represent, respectively, *the characteristic value for the basic velocity pressure* and *the dynamic wind pressure* (see Figure 56). Considering the national choices made by these countries and the relevant procedures prescribed in EN 1991-1-4 for this topic, it was possible to calculate the fundamental value of the basic wind velocity for the Bulgarian and Romanian territories, and values ranging from 16.9 to 35.7 m/s were obtained for the former and from 25.3 to 33.5 m/s for the latter.

The fundamental values of the basic wind velocity, $v_{b,0}$ shown in Figure 55, and derived from Figure 56, range from a minimum value of 17 m/s in Bulgaria to a maximum value of 48 m/s in Croatia. However, despite the very different layout of wind maps, one can point cases of a good cross-border harmonization. For instance, Estonia, Latvia and Finland share the same value of $v_{b,0}$, *i.e.*, 21m/s, which is close to the values adopted at the Sweden territory located at the Finnish border (21m/s and 22 m/s). Luxembourg adopted the same value for $v_{b,0}$ as the neighbouring department in France, *i.e.*, 24 m/s. Ireland and the United Kingdom share the same wind map.

Figure 55. Wind maps adopted by the **Member States** (see copyrights of maps in Annex D)

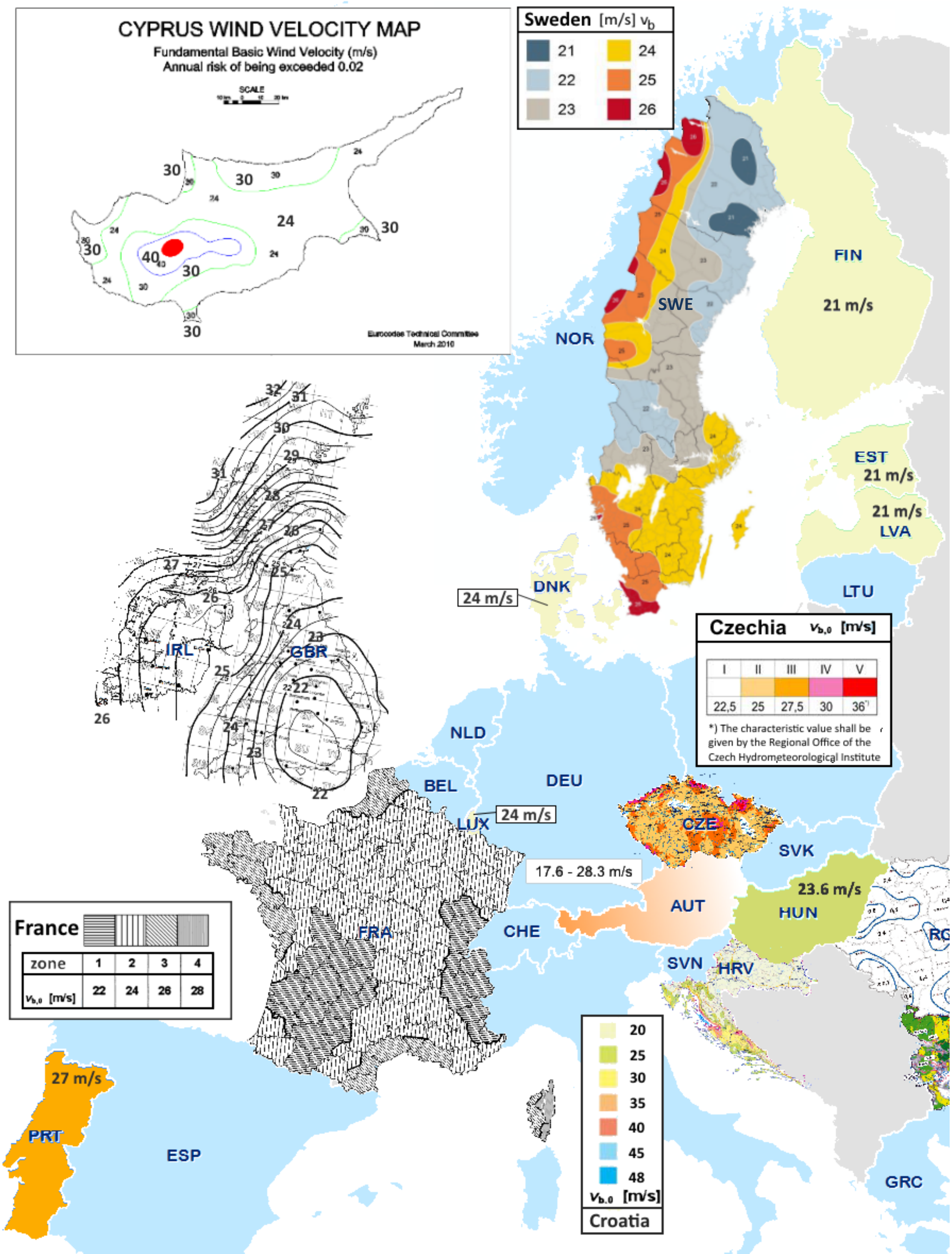


Figure 56. Wind maps adopted by **Bulgaria** (bottom) and **Romania** (top) (see copyrights of maps in Annex D)

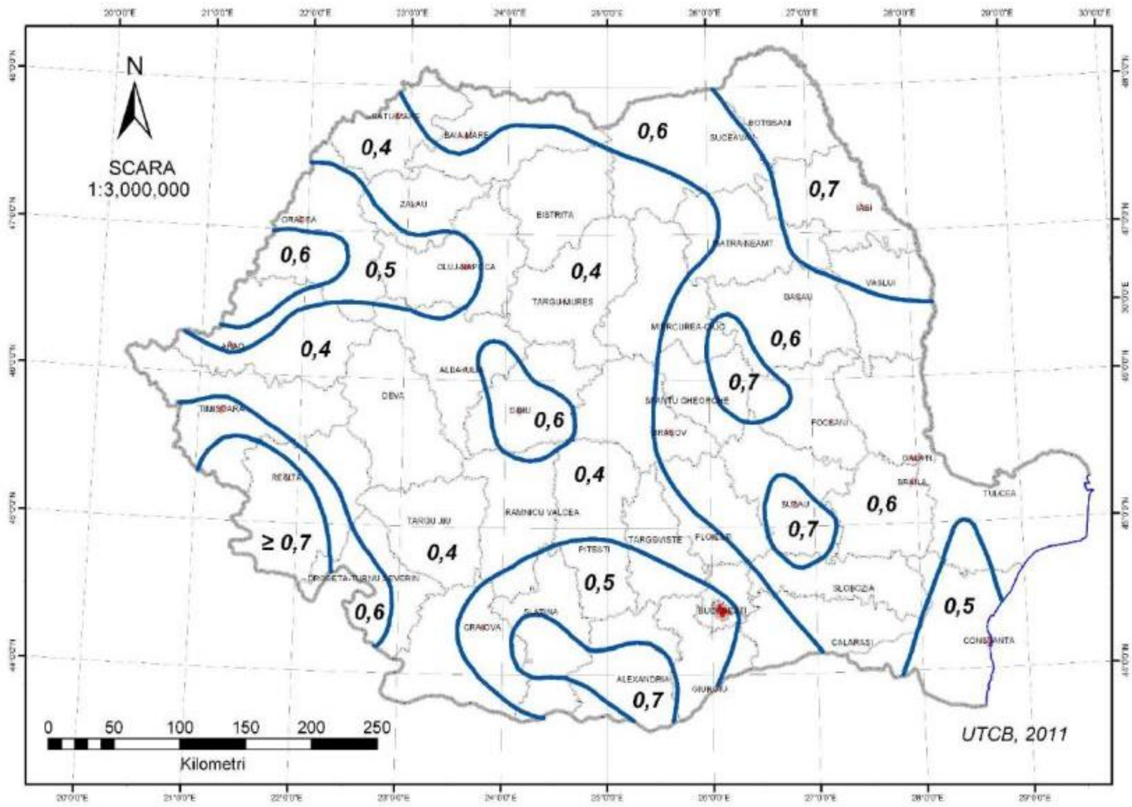
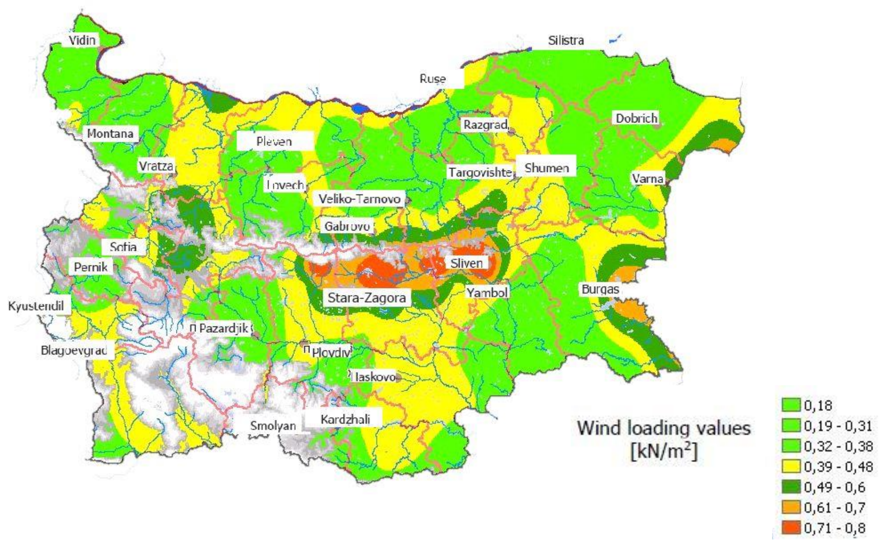


Figure 1(RO): Zoning of the reference values of dynamic wind pressure, q_b in kPa, where *MRI* = 50 years

NOTE For altitudes higher than 1 000 m, the values of the dynamic wind pressure shall be corrected using relationship (3)

Figure NA.G.1 – Map for regions in Bulgaria according characteristic value for basic velocity pressure q b,0 (kN/m2)



3.3.3.5 Thermal maps adopted by the Member States

This section addresses the maps for thermal actions adopted by the Member States. The NDP Annex A.1(1) NOTE 1 is one of the NDPs in part 1-5 of EN 1991, that regulates the *Information (e.g. maps of isotherms) on both annual minimum and annual maximum shade air temperature.* Annex A.1 (1) NOTE 1 is a parameter left open in the Eurocodes for country-driven choices with regard to the maximum and minimum values of shade air temperatures. Those temperatures are defined in EN 1991-1-5 for the annual probability of being exceeded of 0.02, or equivalently, for a mean return period of 50 years, and are based on the minimum and maximum hourly temperature recorded at the mean sea level in open country. The normative Annex A in EN 1991-1-5 includes adjustments for other values of probabilities, heights above sea level and local conditions. Part 1-5 of EN 1991 also provides the NDPs 6.1.3.2(1) and 7.2.1(1) that have a similar description to the NDP Annex A.1(1) NOTE 1, *i.e.*, give *Information (e.g. maps of isotherms) on minimum and maximum shade air temperatures* to be used in a country; the former is related to temperature changes in bridges and the latter to temperature changes in industrial chimneys, pipelines, silos, tanks and cooling towers. Most countries have adopted the same map in the Annex A.1(1) NOTE 1 as in the NDPs 6.1.3.2(1) and 7.2.1(1).

By November 2018, the annual minimum and maximum shade temperature values were available in the NDPs Database in different formats for different countries, namely:

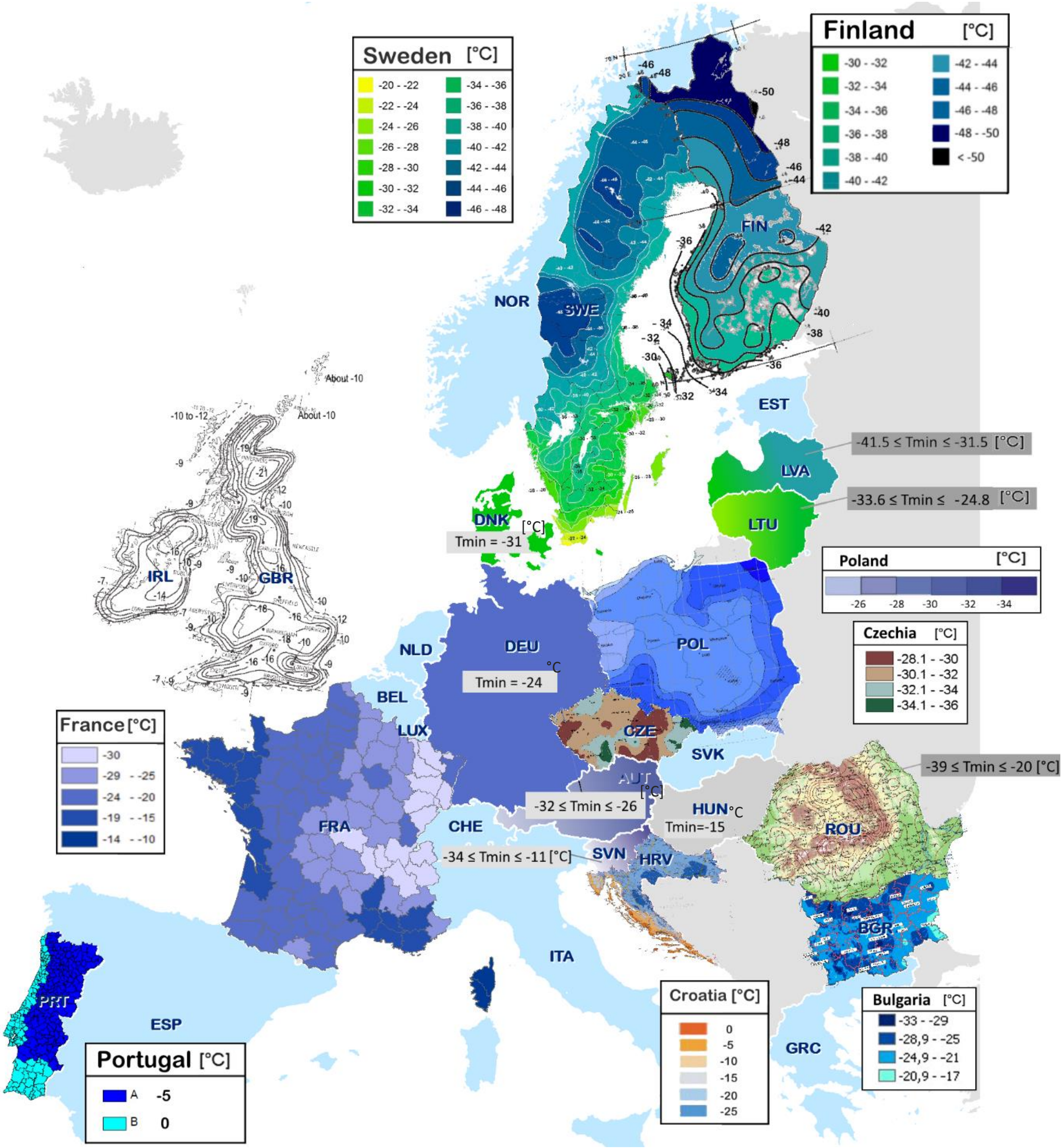
- isothermal maps for Bulgaria, Czechia, Croatia, Ireland, Finland, Poland, Romania, Sweden and the United Kingdom;
- tables with the list of values for different locations in Austria, Latvia, Lithuania and Slovenia;
- maps or tables for administrative regions values for France and Portugal;
- constant values for the territories of Denmark, Luxembourg, Hungary and Germany.

Figure 57 presents an overview of the maps of minimum shade air temperatures adopted by the previously mentioned 19 countries. The values for the minimum shade temperature that were available as tables in the National Annexes of Austria, Latvia, Lithuania and Slovenia, are shown in maps shaded with a gradient colour, aiming to represent the range of values available on the tables. Figure 58 provides zoomed maps for Bulgaria and Romania, since the isotherms of minimum shade air temperature were not easily readable in the previous Figure.

The national choices made by the EU Member States for the minimum shade air temperature illustrated in Figure 57 range from a minimum value less than – 50°C, in Finland, to a maximum value equal to 0°C, in Portugal and in Croatia.

Regarding the inconsistencies of the thermal maps cross-border values, Figure 57 shows that in the border area between France and Germany, the former country has adopted the value of -30°C for the minimum shade air temperature and the latter has chosen a constant value equal to -24°C. Luxembourg presents a minimum shade air temperature value differing from its neighbours, *i.e.*, the country chose -18 °C, while France, in the border area with Luxembourg, has adopted a value equal to -30°C and Germany has chosen a constant value of -24°C for its whole territory. In the Croatian side of the border with Hungary, the thermal map shows a temperature value of -20°C, whereas the constant value adopted by Hungary is -15°C. The Hungarian choice is higher than the range prescribed in the Austrian National Annex, that varies from -32 °C to -26°C, and also higher than the values adopted in the Romanian side of the border (-24°C to -40°C).

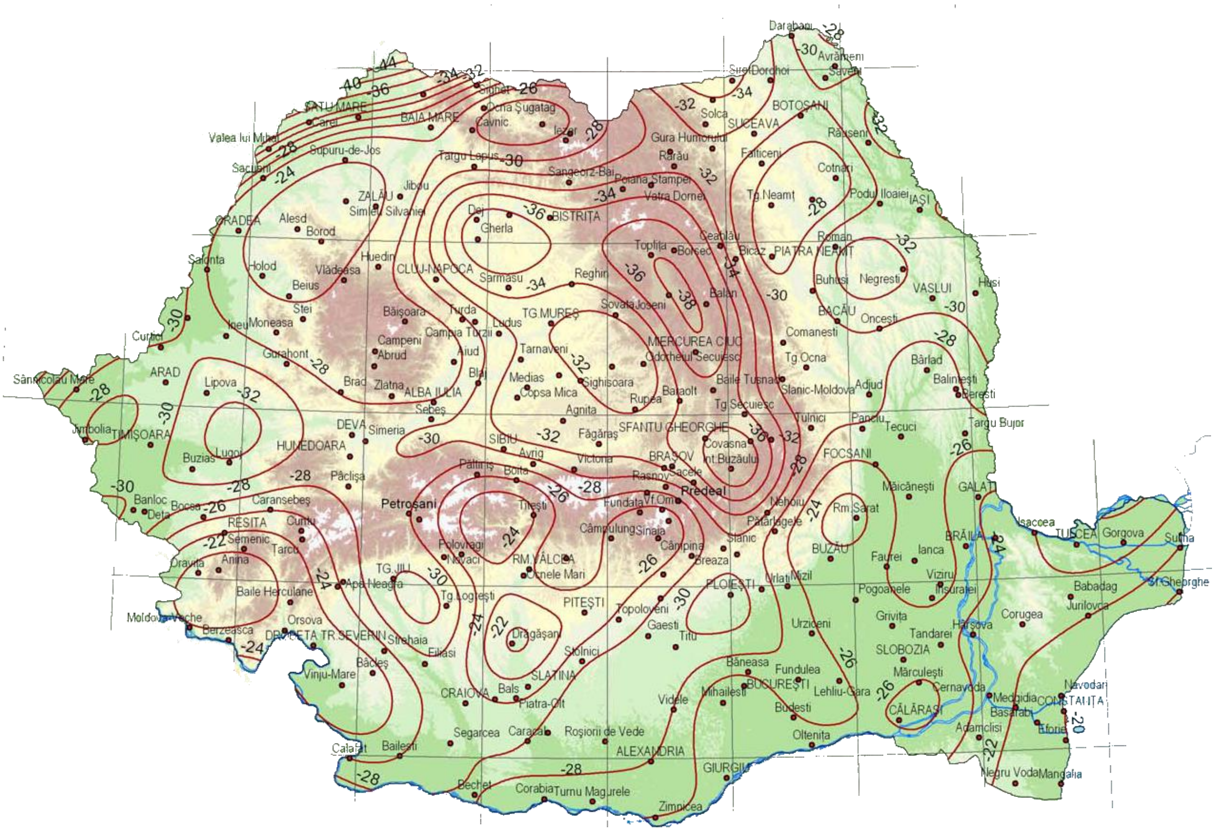
Figure 57. Minimum shade air temperature maps adopted by the **Member States** (see copyrights of maps in Annex D)



The constant value of the minimum shade air temperature adopted by Germany in its territory (-24°C) is higher than the value of -31°C adopted by its northern neighbour, Denmark, but is close to the value chosen by Poland (-26°C) in the border area with Germany. Czechia presents a minimum shade air temperature ranging from -28°C to -34°C in the border with Germany (-24°C) and ranging from -28°C to -36°C in the border with Poland, that in its turn adopted values from -32°C to -34°C.

On the other hand, Ireland and the United Kingdom share the same isothermal map, whereas Sweden and Finland present consistent temperature values in their territories. Note that Finish isotherms map was specially coloured for this report. In the Bulgarian side of the border with Romania the minimum shade air temperature ranges from -29°C to -21°C, whereas Romania adopted values varying from -28°C to -22°C in its thermal map, so both countries show a good agreement in cross border regions.

Figure 58. Minimum shade air temperature maps adopted by **Bulgaria** (bottom) and **Romania** (top) (see copyrights of maps in Annex D)



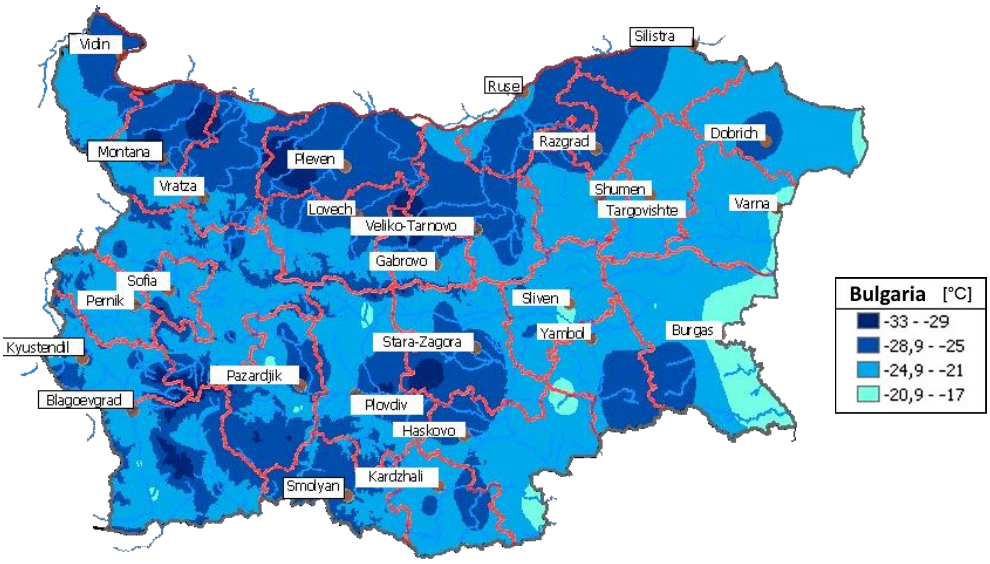
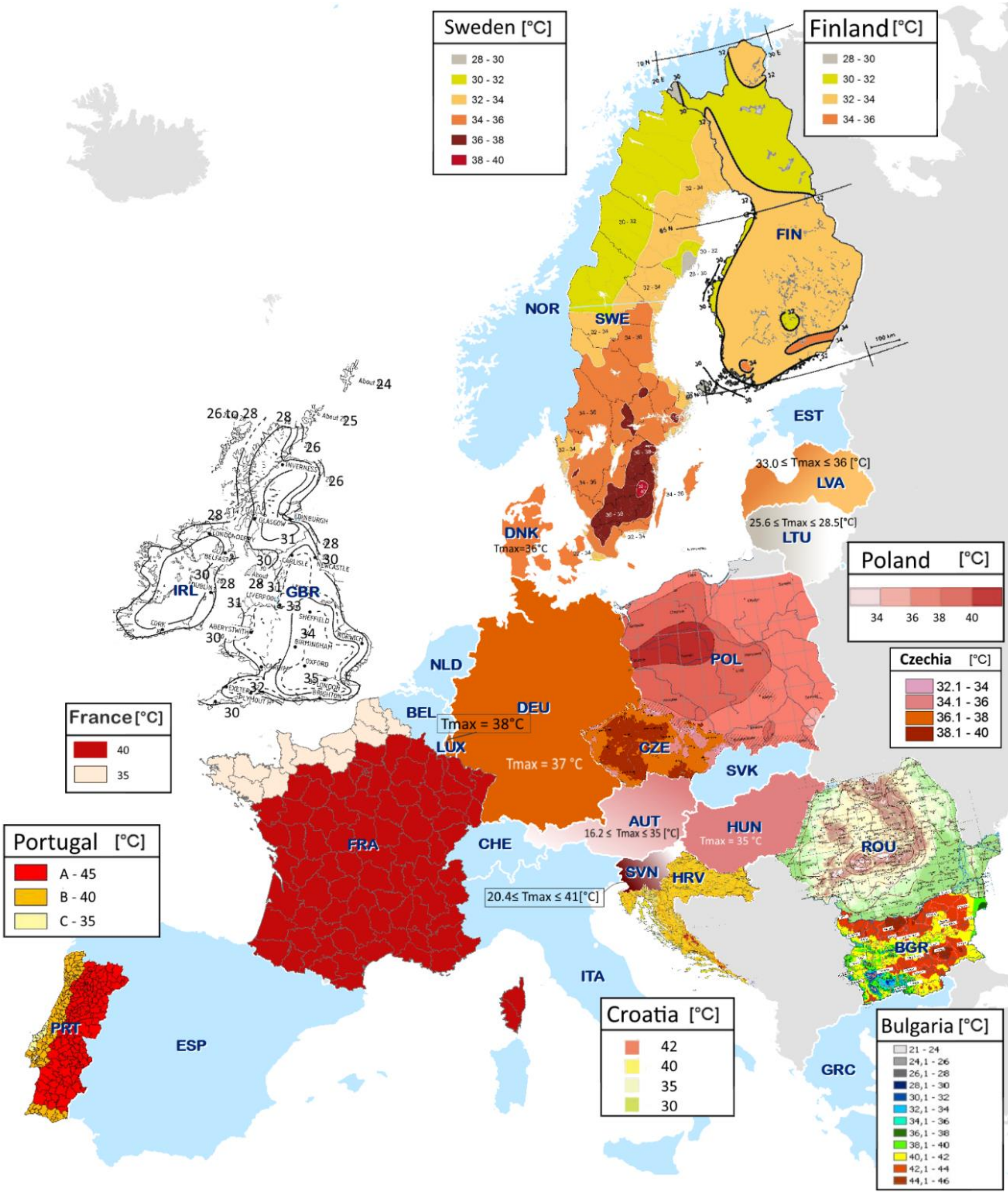


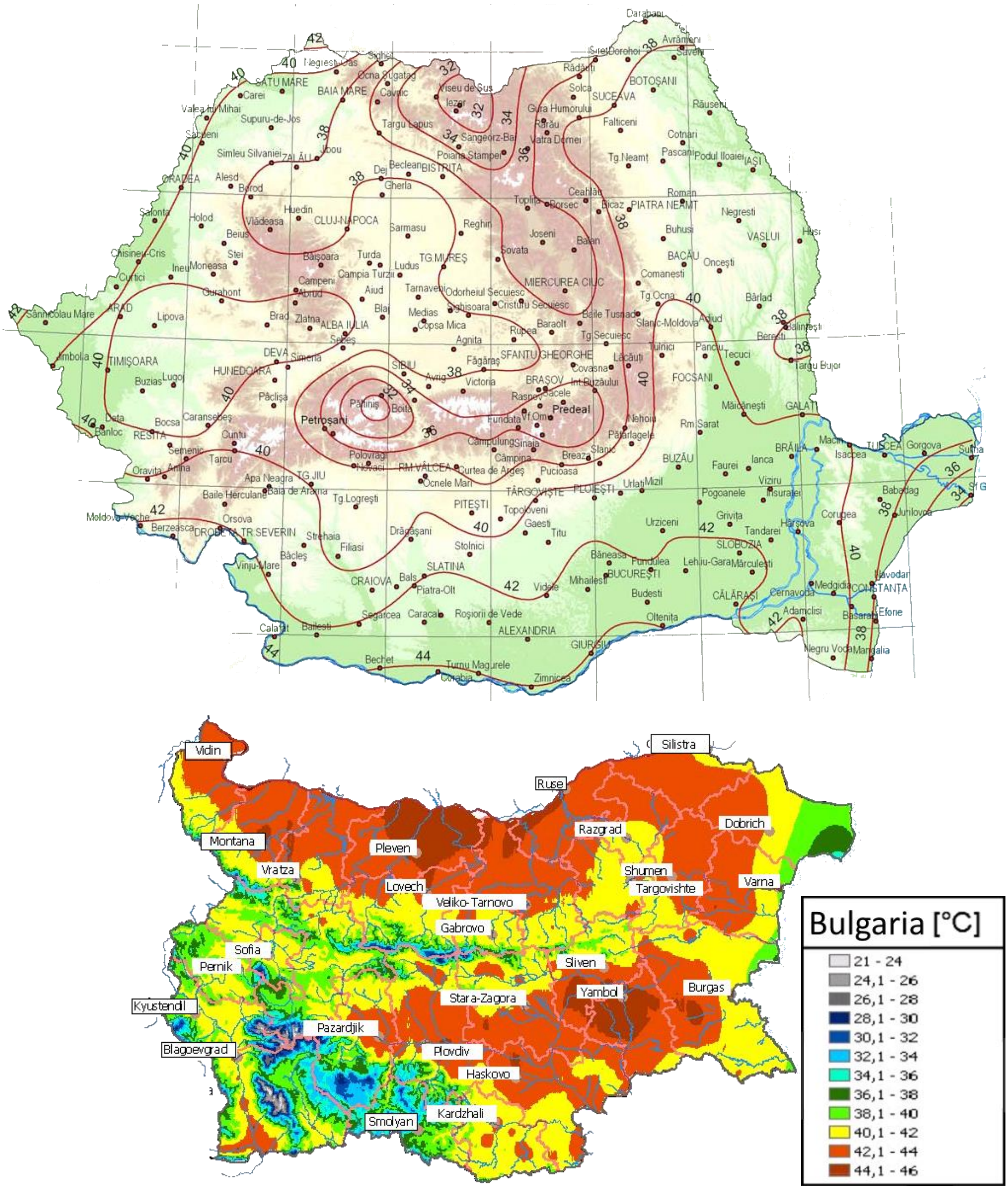
Figure 59 presents an overview of the maps of maximum shade air temperatures adopted by the aforementioned countries and Figure 60 provides zoomed maps for Bulgaria and Romania, since the isotherms of maximum shade air temperature were not easily readable in the previous Figure. The maximum shade air temperatures range from 24°C in the Orkney Islands in Scotland to 46°C in Bulgaria.

Figure 59. Maximum shade air temperature maps adopted by the **Member States** (see copyrights of maps in Annex D)



The maps of maximum shade air temperature present more consistent values among Member States and at countries borderlines than the maps of minimum shade air temperature previously analysed. For instance in the axis France, Luxembourg, Germany, Czechia and Poland, the maximum temperature values present a small variation, ranging from 36°C to 40°C. Once again Ireland and the United Kingdom share the same isothermal map, Sweden and Finland present consistent isothermal maps in their territories and Bulgaria and Romania show a good agreement in the temperature values for the cross border regions. An exception occurs in two of the Baltic States, Latvia and Lithuania, whose range of values for the maximum temperature does not overlap, presenting a gap of almost 5°C.

Figure 60. Maximum shade air temperature maps adopted by **Bulgaria** (bottom) and **Romania** (top) (see copyrights of maps in Annex D)



In conclusion, there are good examples of harmonisation in countries border values of the thermal maps for the minimum and maximum shade air temperature, namely a common isothermal map was implemented in the United Kingdom and Ireland and harmonised maps were adopted by Finland and Sweden. However, several differences and border discontinuities still exist in the implementation of the thermal maps by the EU Member States, mainly in what concerns the minimum shade air temperature maps.

3.3.3.6 Seismic zone maps adopted by the Member States

This section presents the national choices for NDP 3.2.1 (2), described as *Seismic zone maps and reference ground accelerations therein*, currently uploaded, or referred to, in the NDP Database; then it addresses the state of harmonisation of the countries border acceleration values and compares the layout of the maps.

By November 2018, Austria, Belgium, Bulgaria, Cyprus, Croatia, Czechia, Germany, Greece, Hungary, Portugal and Romania have uploaded the NDP described as *Seismic zone map and reference ground accelerations* in the Database or the National Annex for EN 1998-1. The United Kingdom, France and Slovenia have uploaded a reference on where to find the seismic zone map. In addition, Latvia and Luxembourg have adopted a constant reference ground acceleration for their entire territories.

All the considered EU Member States, except Romania and the United Kingdom, have adopted the recommended value of 475 years for the *Reference return period, T_{NCR}, of seismic action for the no-collapse requirement* (NDP 2.1(1) Note 1 of EN 1998-1). Romania has uploaded a T_{NCR} equal to 100 years. The United Kingdom did not upload a value giving the following reason for deviation: "In the absence of a project-specific assessment, adopt a return period T_{NCR} of 2 500 years. Further guidance is given in PD 6698".

In what concerns the NDP 3.2.1 (2), *Seismic zone maps and reference ground accelerations therein*, the following specific situations were identified in the Database:

- Denmark declared complete the uploading of EN 1998 in the Database, without uploading any NDP. Consequently, it was concluded that EN 1998 is not applicable in Danish territory, which was confirmed by the answers to the questionnaire on the state of implementation of the Eurocodes in the European Union described in Dimova *et al*. (2015);
- Hungary uploaded a seismic zone map and mentioned it has an informative status.
- Ireland has decided to accept the EN text as is in the Eurocode;
- Latvia and Luxembourg have respectively adopted constant reference ground acceleration values of 0.02 g and 0.04g for their territories;
- Lithuania did not give the "distribution of Seismic zones by the hazards" and has mentioned that "The reference peak ground acceleration on type A ground is derived by the relevant parts of EN 1998";
- Sweden mentioned that part 1 of EN 1998 is not used in its territory;
- the United Kingdom has uploaded the National Annex to EN 1998-1, in which a document (PD 6698) is referred containing the seismic map. However, PD 6698 has restricted access;
- Portugal and Romania present two types of seismic actions (spectra) in their maps: Type 1 and Type 2[22].

Figure 61 presents an overview of the seismic zone maps adopted by the countries mentioned before, and Figure 62 provides a zoomed map for Romania, since the contours of the reference ground accelerations are not easily readable in the previous Figure.

[22] EN 1998-1 recommends that, if deep geology is not accounted for, two types (shapes) of spectra should be used, i.e., Type 1 and Type 2 (NDP 3.2.2.2(2)). If the earthquakes that contribute most to the seismic hazard defined for the site for the purpose of probabilistic hazard assessment have a surface-wave magnitude, Ms, not greater than 5.5, it is recommended that the Type 2 spectrum is adopted.

Figure 61. **Seismic zone maps** adopted by the **Member States** (see copyrights of maps in Annex D)

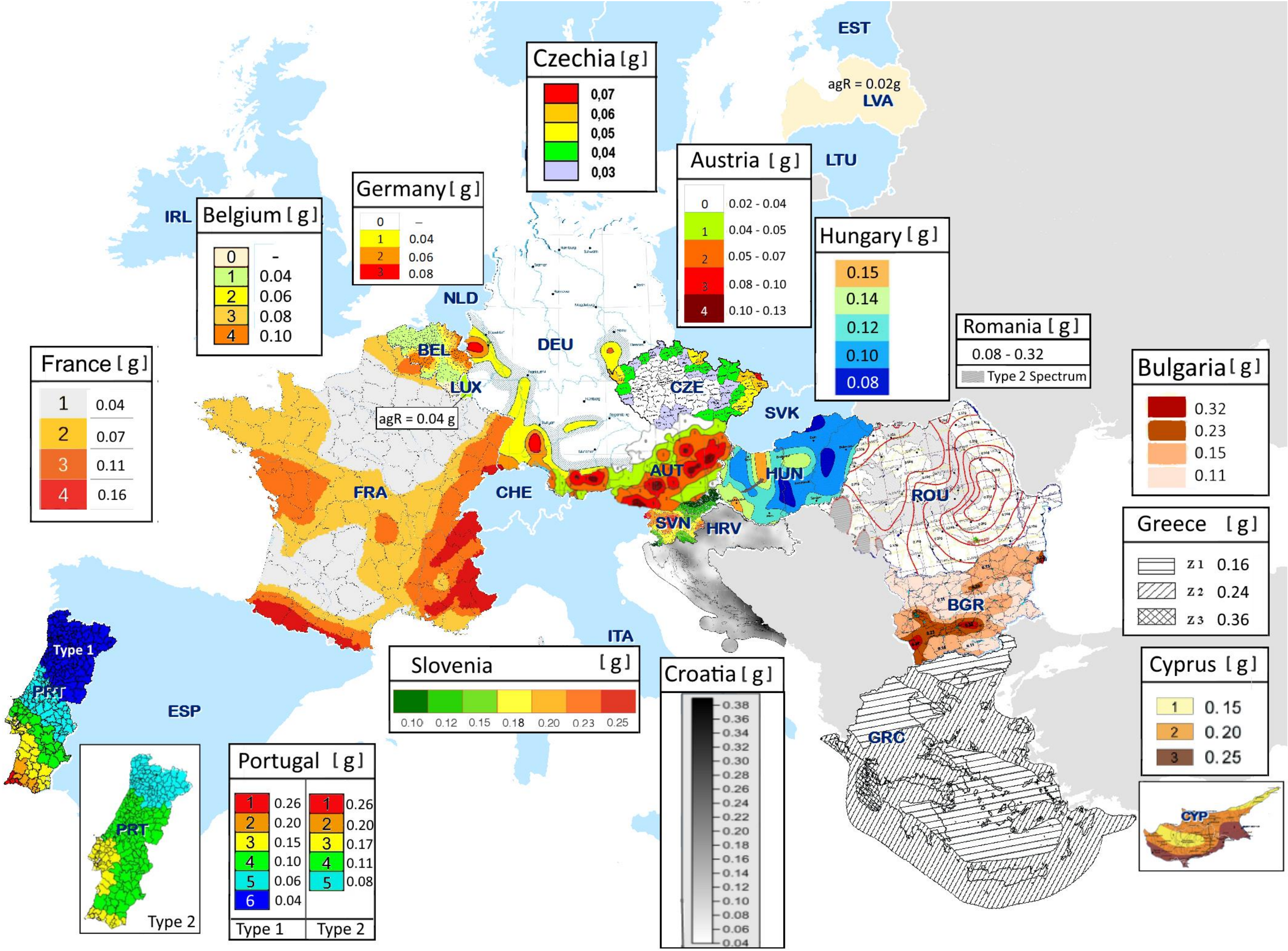
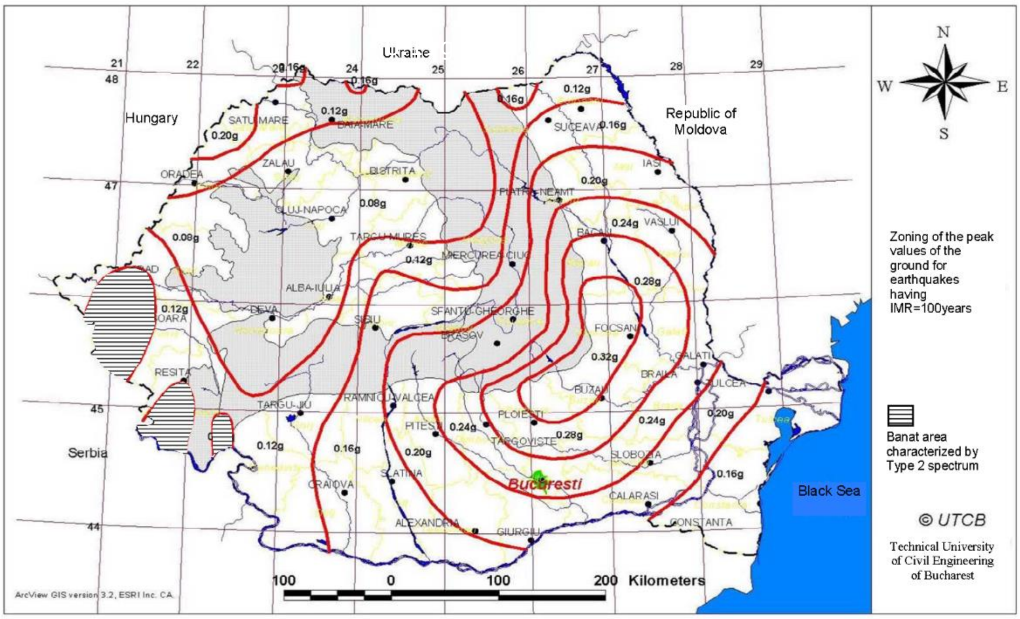


Figure 62. Seismic zone map for **Romania** (see copyrights of maps in Annex D)



SR EN 1998-1:2004/NA:2008

Figure 3.2 (RO) – Zoning map of the Romanian territory in terms of peak reference values of the design ground acceleration a_{gR} for seismic actions T_{NCR} = 100 year

The overseas territories of the EU Member States, like, for instance, the islands of Guadeloupe (France), or of Azores (Portugal) are not shown in the Figures. For this reason, two of the seismic zones shown in the legend of the Portuguese map for seismic action type 2 have no correspondence in the map. Those seismic zones are labelled 1 and 2 and correspond to regions located in the Azores islands.

The reference ground acceleration shown in Figure 61 range from a minimum value of 0.02g in Latvia to 0.38g in Croatia.

The analysis of Figure 61 and Figure 62 shows that all countries uploading the NDPs Database comply with the recommendation of EN 1998-1 to map the seismic zones using the reference peak ground acceleration. However, several differences may be identified in the maps, not only in their layout, but particularly in terms of the reference ground acceleration levels on the two sides of a national border.

Most of the countries have drawn the seismic zones as acceleration contour maps, except Belgium, Czechia and Portugal that have adopted constant levels for the reference ground acceleration for the administrative units of the countries. Portugal and Romania are the only two countries who have associated specific seismic zones to the two types of elastic response spectrum (Type 1 and Type 2).

Regarding the details of the cross border harmonisation, Figure 61 shows that Belgium has adopted five different seismic zones in the neighbourhood of France, whereas France shows a less disaggregated zonation, comprising three seismic zones. Yet, the level of the reference ground acceleration in the border area of both countries is consistently low, ranging from 0.04 g to 0.11 g in France and from 0 g to 0.1 g in Belgium and the highest values match in both sides of the border. Similar observations apply to the border area of Belgium and Luxembourg, where the former shows a more disaggregated zonation, but a level of acceleration consistent with the latter. France and Luxembourg have exactly the same level of reference ground acceleration (0.04g) in the border area. In general, Germany has adopted lower values of the reference ground acceleration than its neighbouring countries, like France and Belgium, except for a reduced part of its frontier with Czechia and Austria, where a reference ground acceleration close to 0.04g was adopted.

Figure 61 shows that the comparison of seismic zone maps in the border area of Croatia and Slovenia is not an easy task, because the representation adopted in the Croatian seismic zone map does not facilitate the differentiation of the reference ground acceleration levels. In general, the acceleration level in the Croatian side seems higher than in the Slovenian side of the border. The same difficulties arise when comparing the border area of Croatia and Hungary, although herein the hazard levels seem more consistent. The reference ground acceleration values adopted by Austria in the border region with Slovenia and Hungary ranges from 0.04g to 0.10g, which are lower values than the ones adopted in the Slovenian (0.1g to 0.15g) and Hungarian (0.12g to 0.14g) sides of the border. The reference ground acceleration on the border area between Hungary and Romania varies between 0.10g and 0.12g in the Hungarian side, and between 0.08g and 0.20g in the Romanian territory, meaning that the acceleration levels on the northwest border of Romania have reached double values of the ones adopted in the neighbouring Hungary. Notice that Romania has chosen a different return period from the other countries, so the seismic hazard underlying its seismic map is not directly comparable with the other countries hazards. In the Romanian side of the border area with Bulgaria, four different seismic zones are shown, with reference ground acceleration levels ranging between 0.12g and 0.20g. On the other hand, on the Bulgarian side of the border, two different seismic zones are drawn with reference ground acceleration levels of 0.11g and 0.15g.

Finally, Figure 61 shows that in the border area between Greece and Bulgaria, the former has adopted two different seismic zones with reference ground acceleration levels of 0.16 g and 0.24g and the latter has implemented lower acceleration values varying between 0.11g and 0.23g. It is clear that there is no matching on the reference ground acceleration levels in these neighbouring regions, since zone Z2 in Greece (0.24g) is nearby a Bulgarian zone with a reference ground acceleration level of 0.15g, and zone Z1 in Greece (0.16g) is close to Bulgarian seismic zones with 0.15g and 0.11g.

As discussed previously, there are still a lot of differences in the seismic zone maps adopted in EN 1998-1 by the EU Member States. Note that the national seismic provisions were produced in different times and this may have contributed to the different layouts of the seismic maps. Additionally, as a result of different national practices, the seismic zone maps show discontinuities in the seismic levels at countries borderlines, making it difficult to harmonise the use of Eurocodes in neighbouring areas of different Member States.

Seismic zonation and the definition of the seismic action are key elements for all parts of EN 1998 and advancements towards a more harmonised seismic zonation, still enabling the Member States to establish their own safety levels, are a matter of priority in the next generation of Eurocodes.

3.4 Analysis of the consensus on using the NDPs to facilitate the harmonisation in the 2G of Eurocodes

3.4.1 NDPs with high and low rate of acceptance

Figure 63 presents the percentage and number of NDPs, per Eurocode, that reached an overall consensus among the uploading countries, *i.e*. the numbers of NDPs shown in the dark grey boxes in the Figure were accepted by 100% of the countries. Figure 64 presents the percentage and number of NDPs, per Eurocode, that met the criterion of being accepted by at least 90% of the countries. In other words, in Figure 63 the numbers refer to the NDPs that have been accepted by all uploading countries and in Figure 64 the numbers refer to the NDPs that have been accepted by at least 9 out of 10 of the uploading countries.

Figure 63. Percentage and number of NDPs with **100% of acceptance rate per Eurocode**

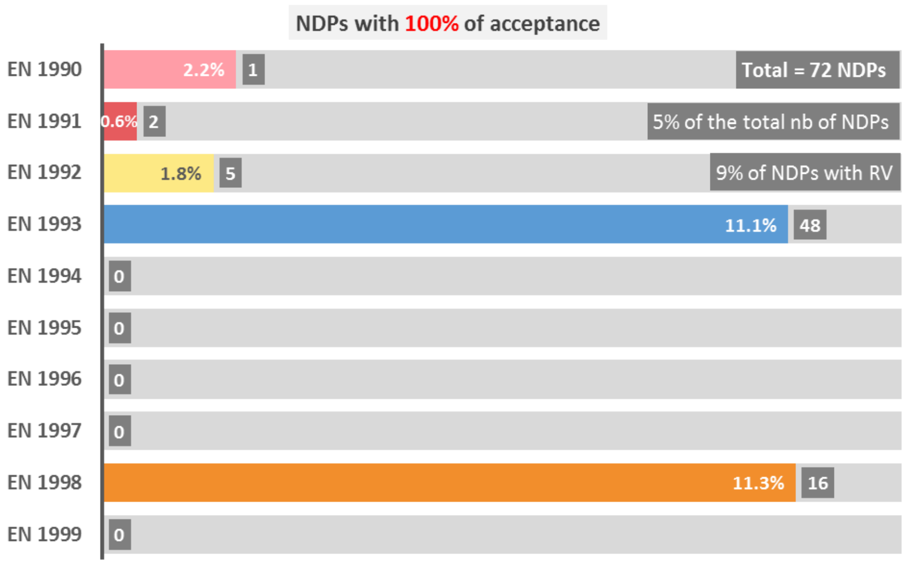
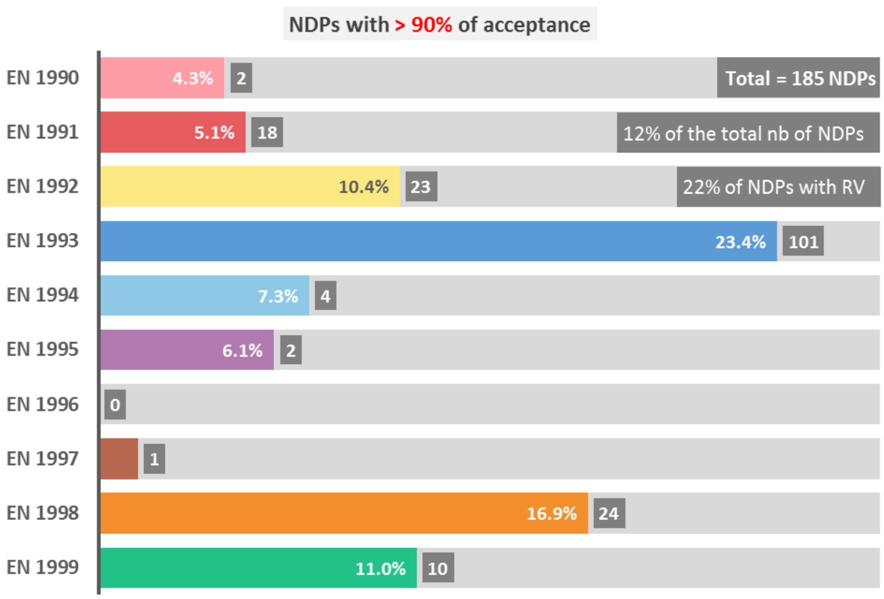


Figure 64. Percentage and number of NDPs with **acceptance rate higher than 90% per Eurocode**



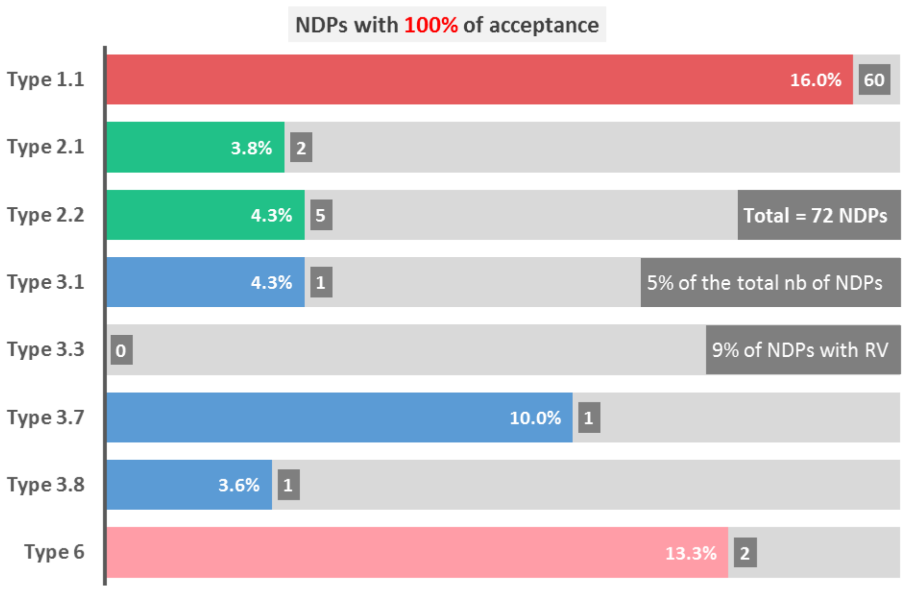
Note that the percentages represented by the coloured bars in the Figures were calculated against the total number of NDPs existing in each Eurocode. In contrast, the dark grey text boxes reporting total values in the Figures show percentages calculated against the total number (1 506) of NDPs, and against the total number (839) of NDPs with RVs, existing in all Eurocodes. With that in mind, the results show that 5% of the total number of NDPs existing in the Eurocodes, were accepted by 100% of the uploading countries. That percentage raises to 9% when it is calculated against the total number of NDPs with RV, instead of being calculated against the total number of NDPs existing in the Eurocodes. For its part, Figure 64 shows that 12% of the total number of NDPs existing in the Eurocodes are accepted by, at least, 9 out of 10 of the uploading countries, but that percentage raises to 22% when the total number of NDPs with RVs is considered.

The Figures also show that EN 1993 is reaching the highest consensus among the uploading countries, since 11% of the total number of NDPs with RVs were accepted by 100% of the countries uploading this Eurocode, and 23% of the NDPs with RVs were accepted by at least 90% of the countries uploading EN 1993. On the contrary, none of the RVs of EN 1994, EN 1995, EN 1996, EN 1997 and EN 1999 was accepted by 100% of the uploading countries.

Annex F presents the list of NDPs that were accepted by 100% of the uploading countries.

Figure 65 presents, per NDP type, the percentage and number of NDPs with RVs that reached 100% of acceptance among the uploading countries.

Figure 65. Percentage and number of NDPs with **100% of acceptance rate per NDP type**



The NDPs of type 1.1 (*Pre-determined parameters with RV*), which, as previously referred, are mainly related to the determination of actions for design, to the material properties of structures and to the geometric data, reached the highest consensus among the uploading countries, with 60 NDPs being accepted by all uploading countries. This number corresponds to 16% of the NDPs type 1.1 uploaded in the Database. Further analysis showed that if the acceptance criterion changes to "being accepted by at least 90% of the uploading countries" instead of "being accepted by 100% of the countries", the number of NDPs type 1.1 uploaded in the Database meeting the new criterion raises to 131. These results corroborate the analysis made in section 3.2.1.4 (Figure 26), which showed that the NDPs of type 1.1 have an acceptance rate of 82% for all Eurocodes, and lead to the conclusion that there is a very good harmonisation in the national implementation of NDPs of type 1.1.

Figure 66 displays the number of NDPs with acceptance rates ranging from less than 1% to less than 50%. Based on the Figure, it can be concluded that there is one NDP with an acceptance rate lower than 7% and 10 NDPs with an acceptance rate lower than 20%.

Figure 66. Number of NDPs with an **acceptance rate lower than** a specific percentage: **7%, 10%, 20% and 50%**

The list of NDPs with an acceptance rate lower than 20% is presented in Table 11. In this Table the acceptances rates lower than 10% are highlighted in bold. Also shown in the last column of Table 11 is the number of countries accepting the RV *versus* the number of countries uploading the NDPs in the Database.

Table 11. NDPs with **acceptance rate lower than 20%**

EN	Part	Section & Clause	Description	NDP type	Acceptance rate
1990	A-2	Annex A2.3.1 Table A2.4 (B) NOTE 1, 2 and 4	NOTE 1: The choice between 6.10, or 6.10a and 6.10b, NOTE 2: Values of γ and ξ factors, NOTE 4: Value of γ_{Sd}	2.1	**7.1% (1 / 14)**
1991	1-1	6.3.1.2 (1) Table 6.2	Values for q_k and Q_k	2.2	**8.3% (2 / 24)**
		6.3.3.2 (1) Table 6.8	Imposed loads on garages and vehicle traffic areas	2.2	12.5% (3 / 24)
		6.3.4.2 (1) Table 6.10	Imposed loads on roofs of category H	2.2	16.7% (4 / 24)
		6.4 (1) Table 6.12	Horizontal loads on partition walls and parapets	2.2	17.4% (4 / 23)
	2	4.3.2 (3) NOTE 1	The values of α_{Qi}, α_{qi} and α_{qr} factors	3.1	15.4% (2 / 13)
	2	6.3.2 (3)	Values of α factor	1.1	**8.3% (1 / 12)**
1996	1-1	2.4.3 (1)	The value of γ_M for the ultimate limit state	2.2	16.7% (3 / 18)
	3	2.3 (2)	The values of γ_M	2.2	**6.7% (1 / 15)**
1998	1	9.2.4(1)	Alternative classes for perpend joints in masonry	3.1	17.6% (3 / 17)

The analysis of the 108 NDPs with an acceptance rate lower than 50% showed that most of them (47%) are of type 3.1, described as *Acceptance of recommended procedures / approaches or introduction of new ones*. However, there are also 12 NDPs of type 1.1 with an acceptance rate ranging from 8 to 48%.

3.4.2 Pre-determined parameters with the largest divergences from RV

The national choices for the NDPs of type 1.1 with the largest deviations from the RV are analysed in the current section in order to identify the causes of such deviations.

Table 12 presents a selection of NDPs values uploaded in the Database for which at least one country adopted a value higher than the double, or lower than one half the prescribed RV. Table 12 exhibits the following values for each parameter: (i) the RV, (ii) the minimum value uploaded, (iii) the maximum value uploaded, (iv) the mean of the values uploaded by countries, (v) the standard deviation of the values uploaded by countries (σ), (vi) the number of values used in the analysis (#), (vii) the number of countries accepting the RVs and (viii) the percentage of acceptance of RVs.

Highlighted in bold in the Table are the cases for which all uploading countries, except one, accepted the recommended values, corresponding, in most cases, to percentages of acceptance equal or greater than 90%, also bold highlighted. In such cases, a single country uploaded a value with a large deviation from the recommended, and all the others accepted the value recommended in the standards. Thus, the uploaded value with large divergence from the recommended corresponds to the maximum or to the minimum values shown in Table 12. Figure 67 depicts illustrative examples of large divergent NDPs values uploaded, presenting their Show Pages in the Database.

For instance, the 25 times higher value than the recommended uploaded in EN 1998-2, and previously illustrated in Figure 28, correspond to a value equal to 0.5 uploaded for NDP 7.7.1(2) (*Value of factor* δ_w *for the lateral restoring capability of the isolation system*), in which the recommended value is 0.015 (see Figure 67, top). In this particular case, the National Annex of the country was checked and the value uploaded in the Database was confirmed.

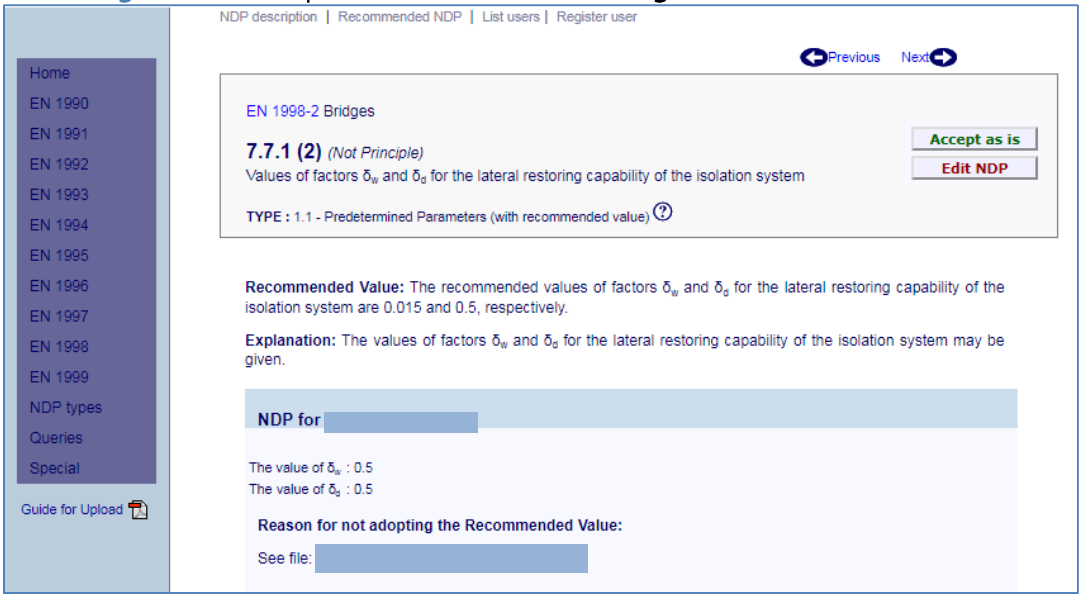
Another example of a large divergence from the recommended value is the national choice equal to 0.01 MN uploaded in the NDP 4.6.2(4) of EN 1991-1-7 (*Impact forces on bridge decks from ships*), for which the Eurocode recommended value equals 1 MN (see Figure 67, middle). In this case, the country National Standardization Body should be contacted to check whether a mistake has occurred in the uploading process.

A third example is the NDP of clause 5, section 2.1.3 of EN 1998-4, corresponding to the *Reference return period* T_{DLR} *of seismic action for the damage limitation state (or, equivalently, reference probability of exceedance in 10 years,* P_{DLR}). The recommended values for this NDP are T_{DLR} = 95 years and P_{DLR} = 10%. Among the 12 countries uploading this NDP in the Database, 11 have accepted the RV. Therefore, the different values correspond to the minimum and maximum values shown in Table 12, *i.e.*, T_{DLR} = 30 years and P_{DLR} = 28% (see Figure 67, bottom). In this case, the National Annex of the country was checked and the value uploaded in the Database was confirmed.

Table 12. NDPs with **the largest deviation from the RV**

EN	Part	Section & Clause	RV	Min	Max	Mean	σ	#	Nb countries accepting	RV acceptance %
1991	1-1	5.2.3(3)	20	0	50	20.9	9	23	17	74
	1-5	6.1.5(1)	0.35	0.35	0.8	0.37	0.1	20	16	80
	1-5	Annex A.2(2)	0.06	0.02	0.06	0.05	0.01	18	13	72
	1-7	4.6.2(4)	1	0.01	1	0.89	0.31	17	11	65
1992	2	113.2(102)	200	200	1000	245	179	20	16	80
	2	8.10.4(105)	50	20	100	50.1	13.6	21	18	86
	1-1	3.2.7(2)	0.9	0.01	0.9	0.86	0.18	24	18	75
	1-1	4.4.1.3(4)	40	10	50	36.900	8.6	24	18	75
	1-1	5.10.2.2(4)	50	20	50	48.8	6	**25**	**24**	**96**
	1-1	6.5.4(6)	3	1	3	2.84	0.54	25	22	88
1993	4-1	8.4.1(6)	10	10	30	11.9	5.4	16	14	88
	4-1	8.4.2(5)	10	10	30	12.5	5.8	16	13	81
	4-1	9.8.2(2)	0.05	0.01	0.05	0.05	0.01	**15**	**14**	**93**
	3-2	2.6(1)	30	10	30	28.5	5.6	13	11	85
	1-3	3.2.4(1)	15	3	15	13.5	4.1	16	12	75
	4-3	3.2(2)	50	50	120	55	18.7	**14**	**13**	**93**
	1-5	9.2.1(9)	6	2	6	5.81	0.87	**21**	**20**	**95**
	1-5	Annex C.8(1) NOTE 1	5	2	5	4.85	0.67	20	16	80
	1-6	6.3(5)	50	20	50	48.3	7.1	**18**	**17**	**94**
	1-6	7.3.2(1)	25	10	25	24.21	3.44	**19**	**17**	89
1998	1	2.1(1) NOTE 1	475	100	475	452	93.8	**16**	**15**	**94**
	1	2.1(1) NOTE 1	10	10	39	11.8	7.25	**16**	**15**	**94**
	1	2.1(1) NOTE 3	95	30	95	90.4	17.4	**14**	**13**	**93**
	1	2.1(1) NOTE 3	10	10	28	11.3	4.8	**14**	**13**	**93**
	1	7.1.2(1) NOTE 1	1.5	1.5	4	1.68	0.61	17	14	82
	1	9.2.3(1)	5	1	5	4.71	1.07	14	11	79
	2	2.1(3)	475	100	475	444	108	12	10	83
	2	7.7.1(2)	0.015	0.015	0.5	0.06	0.15	**10**	**9**	**90**
	4	2.1.2(4)	475	100	475	444	108	**12**	**11**	**92**
	4	2.1.3(5)	95	30	95	89.6	18.78	**12**	**11**	**92**
	4	2.1.3(5)	10	10	28	11.5	5.2	**12**	**11**	**92**

Figure 67. Examples of NDP **values with large deviation from the RV**



NDP description | Recommended NDP | List users | Register user

Previous Next

Home
EN 1990
EN 1991
EN 1992
EN 1993
EN 1994
EN 1995
EN 1996
EN 1997
EN 1998
EN 1999
NDP types
Queries
Special
Guide for Upload

EN 1998-2 Bridges

7.7.1 (2) *(Not Principle)*
Values of factors δ_w and δ_d for the lateral restoring capability of the isolation system

TYPE : 1.1 - Predetermined Parameters (with recommended value)

Accept as is
Edit NDP

Recommended Value: The recommended values of factors δ_w and δ_d for the lateral restoring capability of the isolation system are 0.015 and 0.5, respectively.

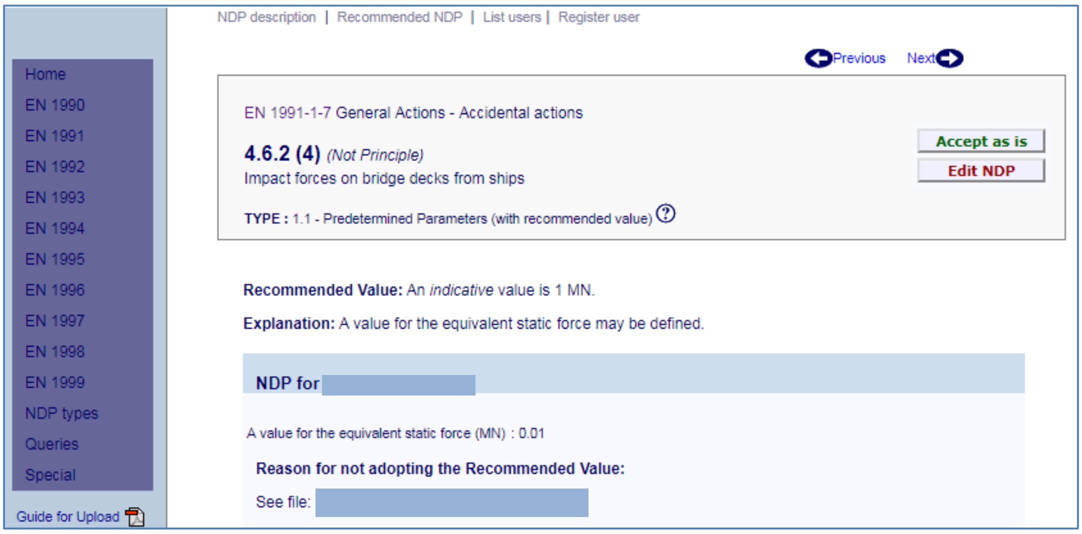
Explanation: The values of factors δ_w and δ_d for the lateral restoring capability of the isolation system may be given.

NDP for

The value of δ_w : 0.5
The value of δ_d : 0.5

Reason for not adopting the Recommended Value:

See file:



NDP description | Recommended NDP | List users | Register user

Previous Next

Home
EN 1990
EN 1991
EN 1992
EN 1993
EN 1994
EN 1995
EN 1996
EN 1997
EN 1998
EN 1999
NDP types
Queries
Special
Guide for Upload

EN 1991-1-7 General Actions - Accidental actions

4.6.2 (4) *(Not Principle)*
Impact forces on bridge decks from ships

TYPE : 1.1 - Predetermined Parameters (with recommended value)

Accept as is
Edit NDP

Recommended Value: An *indicative* value is 1 MN.

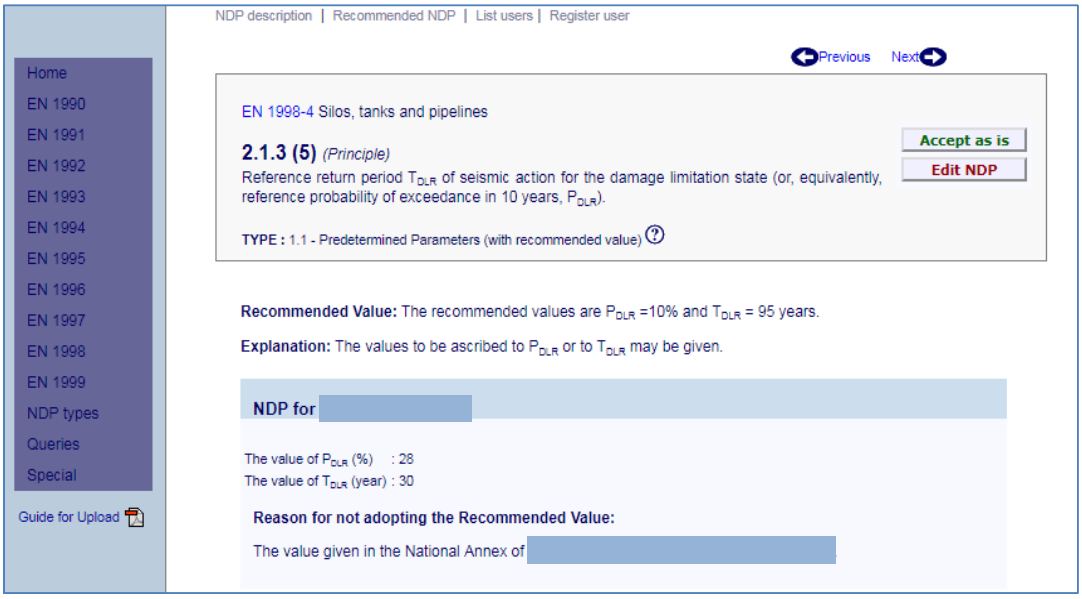
Explanation: A value for the equivalent static force may be defined.

NDP for

A value for the equivalent static force (MN) : 0.01

Reason for not adopting the Recommended Value:

See file:



NDP description | Recommended NDP | List users | Register user

Previous Next

Home
EN 1990
EN 1991
EN 1992
EN 1993
EN 1994
EN 1995
EN 1996
EN 1997
EN 1998
EN 1999
NDP types
Queries
Special
Guide for Upload

EN 1998-4 Silos, tanks and pipelines

2.1.3 (5) *(Principle)*
Reference return period T_{DLR} of seismic action for the damage limitation state (or, equivalently, reference probability of exceedance in 10 years, P_{DLR}).

TYPE : 1.1 - Predetermined Parameters (with recommended value)

Accept as is
Edit NDP

Recommended Value: The recommended values are P_{DLR} =10% and T_{DLR} = 95 years.

Explanation: The values to be ascribed to P_{DLR} or to T_{DLR} may be given.

NDP for

The value of P_{DLR} (%) : 28
The value of T_{DLR} (year) : 30

Reason for not adopting the Recommended Value:

The value given in the National Annex of

3.4.3 Pre-determined parameters not uploaded in the required format

As described in Table 2, the NDPs of types 1.1 and 1.2 are classified as pre-determined parameters. The NDPs of type 1.1 have numeric recommended values given in the standards and the NDPs of type 1.2 do not have specific values recommended in the standards.

In October 2017, a first extraction from the Database was prepared, selecting the NDPs of type 1.1 and 1.2 that were not uploaded in the format prescribed by the standards.

The mentioned extraction comprised NDP values uploaded in an incorrect format by mistake, but also NDPs values for which the countries tried to follow the requirements of their National Annexes. For instance, instead of uploading a single numeric value, the countries uploaded multiple numerical values or even procedures, because the National Annexes prescribed different solutions from what is stated in the Eurocodes. For this reason, the list of NDPs not uploaded in the Database in the required format may be a useful information to support the harmonisation works on the second generation (2G) of the Eurocodes.

Examples of NDP values not uploaded in the required format are listed in the following:

1. NDPs were uploaded as empty values, but the countries did provide a reason for not adopting the RVs. The "Reason" provides a rational explanation for the NDP not being uploaded in the format required by the standards.
2. NDPs were uploaded with incorrect format, *e.g.*:

   (a) multiple numeric values, instead of a single numeric value,

   (b) procedure or a reference to a procedure instead of a numeric value,

   (c) justification text instead of the NDP value.

Figure 68 shows an example of an NDP, *The value of the season factor* c_{season} in clause 4.2 (2) NOTE 3 of EN 1991-1-4, where the countries should provide a single numeric value. For this NDP, 5 out of 20 countries did not upload a single numerical value as recommended in EN 1991-1-4. Instead, they uploaded values of the season factor dependent on the month of the year.

Table 13 presents the list of NDPs where 5 or more MS did not upload a single numeric value as stated in the Eurocodes. For instance, for the NDP 4.2 (2) Note 3 in EN 1991-1-4, *The value of the season factor,* c_{season} , and NDP 8.1(4) in EN 1991-1-4, *A value for* $V^{*}_{b,0}$, the countries provided a list of values in their National Annexes, instead of a single value, depending on the month of the year or on the geographic regions. For the remaining NDPs exemplified in Table 13 there were countries that provided in their National Annexes detailed rules or procedures for calculation, instead of the parameters as prescribed in the standards.

Figure 68. Example of a **NDP not uploaded as a single value** as recommended in the Eurocodes

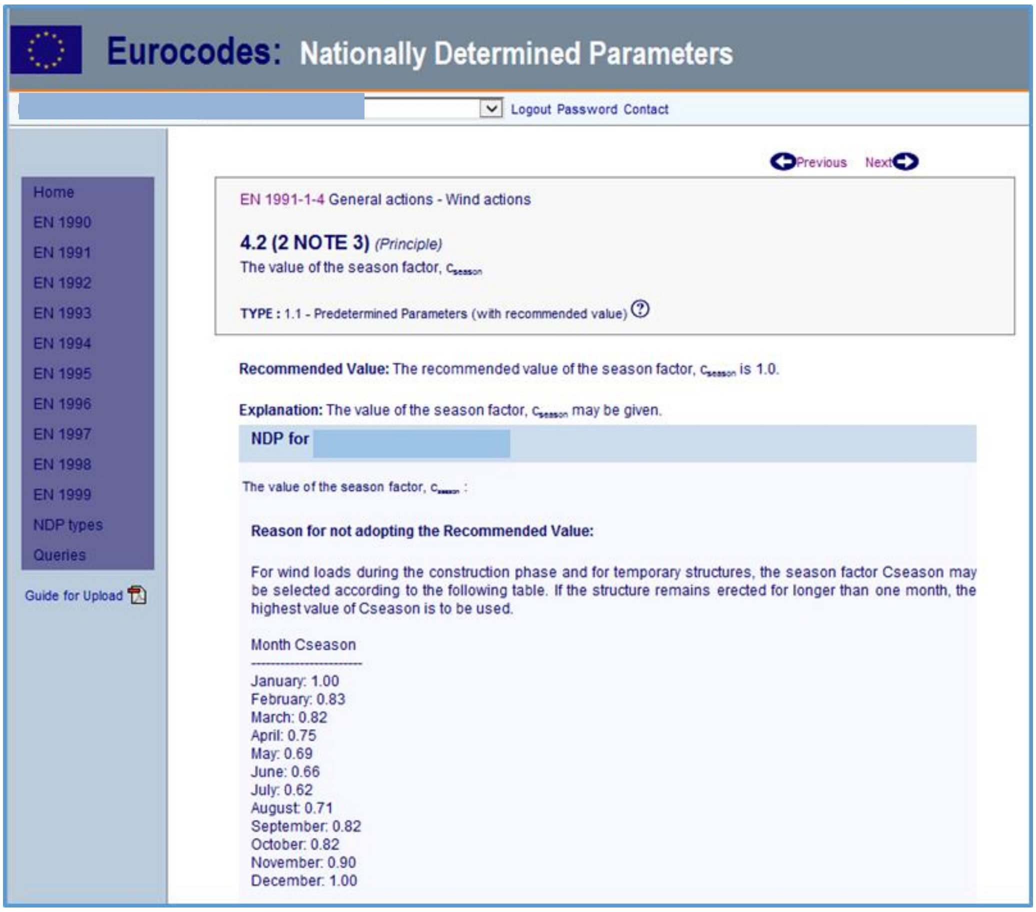


Table 13. **NDPs** for which five or more countries did **not upload a single numeric value**, as recommended in the Eurocodes

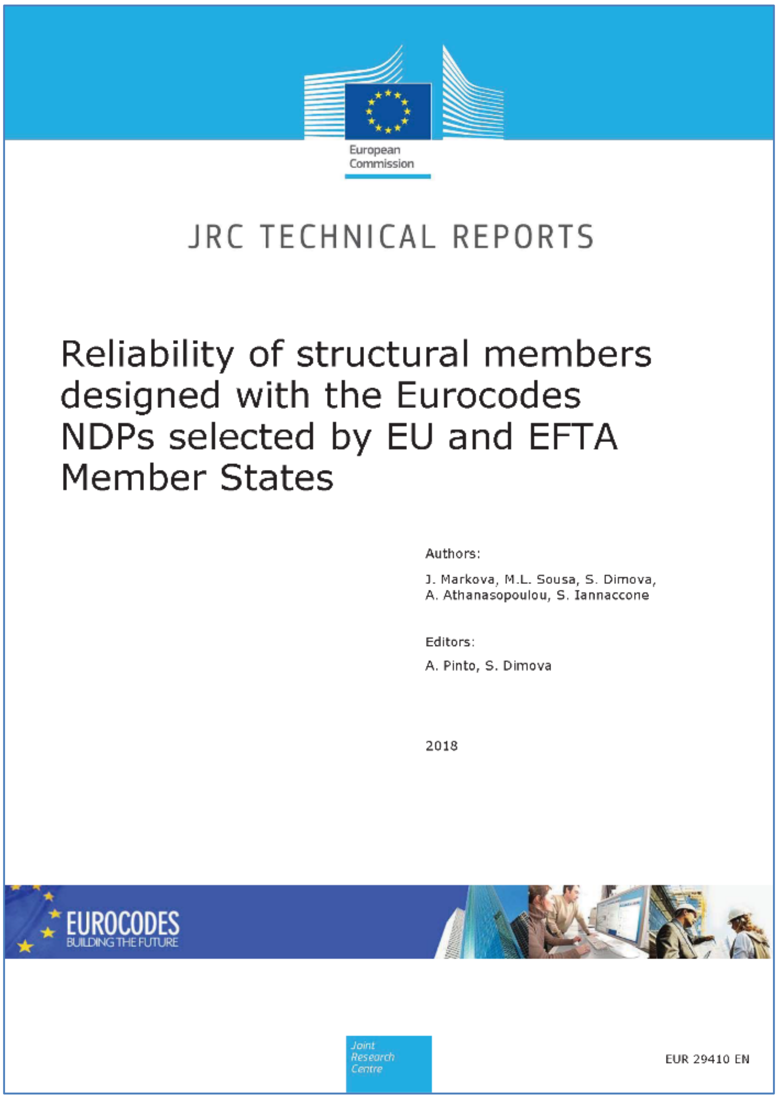
EN	Part	Section & Clause	Description	No.MSs
1991	1-4	4.2 (2) NOTE 3	The value of the season factor, c_{season}	5
		4.3.1 (1) NOTE 1	The orography factor, c_0	5
		NDP 8.1 (4)	A value for $V^*_{b,0}$	5
1992	1-1	NDP 2.3.3 (3)	The value of d_{joint}	6
		NDP 9.10.2.2 (2)	Values of q_1 and Q_2	5
1993	1-5	NDP Annex C.9 (3)	The partial factors γ_{M1} and γ_{M2}	5
1995	1-1	10.9.2 (4)	Erection of trusses with punched metal plate fasteners: Maximum deviation	6
1998	1-1	NDP 9.2.2 (1)	Minimum strength of masonry units	6

4 Reliability levels of design achieved with NDPs selected by Member States

4.1 General

This section summarizes a recent study (Markova et al., 2018) on the reliability levels of structural members in buildings designed according to the partial factor method implemented in the Eurocodes and using the Nationally Determined Parameters uploaded in the JRC Database. The study was performed in the frame of Administrative Arrangements between DG GROW and the JRC and the results were published in a JRC technical report (EUR 29410 EN), whose cover page is displayed in Figure 81.

Figure 69. Cover page of the JRC report "**Reliability of structural members designed with the Eurocodes NDPs selected by EU and EFTA Member States**"


European Commission

JRC TECHNICAL REPORTS

Reliability of structural members designed with the Eurocodes NDPs selected by EU and EFTA Member States

Authors:

J. Markova, M.L. Sousa, S. Dimova, A. Athanasopoulou, S. Iannaccone

Editors:

A. Pinto, S. Dimova

2018

EUROCODES BUILDING THE FUTURE

Joint Research Centre

EUR 29410 EN

The analysis of the reliability levels achieved with the NDPs chosen by the Member States complements the statistical analysis of the NDPs by providing a more global assessment of the impact the national choices have on the technical differences for construction works or parts of works. While the statistical analysis of the NDPs evaluates the divergences in the choices of NDP values, the assessment of the reliability allows clustering the national choices related to the design of particular types of structures and comparing their combined impact on the level of safety achieved.

Reliability is defined in the Eurocodes as the "ability of a structure or a structural member to fulfil the specified requirements, including the design working life, for which it has been designed". The reliability levels are expressed by reliability indices, β, which are calculated by probabilistic analysis considering the uncertainties in the actions and material properties, and the uncertainties in the modelling of action effects and structural resistance. The Eurocodes recommend different minimum values for reliability indices, for three reliability classes, which are associated to the consequences of failure or malfunction of the structure.

4.2 Description of the study

The reliability levels of structural members in buildings were assessed using the NDPs uploaded in the Database in 2017 by 16 EU countries and consulting the National Annexes of four EU and EFTA Member States. Besides considering the national choices adopted by the Member States, the reliability analysis was also performed using the recommended values provided in the Eurocodes, herein called as CEN RVs or CEN values.

For the study, five basic structural members (beam, column, slab, tie and wall) made of five different materials (reinforced concrete, composite steel concrete, steel, timber and masonry) were selected, as follows:

- reinforced concrete (RC) beam, column and slab,
- composite steel concrete slab,
- steel tie and column,
- timber beam and column,
- masonry wall.

The imposed loads considered in the analysis correspond to commonly used categories of loaded areas A to D in buildings, as specified in clause (1) of section 6.3.1.1 of EN 1991-1-1: *Areas in residential, social, commercial and administration buildings shall divided into categories according to their specific uses shown in Table 6.1*. In that table typical buildings whose prevailing type of area corresponds to these categories of loaded areas are:

- residential buildings and houses (category A);
- office buildings (category B);
- schools (category C1);
- churches, theatres, cinemas (category C2);
- museums, exhibition centres (category C3);
- sports facilities (category C4);
- concert halls, sports halls (category C5);
- retails shops (category D1);
- department stores (category D2).

Four alternative procedures for the fundamental combination of actions, specified in EN 1990 may be chosen by the countries in the EN 1990 NDPs Annex A1.3.1 (1) (Table A1.2(A) to (C)) and Annex A1.3 (1) (Table A1.2(B)):

- *procedure a*, when the alternative expression (6.10) provided in EN 1990 for the fundamental combination of actions is considered;
- *procedure b,* when the twin expressions (6.10a) and (6.10b) are used;
- *procedure c,* when in the first one of the twin expressions, only permanent actions are applied, here denoted as $6.10a_{mod}$; the twin expressions are then identified by ($6.10a_{mod}$, 6.10b);

- *procedure a + b*, when there is the national possibility of application of both *procedures a* or *b*, *i.e.*, when the national choice comprises expression (6.10), but also expressions (6.10a) and (6.10b) can be applied.

The reliability indices, denoted as β, were obtained for selected values of the load ratio, χ defined as the ratio between the characteristic value of an imposed load and the characteristic value of a total load.

The obtained reliability indices were compared with the recommended minimum values for reliability index, given in Table B.2 of EN 1990 for the reference period of 50 years, here denoted as β_t and referred to as the recommended target reliability index.

To recall, for purpose of reliability differentiation, Table B.1 in Annex B of EN 1990 define three consequence classes (CC) according to the consequences of failure or malfunction of a structure. Consequence classes CC1, CC2 and CC3 are defined, respectively, as having low, medium and high consequences for loss of human life, or negligible, considerable and very great economic, social or environmental consequences. In the same Annex B of EN 1990, the clause B3.2(2) states that three reliability classes RC1, RC2 and RC3 may be associated with the three consequences classes CC1, CC2 and CC3. The three reliability classes (RC1, RC2 and RC3) are defined by the β reliability index concept (clause B3.2(1)), which is a function of the probability of failure. Table B2 of EN 1990 gives the recommended minimum values for the reliability index β_t, for ultimate limit states (Gulvanessian *et al.,* 2002).

Common buildings with categories of imposed loads A, B, C1 to C3, D1 and D2 are classified in the reliability class RC2 and the recommended minimum value for the reliability index is 3.8, for a 50 years reference period. Buildings in categories C4 and C5, typically used for sport activities or for concert and sport halls are classified in the reliability class RC3 and the recommended minimum value for the reliability index is β_t = 4.3, for a 50 years reference period. Note that Denmark has set up in its National Annex to EN 1990 target reliability indexes for a reference period of 1 year, with values β_t = 4.3 for the class RC2 of structural members and β_t = 4.7 for the class RC3, that correspond, for a 50 years reference period, to β_t = 3.3 for the former, and β_t = 3.8 for the latter.

4.3 Summary of results

The minimum and maximum values of reliability indices, β, were obtained in a common interval of the load ratio, χ ranging from a lower bound equal to 0 to an upper bound equal to 0.7, for the nine different structural members and for the loaded areas of categories A to D. The reliability indices were also obtained for a load ratio considered typical between the characteristic value of an imposed load and the characteristic value of the total load, *i.e.,* for χ equal to 0.4. Finally, the load ratios for which the reliability indices achieved the extreme values were investigated.

Table 14 summarises the findings of the study on the example of a steel column. The calculated reliability indices are shaded in red in case they are lower than the minimum indicative level, β_t, of the reliability classes given in EN 1990 and shaded in blue otherwise. In both cases, the greater the difference to the target reliability levels, the stronger is the colour of the shade covering the reliability levels.

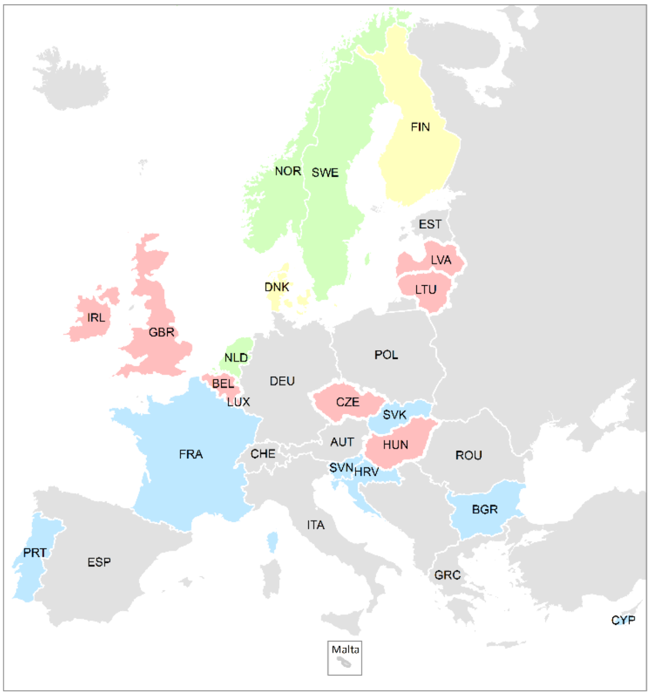
The alternative procedures adopted by the countries for the fundamental combination of actions are shown in the last column of the Table 14 and in in Figure 70. Eight countries chose the possibility of application of both *procedures*, *i.e.*, a + b. The procedure *adopted in the calculations* is identified in Table 14, *italic underlined,* as follows: *a* + b or a + *b*.

Table 14. Minimum and maximum reliability indices (β) for relevant χ load ratios, and reliability indices for the load ratio χ = 0.4, considering the categories of imposed loads **A to D2 – steel column**

MS\Cat. of imposed loads	A houses			B offices			C1 Schools			C2 cinemas			C3 Museums			C4 sport facilities			C5 concert halls			D1 retail shops			D2 depart. stores			Load comb.
	β_{min}	$\beta_{\|\chi=0.4}$	β_{max}	β_{min}	$\beta_{\|\chi=0.4}$	β_{max}	β_{min}	$\beta_{\|\chi=0.4}$	β_{max}	β_{min}	$\beta_{\|\chi=0.4}$	β_{max}	β_{min}	$\beta_{\|\chi=0.4}$	β_{max}	β_{min}	$\beta_{\|\chi=0.4}$	β_{max}	β_{min}	$\beta_{\|\chi=0.4}$	β_{max}	β_{min}	$\beta_{\|\chi=0.4}$	β_{max}	β_{min}	$\beta_{\|\chi=0.4}$	β_{max}	
CEN	***3.8***	***4.4***	***4.6***	***3.9***	***4.9***	***5.0***	***3.9***	***4.5***	***4.7***	***3.9***	***4.4***	***4.5***	***3.9***	***4.7***	***4.8***	***4.5***	***5.2***	***5.2***	***3.7***	***4.4***	***4.6***	***3.9***	***4.5***	***4.6***	***3.9***	***4.9***	***4.9***	**a+b**
BEL	3.8	4.4	4.6	3.9	4.9	5.0	3.9	4.5	4.7	3.9	4.4	4.5	3.9	4.7	4.8	4.5	5.2	5.2	3.7	4.4	4.6	3.9	5.0	5.0	3.9	4.9	4.9	a+b
BGR	3.9	4.6	4.9	4.2	5.2	5.3	4.0	4.7	5.0	4.2	4.8	4.8	4.2	4.9	5.1	4.8	5.5	5.5	4.8	5.7	5.7	4.1	4.8	4.9	4.2	5.1	5.1	a
CYP	3.8	4.4	4.6	3.9	4.9	5.0	3.9	4.5	4.7	3.9	4.4	4.5	3.9	4.7	4.8	4.5	5.2	5.2	3.7	4.4	4.6	3.9	5.0	5.0	3.9	4.9	4.9	a
CZE	3.4	4.0	4.4	3.9	4.5	4.6	3.9	4.5	4.7	3.9	4.4	4.5	3.9	4.7	4.8	4.5	5.2	5.2	3.7	4.4	4.6	3.9	5.0	5.0	3.9	4.9	4.9	a+b
DNK	3.6	4.1	4.3	3.9	4.6	4.6	3.8	4.2	4.3	3.6	4.6	5.0	3.9	4.8	4.9	4.4	5.3	5.4	4.1	4.4	4.9	3.9	5.1	5.1	3.9	5.0	5.0	c
FIN	3.5	4.0	4.1	3.5	4.1	4.1	3.4	3.7	3.9	3.1	3.3	3.9	3.5	3.9	3.9	4.0	4.7	4.7	3.9	4.4	4.5	3.4	4.0	4.0	3.5	4.4	4.4	c
FRA	3.4	4.0	4.4	3.9	4.5	4.6	3.5	4.1	4.5	3.9	4.4	4.5	3.7	4.3	4.5	4.5	5.2	5.2	4.1	4.7	4.7	3.9	5.0	5.0	3.9	4.9	4.9	a
GBR	3.8	4.4	4.6	3.9	4.9	5.0	3.9	4.5	4.7	3.9	4.4	4.5	3.9	4.7	4.8	4.5	5.2	5.2	3.7	4.4	4.6	3.9	4.5	4.6	3.8	4.4	4.4	a+b
HRV	2.7	3.9	3.9	2.7	4.4	4.4	2.7	4.0	4.1	2.7	3.8	4.1	2.7	4.2	4.2	3.2	4.6	4.6	3.2	3.6	3.6	2.7	3.4	3.4	2.7	4.3	4.3	a
HUN	3.8	4.4	4.6	3.9	4.9	5.0	3.9	4.5	4.7	3.9	4.4	4.5	3.9	4.7	4.8	4.5	5.2	5.2	3.7	4.4	4.6	3.9	4.5	4.6	3.9	4.9	4.9	a+b
IRL	3.8	4.4	4.6	3.9	4.9	5.0	3.9	4.5	4.7	3.9	4.4	4.5	3.9	4.7	4.8	4.5	5.2	5.2	3.7	4.4	4.6	3.9	4.5	4.6	3.9	4.9	4.9	a+b
LTU	3.1	3.8	4.2	3.1	3.8	4.1	3.6	4.2	4.5	3.8	4.0	4.1	3.8	4.4	4.6	4.2	4.9	4.9	3.3	4.1	4.5	3.6	4.2	4.4	3.9	4.5	4.5	a+b
LUX	3.8	4.4	4.6	3.9	4.9	5.0	3.9	4.5	4.7	3.9	4.4	4.5	3.9	4.7	4.8	4.5	5.2	5.2	3.7	4.4	4.6	3.9	5.0	5.0	3.9	4.9	4.9	a+b
LVA	3.8	4.4	4.6	3.9	4.5	4.6	3.5	4.1	4.5	3.5	3.9	4.0	3.7	4.3	4.5	4.5	5.2	5.2	4.1	4.7	4.7	3.9	4.5	4.6	3.9	4.9	4.9	a+b
NLD	3.5	3.9	4.0	3.8	4.2	4.2	3.8	4.3	4.4	3.5	4.0	4.2	3.8	4.4	4.4	4.2	4.8	4.8	3.5	4.0	4.5	3.8	4.2	4.2	3.7	4.0	4.0	b
NOR	3.8	4.3	4.5	4.2	4.9	4.9	4.0	4.4	4.6	4.1	4.4	4.5	4.2	4.6	4.7	4.7	5.1	5.1	3.8	4.3	4.8	4.2	4.9	4.9	4.2	4.8	4.8	b
PRT	3.8	4.4	4.6	3.9	4.9	5.0	3.9	4.5	4.7	3.9	4.4	4.5	3.9	4.7	4.8	4.5	5.2	5.2	4.1	4.7	4.7	3.9	4.5	4.6	3.9	4.9	4.9	a
SVK	3.8	4.4	4.6	3.9	4.9	5.0	3.9	4.5	4.7	3.9	4.4	4.5	3.9	4.7	4.8	4.5	5.2	5.2	3.7	4.4	4.6	3.9	4.5	4.6	3.9	4.9	4.9	a
SVN	3.8	4.4	4.6	3.9	4.9	5.0	3.9	4.5	4.7	3.9	4.4	4.5	3.9	4.7	4.8	4.5	5.2	5.2	3.7	4.4	4.6	3.9	4.5	4.6	3.9	4.9	4.9	a
SWE	3.7	4.1	4.2	3.8	4.2	4.2	3.4	3.8	4.1	3.6	3.8	3.9	3.6	4.0	4.1	4.4	4.7	4.7	3.5	4.0	4.5	3.8	4.2	4.2	3.9	4.5	4.5	b
CEN	***3.7***	***4.0***	***4.2***	***3.9***	***4.5***	***4.5***	***3.8***	***4.1***	***4.2***	***3.7***	***3.9***	***4.1***	***3.9***	***4.3***	***4.3***	***4.5***	***4.7***	***4.7***	***3.5***	***3.8***	***4.5***	***3.8***	***4.0***	***4.1***	***3.9***	***4.4***	***4.4***	**a+b**
BEL	3.7	4.0	4.2	3.9	4.5	4.5	3.8	4.1	4.2	3.7	3.9	4.1	3.9	4.3	4.3	4.5	4.7	4.7	3.5	3.8	4.5	3.9	4.5	4.5	3.9	4.4	4.4	a+b
CZE	3.2	3.6	4.1	3.8	4.1	4.1	3.8	4.1	4.2	3.7	3.9	4.1	3.9	4.3	4.3	4.5	4.7	4.7	3.5	3.8	4.5	3.9	4.5	4.5	3.9	4.4	4.4	a+b
GBR	3.7	4.2	4.4	3.9	4.7	4.7	3.8	4.3	4.4	3.8	4.2	4.3	3.9	4.5	4.6	4.5	5.0	5.0	3.6	4.1	4.5	3.8	4.3	4.3	3.7	4.1	4.1	a+b
HUN	3.7	4.0	4.2	3.9	4.5	4.5	3.8	4.1	4.2	3.7	3.9	4.1	3.9	4.3	4.3	4.5	4.7	4.7	3.5	3.8	4.5	3.8	4.0	4.1	3.9	4.4	4.4	a+b
IRL	3.7	4.0	4.2	3.9	4.5	4.5	3.8	4.1	4.2	3.7	3.9	4.1	3.9	4.3	4.3	4.5	4.7	4.7	3.5	3.8	4.5	3.8	4.0	4.1	3.9	4.4	4.4	a+b
LTU	2.9	3.3	4.0	2.9	3.3	3.9	3.5	3.8	4.1	3.4	3.5	3.9	3.6	4.0	4.1	4.0	4.3	4.5	3.0	3.5	4.5	3.4	3.7	4.0	3.8	4.0	4.0	a+b
LUX	3.7	4.0	4.2	3.9	4.5	4.5	3.8	4.1	4.2	3.7	3.9	4.1	3.9	4.3	4.3	4.5	4.7	4.7	3.5	3.8	4.5	3.9	4.5	4.5	3.9	4.4	4.4	a+b
LVA	3.7	4.0	4.2	3.8	4.1	4.1	3.4	3.7	4.1	3.3	3.3	3.9	3.6	3.9	4.1	4.5	4.7	4.7	3.9	4.1	4.5	3.8	4.0	4.1	3.9	4.4	4.4	a+b

β < β_t β > β_t

Figure 70. Procedures chosen for the **fundamental combination of actions** by the countries involved in the reliability study



Procedures for fundamental combination of actions	EN 1990 expressions
a **7** countries	**6.10**
b **3** countries	**6.10a & 6.10b**
c **2** countries	**$6.10a_{mod}$ & 6.10b**
Possibility of application both *procedures* ***a*** **or** ***b*** **8** countries	**6.10, or 6.10a & 6.10b**

To begin with, the results in Table 14 are presented for the structural member designed according to CEN recommended values and for the complete set of 20 countries using the respective choice of load combinations. For the calculation using the CEN recommended values (denoted as CEN), and for the eight countries where the application of both *procedures a* and *b* is allowable, the calculation is firstly made adopting *procedure a*, identified as *a* + *b*. Below, in the same Table 14, the reliability levels are calculated adopting *procedure b* for CEN and for the eight countries where there is the possibility of application of both *procedures*, identified as a + *b*.

In the example given for a steel column, a large number of countries and categories of loaded areas achieved the CEN recommended minimum value for the reliability index. However, when the alternative load *combination b* is adopted, all countries and CEN did not meet the target reliability for the category of imposed loads C5 (concert halls, sports halls) and load ratio χ = 0.4. Croatia's β_{min} is lower than the CEN recommended minimum value for all categories of imposed loads. The maximum relative difference (-31%) to the recommended target is achieved by Lithuania for β_{min} and C5 for the alternative *procedure b*. CEN shows a relative difference of -12% for the load ratio χ = 0.4 for the reliability level of category C5 and *procedure b*.

The reliability indices calculated in the study for the typical load ratio $\chi = 0.4$ vary from 2.9 to 6.8, the former value was obtained by Latvia for the composite steel concrete slab for category of use C2 and for the *combination procedure b* and the latter value was obtained by the United Kingdom for the masonry wall for category of use C4 and for the *combination procedure a*.

Next, an overview of the calculated reliability indices β when compared with the Eurocodes target indices is presented for several structural members and materials. Figure 71 to Figure 80 illustrate the achievement of reliability levels, relatively to CEN target values, using CEN recommended NDPs and Member States choices, for the load ratio χ = 0.4. The graphs show the relative differences achieved with CEN values to the target reliability index β_t, for all categories of imposed loads and for the alternative *procedures a* and *b*, represented by a bullet and by a square marker, respectively. When CEN target reliability index is achieved, the relative difference is represented by a blue marker, otherwise by a light red one. The maps present the cases where the Member States achieved the target reliability levels for (i) both load combinations, i.e., expression (6.10) and the twin expressions (6.10a) and (6.10b) – shaded in blue -, (ii) only one load combination, i.e., either expression (6.10) or the twin expressions (6.10a) and (6.10b) – shaded blue and light red striped - and (iii) for none of the possible load combinations – shaded in light red.

For **reinforced concrete** members (**beam**, **column** and **slab**)designed according to the CEN values, the obtained reliability levels are above the target reliability β_t for both *procedures a* and *b* and for all categories of loaded areas (Figure 71). For these structural members all countries achieved reliability levels for common buildings (reliability class RC2) equal or above the CEN recommended minimum value of β_t = 3.8 for the typical load ratio χ = 0.4. For the categories of loaded areas C4 and C5 (reliability class RC3), the target reliability index β_t = 4.3 was also achieved for most countries. Figure 72 depicts the achievement of reliability levels by Member States for the category C5, for a reinforced concrete column.

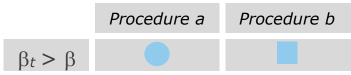
For a **composite steel concrete slab** designed according to CEN values, the obtained reliability levels for the typical load ratio χ = 0.4 are all above the target reliability index β_t when the alternative expression (6.10) for the combination of actions is considered, except for the category of loaded areas C5. When the twin expressions (6.10a) and (6.10b) are used, the obtained reliability levels are below the target reliability index β_t for the category of loaded areas C5 and slightly below for loaded areas A, C2 and C4 (see Figure 73). For most considered countries the obtained reliability level is below the CEN recommended minimum reliability level for categories of loaded areas C2 and C5, mainly when *procedure b* is chosen. Figure 74(a) illustrates the results for the category of imposed loads B and Figure 74(b) for the category of imposed loads C5.

When designed according to CEN recommended values, the considered **steel** structural members (**tie** and **column**) exhibit reliability below the target reliability index for the typical load ratio χ = 0.4, when using *procedure b* for load combination and category C5 (Figure 75). For the steel tie, many countries achieved reliability levels below the CEN target value, for categories of imposed loads A and C5, mainly when *procedure b* is chosen. For a steel column (Figure 76), the results show that for the category of loaded area C5 and when *procedure b* is chosen, all the countries did not achieve a reliability level below the CEN target reliability index. In fact, the reliability levels attained with *procedures a* and *b* by Croatia, Lithuania, the Netherlands, Norway and Sweden are below the CEN target reliability index and countries like Belgium, Czechia, Hungary, Ireland, Latvia, Luxembourg and the United Kingdom did not attain the target reliability level, when using *procedure b* for load combination. On the other hand, countries like Bulgaria, which have chosen the upper bound of the imposed load interval for C5 and adopted a higher value of partial factor for structural steel than the RV in EN 1993-1-1, commonly achieved the CEN recommended minimum reliability level.

For the category C5 for a **timber beam** and both *procedures a* and *b* the reliability levels for the typical load ratio χ = 0.4 are below the CEN target reliability index when using CEN recommended values. Similar results were obtained when using the CEN recommended values for a **timber column** for categories C2, C4 and C5 (see Figure 77). For a timber beam and column for category C5, reliability levels below the CEN target level were also achieved for all considered countries except for Bulgaria. For the timber beam and column, the results show that most considered countries achieved the CEN target reliability index for categories of loaded areas A, B, C1, C3, D1 and D2. Figure 78 illustrates the results for a timber beam for the typical load ratio χ = 0.4 and category of imposed loads A.

The results showed that for the **masonry wall**, made of solid bricks and general mortar, the reliability levels achieved with the recommended by CEN values have met the target reliability indices in all instances (Figure 79). The same results were obtained for the vast majority of the considered countries for all categories of use. A single exception occurred for the Netherlands for category of use C5 for $\chi = 0.4$. The obtained results for all member states are illustrated in Figure 80 for category A.

Figure 71. Relative differences to the **target reliability index** β_t of **RC** structural members designed according to CEN recommended values; alternative *procedures a* and *b*, load ratio χ = 0.4, categories of imposed loads **A** to **D2**.



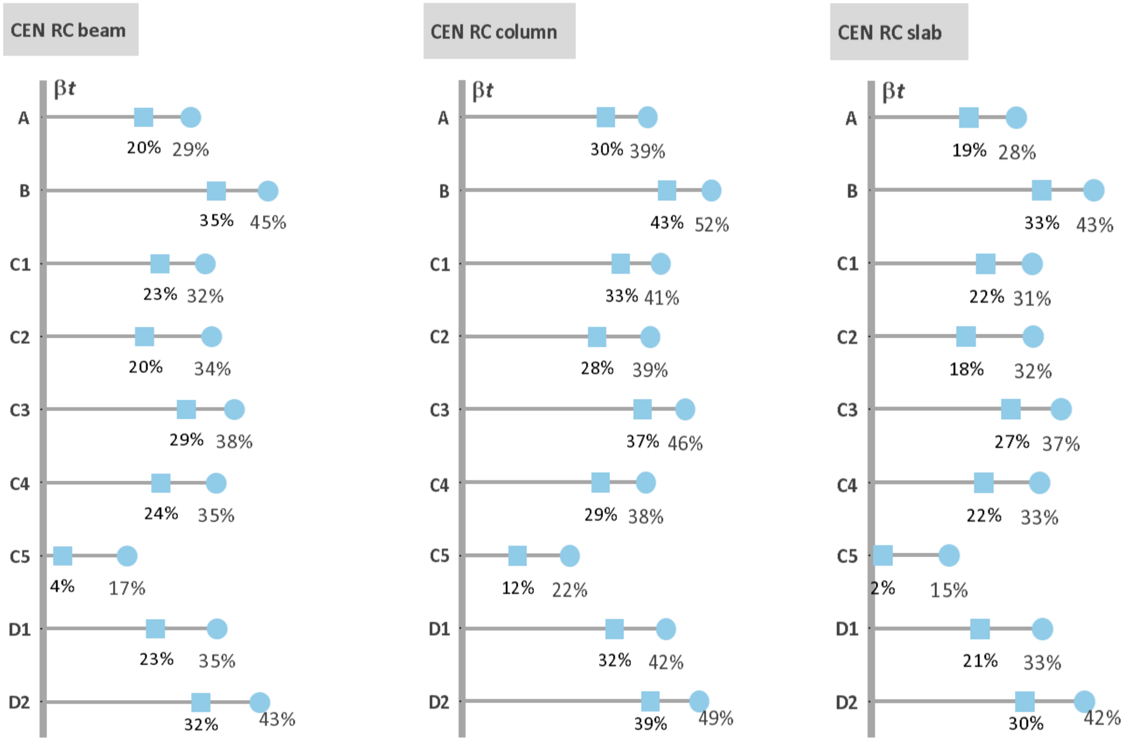


Figure 72. Achievement of reliability levels by Member States relatively to CEN target values; load ratio χ = 0.4, **reinforced concrete column**, category of imposed loads **C5**

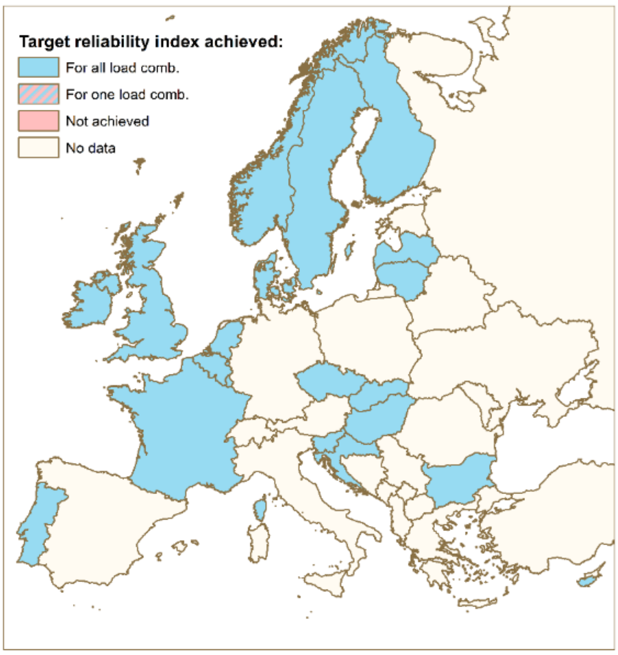


Figure 73. Relative differences to **target reliability index** β_t for a **composite steel concrete slab** designed according to CEN recommended values; alternative *procedures a* and *b*, load ratio χ = 0.4, categories of imposed loads **A** to **D2**.

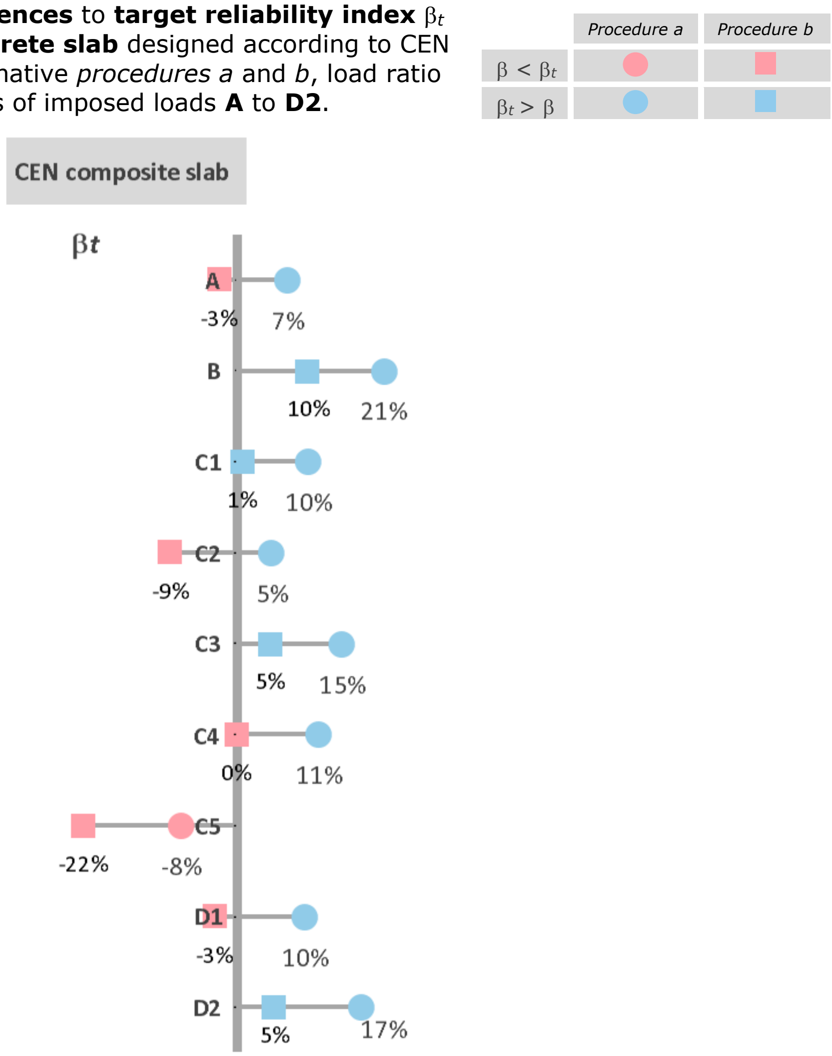


Figure 74. Achievement of reliability levels by Member States relatively to CEN target values; load ratio χ = 0.4, **composite steel concrete slab**, (a) category of imposed loads **B**, and (b) category of imposed loads **C5**

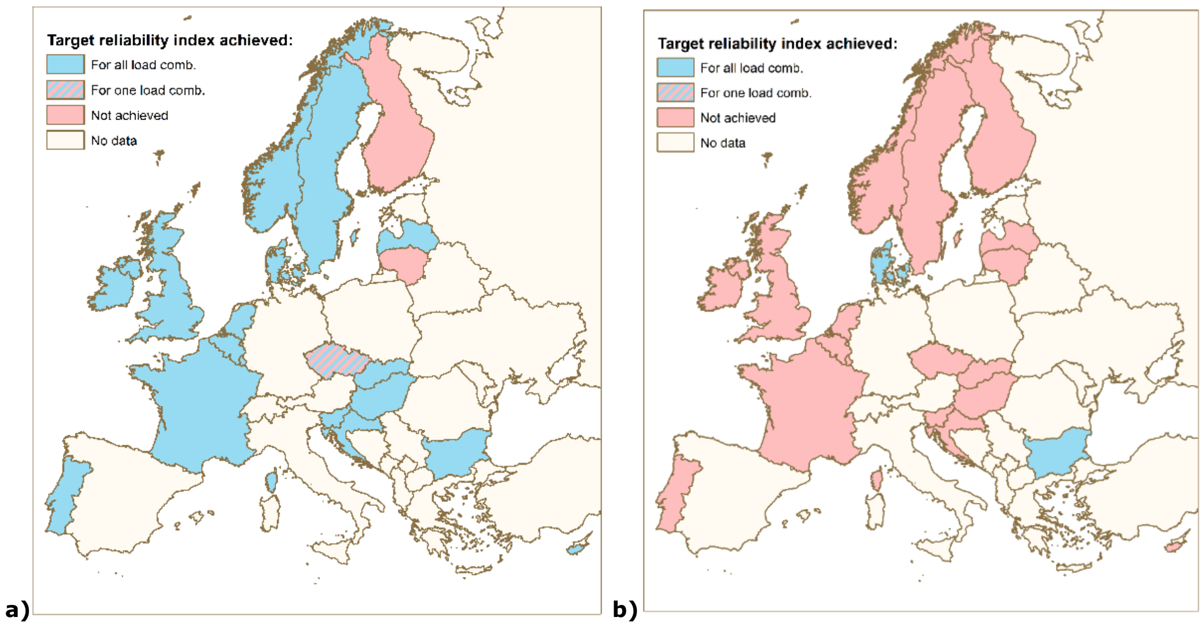
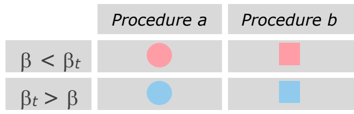


Figure 75. Relative differences to the **target reliability index** β_t of **steel** structural members designed according to CEN recommended values; alternative *procedures a* and *b*, load ratio χ = 0.4, categories of imposed loads **A** to **D2**.



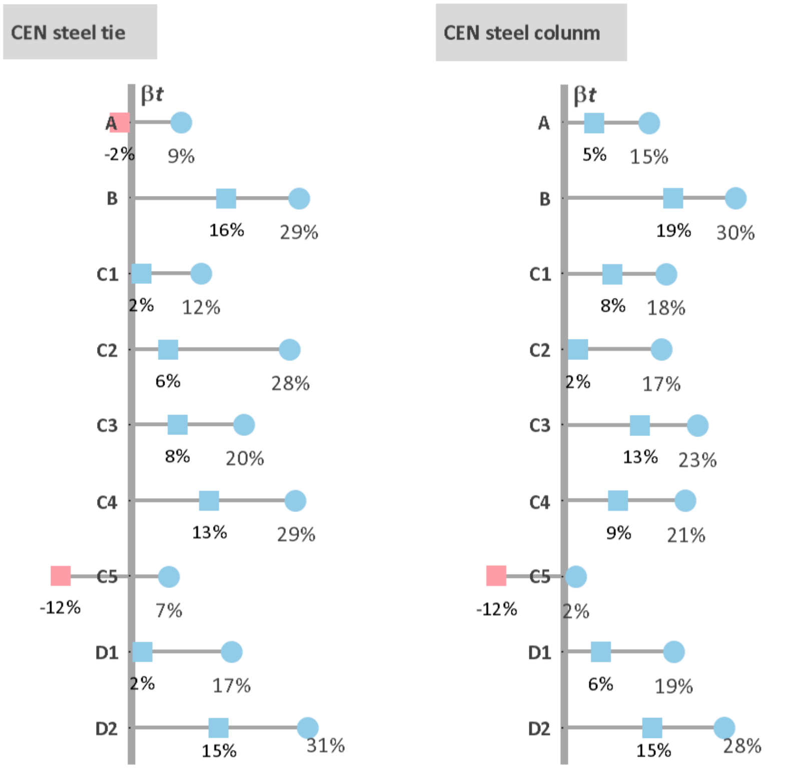


Figure 76. Achievement of reliability levels by Member States relatively to CEN target values; load ratio χ = 0.4, **steel column**, category of imposed loads **C5**

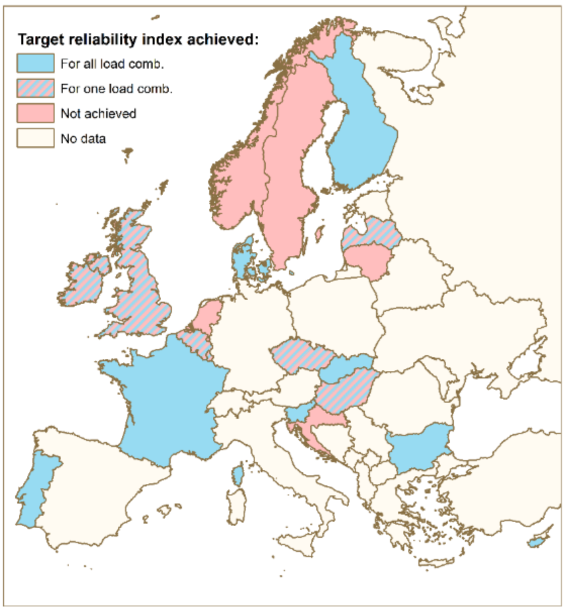
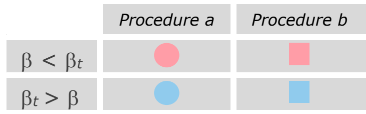


Figure 77. Relative differences to the **target reliability index** β_t of **timber** structural members designed according to CEN; alternative *procedures a* and *b*, load ratio χ = 0.4, categories of imposed loads **A** to **D2**.



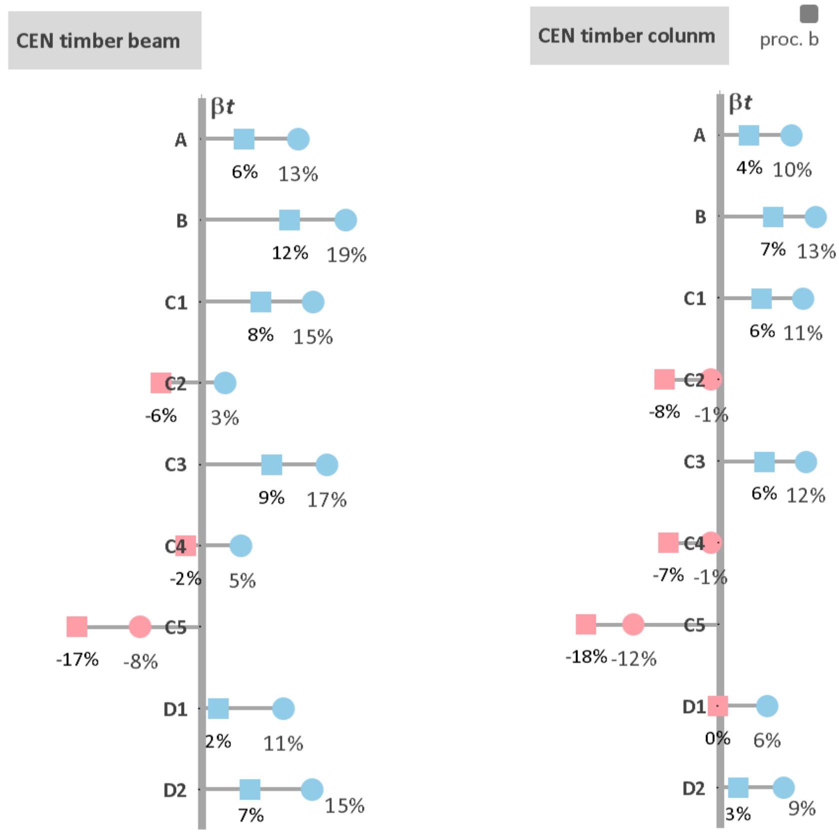


Figure 78. Achievement of reliability levels by Member States relatively to CEN target values; load ratio χ = 0.4, **timber beam**, category of imposed loads **A**

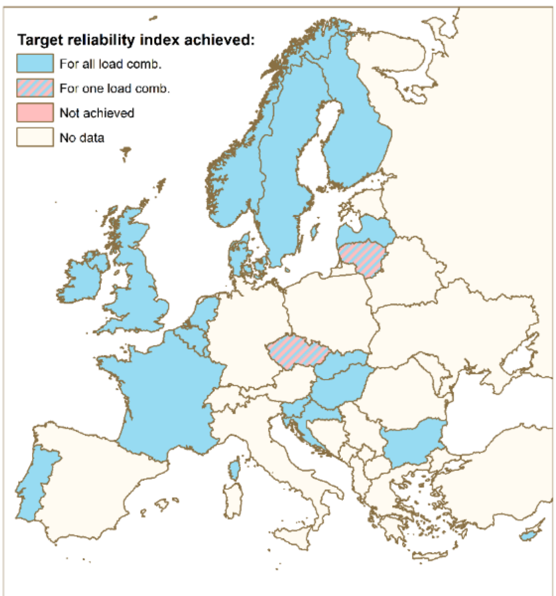


Figure 79. Relative differences to the **target reliability index** β_t of a **masonry wall** designed according to CEN recommended values; alternative *procedures a* and *b*, load ratio χ = 0.4, categories of imposed loads **A** to **D2**.

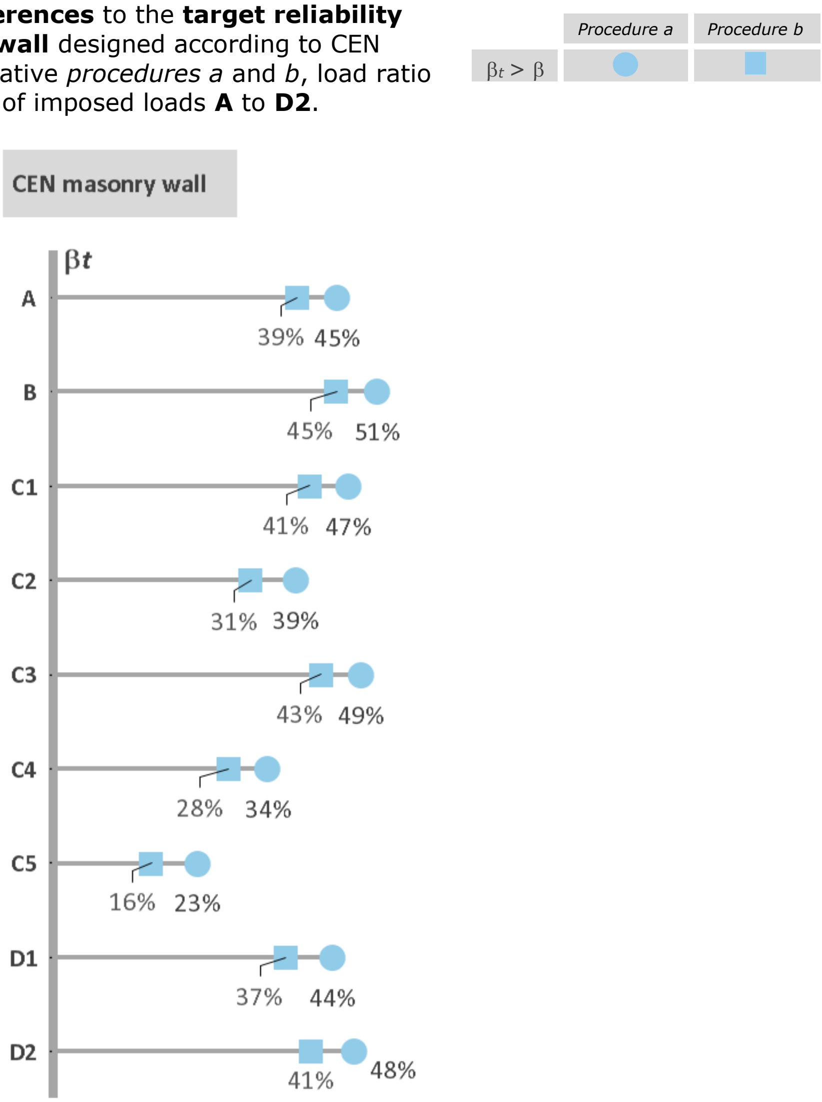
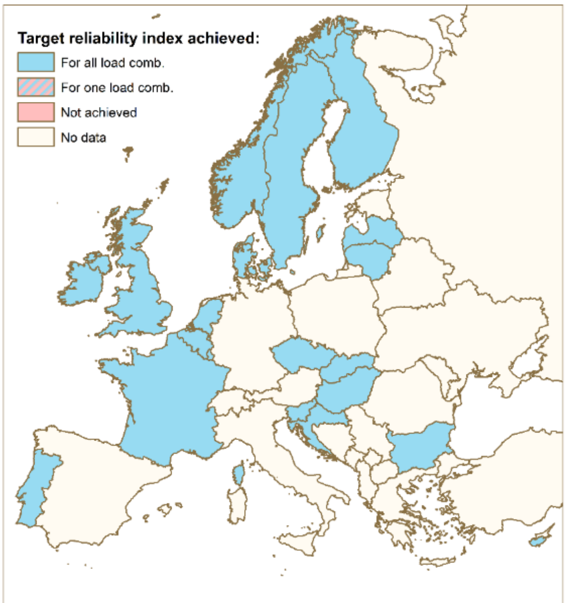


Figure 80. Achievement of reliability levels by Member States relatively to CEN target values; load ratio χ = 0.4, **masonry wall,** category of imposed loads **A**



The reliability analysis for the selected structural members designed according to the NDPs recommended values (RV) by CEN/TC 250 and considering the upper and lower bounds of the characteristic values of imposed loads provided in EN 1991-1-1 was also performed. The analysis was made for a building loaded area of category B, *i.e.*, office buildings, for the complete range of the load ratio χ, and is exemplified in Figure 81 and in Figure 82 for a composite steel concrete slab. The alternative *procedure a* (exp. 6.10) is shown in red, the alternative *procedure b* (exp. 6.10a & 6.10b) in blue and the lowest curve in dashed green represents alternative *procedure c* when in expression 6.10a only the permanent loads are considered (6.10a$_{mod}$ & 6.10b).

The results for the composite steel concrete slab show that for the upper bound of the imposed load, the recommended reliability of 3.8 is met along almost the complete range of χ for the alternative combination rule *a*. For the alternative combination rules *b* and *c* the recommended minimum reliability value is met when χ is greater than 0.15 and 0.25, respectively. For the lower bound of the imposed load, the recommended minimum reliability value of 3.8 is only met for the application of the alternative combination rule *a* when χ is in the range between 0.2 and 0.35.

Figure 81. Reliability index β of a **composite steel concrete slab** as a function of the load ratio χ, for the **upper bound** of imposed load of category **B** recommended in EN 1991-1-1.

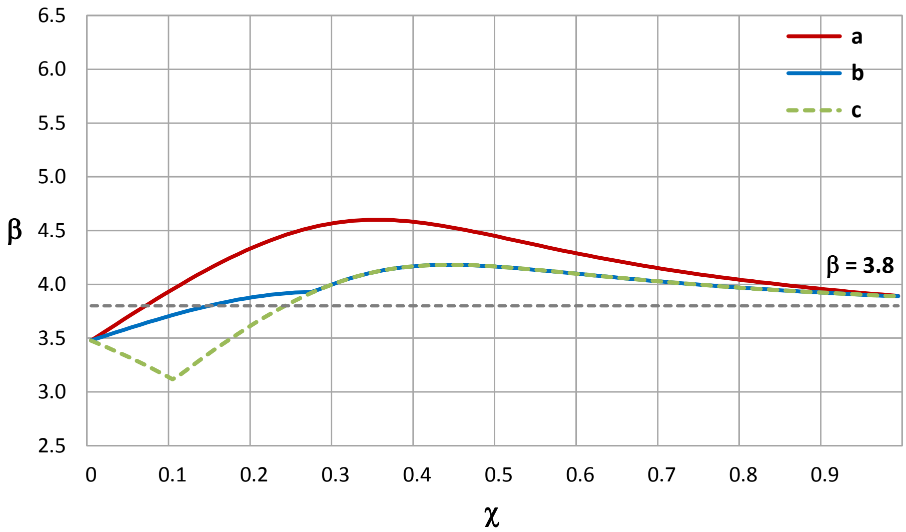


Figure 82. Reliability index β of a **composite steel concrete slab** as a function of the load ratio χ, for the **lower bound** of imposed load of category **B** recommended in EN 1991-1-1.

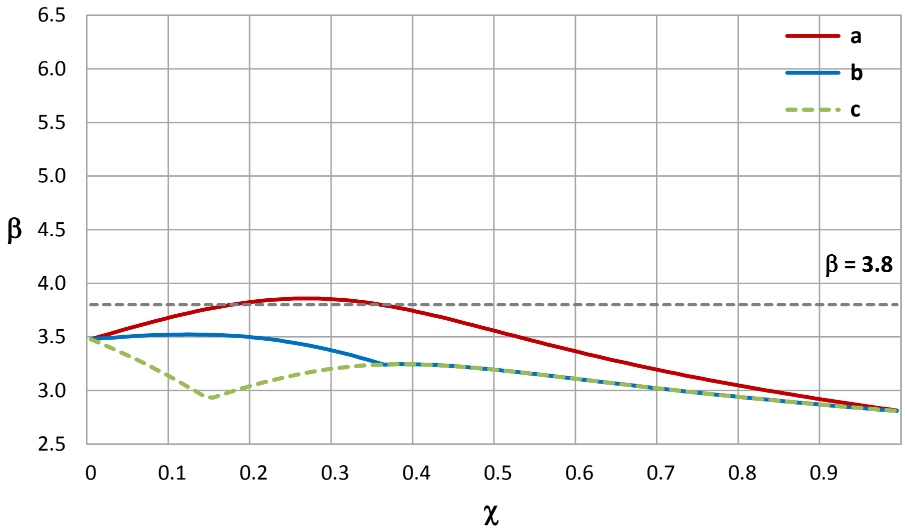


Table 15 presents a summary of the results of the reliability analysis for the selected structural members designed according to CEN NDPs values, considering the upper and lower bounds of the characteristic values of imposed load of category B provided in EN 1991-1-1.

Table 15. Summary of the results of the **reliability analysis** for the selected structural members designed according to CEN NDPs values considering the **upper** and **lower bounds** of imposed loads of category **B** provided in EN 1991-1-1

Selected member	Imposed loads of category B	Range of χ for which β > 3.8		
		Procedure a	*Procedure b*	*Procedure c*
Reinforced concrete beam	Upper bound	Whole	Whole	Whole
	Lower bound	0 – 0.75	0 – 0.7	0 – 0.7
Reinforced concrete column	Upper bound	Whole	Whole	Whole
	Lower bound	Whole	Whole	Whole
Reinforced concrete slab	Upper bound	Whole	Whole	Whole
	Lower bound	0 – 0.75	0 – 0.7	0 – 0.7
Composite steel concrete slab	Upper bound	> 0.05 (almost all)	> 0.15	> 0.25
	Lower bound	0.2 – 0.35	Not met	Not met
Steel tie	Upper bound	Whole	Whole	> 0.15
	Lower bound	0 – 0.45	0-0.25	Not met
Steel column	Upper bound	Whole	Whole	> 0.15
	Lower bound	0 – 0.5	0-0.3	Not met
Timber beam	Upper bound	>0.05 (almost all)	> 0.1	> 0.2
	Lower bound	0.1 – 0.6	Not met	Not met
Timber column	Upper bound	> 0.1	> 0.25	> 0.25
	Lower bound	0.3 – 0.65	Not met	Not met
Masonry wall	Upper bound	Whole	Whole	Whole
	Lower bound	Whole	Whole	Whole

4.4 The way ahead

The analyses performed indicate that the reliability of selected structural members, which were designed according to the national choice of the reliability elements (NDPs) varies in a rather broad range. The reliability levels of the structural members for most common categories of imposed loads match the reliability indices recommended in EN 1990. However, in some cases the reliability levels are below the CEN target value and therefore should be further analysed and calibrated.

Special attention should be given to country choices related to composite members, for the categories of imposed loads C2 and C5, to steel members for the category C5, and to timber structural members for the categories C2, C4 and C5, especially when *procedure b* for the fundamental combination of actions (expressions 6.10a & 6.10b of EN 1990) is used.

The reliability levels achieved using CEN recommended values should also be studied further, in order to delineate eventual needs for calibration of the recommended values, especially when *procedure b* for the fundamental combination of actions is chosen.

The rather broad interval of imposed loads for categories A to D presently recommended in the Eurocodes should be further analysed and narrowed down.

The application of the *procedure b* for the fundamental combination of actions, leads to a more uniform reliability level along the considered range of ratio χ of the variable loads to the total load, than the application of the unique combination, i.e., *procedure a* (expression 6.10 of EN 1990). However, the application of the *procedure b* for imposed loads of categories C2, C4 and C5 shall be allowed after a careful calibration of the chosen NDPs with regard to the recommended reliability levels.

5 Conclusions

Since 2005, within the framework of Administrative Arrangements on the Eurocodes, the JRC is providing scientific and technical support to DG GROW, intending to achieve, amongst other objectives, further harmonisation on the implementation of the Eurocodes.

In this context, and in view of achieving the concerned parts of the European Commission Recommendation 2003/887/EC on the implementation and use of Eurocodes, the JRC was assigned the task of developing and maintaining the Database with the Nationally Determined Parameters (NDPs Database) adopted in the countries of EU and EFTA applying the Eurocodes.

Currently, the **NDPs Database** is a **unique** and **comprehensive source of information** on the **countries' choices** regarding the **NDPs in the Eurocodes**. Furthermore, it has an increasing importance in light of the work programme that is being developed under Mandate M/515 to prepare the **second generation of the Eurocodes**. The programme is grounded on a sustained development of the Eurocodes, including the improvement and updating of the existing suite and the expansion of the Eurocodes harmonisation by, for example, reducing the need for Nationally Determined Parameters. In this framework, the NDPs Database is especially useful to assess the values or choices adopted by the countries in their National Annexes, as they are constituting the **basis to evaluate the state of harmonised use of the Eurocodes in the EU and EFTA Member States** and to **support decisions for further harmonisation** in the second generation of the Eurocodes.

In this report, the NDPs values uploaded in the Database were subject of extensive analysis, comprising the evaluation of the availability of data and of the acceptance of recommended values provided by the Eurocodes.

Regarding the analysis of availability of data, as by November 2018, the results indicate the following:

- The Database contained NDPs for all 58 Eurocodes parts and a total of 27 529 NDPs were available for data post-processing, representing **71%** out of all expected data (39 046 NDPs) to be uploaded;
- EN 1992 and EN 1994 are the most data-populated Eurocodes in the Database and EN 1990 and EN 1996 are the least populated ones. **EN 1992** presents the **highest percentage of uploaded NDPs**, reaching an uploading rate **over 82%**;
- **Three countries**, Czechia, France and Hungary **have uploaded** in the Database **100% of their expected NDPs**. Croatia, Ireland, Latvia, Slovenia and the United Kingdom have uploaded at least 99% of their NDPs and 18 countries have uploaded more than 75% of their expected NDPs.

The acceptance analysis was made with several levels of detail, namely per Eurocode, per Eurocode part, per country, per Eurocode and country simultaneously, and per NDP type and Eurocode part. The results of the acceptance analysis indicate the following:

- The **uploading rate of NDPs with RVs** reached a value of **73%** that is slightly higher than the uploading rate for all NDPs (71%);
- The mean **acceptance percentage** for all **NDPs with RV**, is **73%**, based on 73% of the expected data available;
- The **mean acceptance percentage** of RVs has **remained stable in recent years**.

Given the high value of the uploading percentage, and the stable behaviour of the acceptance of the NDPs recommended values in recent years, the data uploaded in the Database can be considered **representative of the countries' choices**, be used to **derive conclusions on the state of harmonised use of the Eurocodes** by the EU and

EFTA Member States and be used to identify **relevant patterns of divergence** in the national choices.

Having the last conclusion in mind, the analysis of the acceptance of the NDPs recommended values demonstrated the following:

- a **good harmonisation level** was achieved in the national implementation of the **most widely used** "**material Eurocodes**" that are **EN 1992** and **EN 1993**, but also the recommended values of **EN 1994** and **EN 1999** were well accepted among the Member States;
- the **mean acceptance percentage** of RVs **per Eurocode** has also **remained approximately stable** in recent years, with **acceptance rates** achieving **above-average values** for the four previous mentioned Eurocodes, *i.e.*, EN 1992, EN 1993, EN 1994 and EN 1999;
- the national practices relative to the basis of structural design and to the field of geotechnical design (**EN 1990** and **EN 1997)**, have **not achieved** a **good state of harmonisation** among Member States, and have been stably maintaining a mean acceptance level slightly above **50%** in recent years;
- There are **three EN 1993 parts (1-6, 1-11** and **4-3)** that achieved a very good national consensus having an **acceptance rate** greater than or equal to **95%**, and eight Eurocode parts that reached an acceptance rate greater than or equal to 90%. The parts having achieved a notable consensus among the countries have a great potential to be further harmonised in the next generation of the Eurocodes;
- The **countries accepting the highest number of recommended values** (greater than 700) are Cyprus, Czechia, Latvia and Lithuania, whereas **acceptance rates above 90%** go to Lithuania and Slovenia;
- Denmark, France and the United Kingdom have the **lowest rates of acceptance of RVs**, with values around **50%**. The lowest rate of acceptance of RVs by those countries is most probably caused by their preference to retain their national traditions in the design, which are not mirrored in the recommended NDP values or procedures of the standards;
- **EN 1994** is the Eurocode with the highest number of **countries (eight)** that **have accepted all RVs (100%)** of the NDPs they have uploaded;
- The type of NDPs that reached the **highest national consensus** for **all Eurocodes** is **type 1.1, p*redetermined parameters with RV***. The NDPs of this type are mainly related to the determination of actions for the design, the material properties of the structure and to its geometric data, and have an **acceptance rate of 82%,** a value greater than the average;
- The NDPs of **type 6**, ***Diagrams*,** achieved an acceptance of **94%** in **EN 1993.** This Eurocode has four NDPs of this type and 73 out of 78 NDPs values were accepted by the countries uploading the Database;
- Most of the **national decisions on the application of informative annexes** uploaded in the NDPs Database (**91%**) indicate that the **annexes should remain informative**. Moreover, there are **11 Eurocodes parts** where **100%** of the uploaded decisions indicate that the annexes **shall remain informative** and **89 informative annexes** where **100%** of the uploading countries decided that the annexes shall **remain informative**.
- Globally, **76%** of the uploaded values related to NCCIs for a given part correspond to statements to **do not have references to NCCI**. Particular emphasis should be made to **part 3** of **EN 1991** and to **parts 1-7** and **4-3** of **EN 1993**, where **100%** of the uploading countries have declared to **do not have references to NCCIs.**

Analysis of the NDPs belonging to specific Eurocodes parts was also made, including the NDPs of the Eurocodes **fire parts** and **bridge parts**, and the NDPs relevant to the definition of **climatic and seismic actions**:

- The **mean** rate of **acceptance** of the **NDPs** related to **fire** and **bridge design** is slightly **below** (three percentage points) the average acceptance rate for **all NDPs**. However, the **fire parts** in EN 1991, EN 1993 and EN 1995 **show significant differences** in the rate of acceptance when compared with global acceptance of the corresponding Eurocode, meaning that when it comes to fire design the national traditions seem to have a strong influence.
- In general terms, the **snow load** and the **wind actions** are **well harmonised** across EU countries borderlines, although some inconsistencies exist. Both snow load and wind maps present very **different layouts** among countries and the range of altitudes for which the snow load maps apply also varies considerably. There are **good examples of harmonisation** in countries border values of the **thermal** and **seismic maps**. However, the collected maps present **dissimilar layouts** and **reveal discontinuities at** countries **borderlines** mainly in the levels of the minimum shade air temperatures and of the reference ground acceleration, making it difficult to harmonise the use of EN 1991-1-5 and EN 1998-1 in neighbouring areas of different Member States.

Aiming at **facilitating the harmonisation in the second generation of Eurocodes**, further analysis of NDPs with high or low acceptance rates, or with values highly divergent from the recommended was made, and results show that:

- There are **72 NDPs** that reached an **overall consensus** among the uploading countries, representing **9%** of the existing NDPs with RV. A significant part (**60**) of these NDPs are **type 1.1,** corroborating that this type of NDPs is generally well harmonised in the national choices;
- The overall **level of divergence from the recommended values** of NDPs **type 1.1** is **high** in **EN 1992** and **EN 1998** and **reduced** in **EN 1995** and **EN 1999**. The analysis of national choices for the NDPs of type 1.1 with the **largest deviations** from the recommended values led to the conclusion that in various cases **a single country** uploaded a **value** with a **large deviation** from the recommended, and all the others accepted the value recommended in the standards. Those NDPs were identified.

The **reliability study** gave the following conclusions:

- The reliability of structural members which were designed according to the national choice of the NDPs varies in a rather broad range. The **reliability levels** of the structural members **for most common categories** of imposed loads **match the target reliability indices recommended in EN 1990**;
- In some cases, the **reliability levels** according to the **country choices of the NDPs** are **below the CEN target values** and therefore should be further analysed and calibrated. **Special attention** should be given to country choices related to **composite members**, for the categories of imposed loads **C2** and **C5**, to **steel members** for the category **C5**, and to **timber structural members** for the categories **C2, C4 and C5**, especially for fundamental combination of actions defined with the twin expressions (**6.10a, 6.10b**) of EN 1990;
- The **reliability levels achieved using CEN recommended values** should also be studied further, in order to delineate eventual **needs for calibration of the recommended values**, especially when **expressions 6.10a & 6.10b** of EN 1990 are used for the fundamental combination of actions ;
- The **reliability levels** of **composite, steel and timber members** designed according to the **lower bound** of imposed loads recommended in EN 1991-1-1, are commonly **lower** than the **recommended minimum reliability levels** in EN

1990, when expressions **6.10a & 6.10b** of EN 1990 are used for the fundamental combination of actions. The rather broad interval of values of imposed loads for categories A to D presently recommended in the Eurocodes, should be further analysed by CEN and narrowed down;

- The reliability of whole structure is normally higher than the one of a structural member. Thus, the presented results show that a generally **good level of structural reliability** has been achieved **with** the **country choices** of the NDPs.

To sum up, the detailed analysis of the NDPs values uploaded in the Database, allowed to identify the **Eurocodes, Eurocodes parts and NDPs** that reached a **remarkable consensus** among the countries. The high rate of acceptance of the NDPs does not automatically imply that these NDPs shall be eliminated in the second generation of the Eurocodes, since many of them are directly related to the safety which is under national responsibility. Nevertheless, they have **good potential** to be considered for **analysis** by CEN/TC250 Sub-committees and Project Teams working on the **second generation of the Eurocodes**. Also important was the identification of the Eurocodes and NDPs that achieved a **low consensus in national choices** and the parameters with the **largest deviations from the recommended values**, in order to understand the causes of such deviations.

The results conclusively show that the Eurocodes have achieved a **high level of harmonisation in the national implementation**, since most countries accepted the parameters recommended in the Standards. Yet, there is still much to be done to decrease the need for Nationally Determined Parameters and to improve the "ease of use" of the Eurocodes, to ultimately reduce the barriers arising from different national practices and stimulate the international trade with construction products and engineering services.

References

Athanasopoulou, A., Apostolska, R., Sousa, L., Dimova, S., *Workshop: The way forward for the Eurocodes implementation in the Balkans*, Publications Office of the European Union, ISBN 978-92-79-98582-9, doi:10.2760/789047, Luxembourg, 2018.

Dimova, S., Fuchs M., Pinto, A., Nikolova, B., Sousa, M.L., Iannaccone, S. *State of implementation of the Eurocodes in the European Union*. EUR 27511 EN. Publications Office of the European Union, doi:10.2788/854939, Luxembourg, 2015.

EN 1992-4:2018. *Eurocode 2 – Design of concrete structures*. Part 4 - *Design of fastenings for use in concrete*, CEN, Brussels, 2018.

ESLRP, *Scientific support activity in the field of structural stability of civil engineering works. Snow* loads, Final Report of the European Snow Load Research Project, 1998. http://www2.ing.unipi.it/dic/snowloads/Final%20Report%20I.pdf, accessed 23th January 2019.

European Union (EU), *The European construction sector. A global partner*. European Comission, Internal Market, Industry, Entrepreneurship and SMEs Directorate General, Energy Directorate General, Joint Research Centre, 2016.

Formichi, P., Danciu, L., Akkar, S., Kale, O., Malakatas, N., Croce, P., Nikolov, D., Gocheva, A., Luechinger, P., Fardis, M., Yakut, A., Apostolska, R., Sousa, M.L., Dimova, S., Pinto A. *Eurocodes: background and applications. Elaboration of maps for climatic and seismic actions for structural design with the Eurocodes,* JRC Science for Policy Report, Publications Office of the European Union, EUR 28217, doi:10.2788/534912, Luxembourg, 2016.

Gulvanessian, H., Calgaro, J.-A., Holicky, M. *Designers' Guide to EN 1990. Eurocode: Basis of Structural Design.* Designers Guides to the Eurocodes, Thomas Telford Publishing, London, 2002.

Markova, J., Sousa, M.L., Dimova, D., Athanasopoulou, A., Iannaccone, S. *Reliability of structural members designed with the Eurocodes NDPs selected by EU and EFTA Member States*. JRC Scientific and Technical Reports. Publications Office of the European Union, EUR 29410 EN. doi:10.2760/24880, Luxembourg, 2018.

Mehr, K., Altinyollar, A., Pinto, A., Dimova, A., Taucer, F., Tsionis, G., Geradin, M. *Eurocodes database for Nationally Determined Parameters*. *Support to the implementation, harmonisation and further development of the Eurocodes*. JRC Scientific and Technical Reports, Publications Office of the European Union, EUR 22860, Luxembourg, 2007.

Sadovský, Z. *The New Slovak National Annex STN EN 1991-1-3/NA1 General Actions. Snow loads: 2012*. Procedia Engineering, Vol. 40, 405-410. Elsevier, 2012.

Tóth, L., Győri, E., Mónus, P., Zsíros, T. *Seismic Hazard in the Pannonian Region*. In: Pinter, N., Grenerczy, Gy., Weber, J., Stein, S., Medak, D., (eds.), The Adria Microplate: GPS Geodesy, Tectonics, and Hazards. Springer Verlag, NATO ARW Series, Vol. 61, p. 369-384, 2006.

List of figures

List of tables

Annexes

Annex A. List of Amendments and Corrigenda not considered in the analysis

EN		Part		A/AC reference
EN 1990	Eurocode. Basis of structural design			EN 1990:2002/A1:2005/AC:2010 (E)
EN 1991	Eurocode 1. Actions on structures	1-1	General actions - Densities, self-weight, imposed loads for buildings	EN 1991-1-1:2002/AC:2009 (E)
		1-2	General actions - Actions on structures exposed to fire	EN 1991-1-2:2002/AC:2013 (E)
		1-3	General actions - Snow loads	EN 1991-1-3:2003/A1:2015 (E)
				EN 1991-1-3:2003/AC:2009 (E)
		1-4	General actions - Wind actions	EN 1991-1-4:2005/A1:2010 (E)
				EN 1991-1-4:2005/AC:2010 (E)
		1-5	General actions - Thermal actions	EN 1991-1-5:2003/AC:2009 (E)
		1-6	General actions - Actions during execution	EN 1991-1-6:2005/AC:2013 (E)
		1-7	General Actions - Accidental actions	EN 1991-1-7:2006/A1:2014 (E)
				EN 1991-1-7:2006/AC:2010 (E)
		2	Traffic loads on bridges	EN 1991-2:2003/AC:2010 (E)
		3	Actions induced by cranes and machinery	EN 1991-3:2006/AC:2012 (E)
		4	Silos and tanks	EN 1991-4:2006
EN 1992	Eurocode 2. Design of concrete structures	1-1	General rules and rules for buildings	EN 1992-1-1:2004/A1:2014 (E)
				EN 1992-1-1:2004/AC:2010 (E)
		1-2	General rules - Structural fire design	EN 1992-1-2:2004/AC:2008 (E)
EN 1993	Eurocode 3. Design of steel structures	1-1	General rules and rules for buildings	EN 1993-1-1:2005/A1:2014 (E)
				EN 1993-1-1:2005/AC:2009 (E)
		1-2	General rules - Structural fire design	EN 1993-1-2:2005/AC:2009 (E)
		1-3	General rules - Supplementary rules for cold-formed thin gauge members and sheeting	EN 1993-1-3:2006/AC:2009 (E)
		1-4	General rules - Supplementary rules for stainless steels	EN 1993-1-4:2006/A1:2015 (E)
		1-5	Plated structural elements	EN 1993-1-5:2006/A1:2017
		1-6	Strength and stability of shell structures	EN 1993-1-6:2007/ A1:2017
				EN 1993-1-6:2007/AC:2009 (E)
		1-11	Design of structures with tension components	EN 1993-1-11:2006/AC:2009 (E)
		1-12	High strength steels	EN 1993-1-12:2007/AC:2009 (E)

EN		Part		A/AC reference
EN 1993	Eurocode 3. Design of steel structures	2	Steel bridges	EN 1993-2:2006/AC:2009 (E)
		3-1	Towers, masts and chimneys - Towers and masts	EN 1993-3-1:2006/AC:2009 (E)
		4-1	Silos	EN 1993-4-1:2007/ A1:2017
				EN 1993-4-1:2007/AC:2009 (E)
		4-2	Tanks	EN 1993-4-2:2007/ A1:2017
				EN 1993-4-2:2007/AC:2009 (E)
		5	Piling	EN 1993-5:2007/AC:2009 (E)
EN 1994	Eurocode 4. Design of composite steel and concrete structures	2	General rules and rules for bridges	EN 1994-2:2005/AC:2008 (E)
EN 1995	Eurocode 5. Design of timber structures	1-1	General - Common rules and rules for buildings	EN 1995-1-1:2004/A1:2008 (E)
EN 1996	Eurocode 6. Design of masonry structures	1-1	Common rules for reinforced and unreinforced masonry structures	EN 1996-1-1: 2005/AC:2009
				EN 1996-1-1:2005/FprA1:2012 (E)
		1-2	General rules - structural fire design	EN 1996-1-2:2005/AC:2010 (E)
		3	Simplified calculation methods for unreinforced masonry structures	EN 1996-3:2006/AC:2009 (E)
EN 1997	Eurocode 7. Geotechnical design	1	General rules	EN 1997-1:2004/A1:2013 (E)
				EN 1997-1:2004/AC:2009 (E)
EN 1998	Eurocode 8. Design of structures for earthquake resistance	1	General rules, seismic actions and rules for buildings	EN 1998-1:2004/AC:2009 (E)
		2	Bridges	EN 1998-2:2005/A1:2009 (E)
				EN 1998-2:2005/A2:2011
		3	Assessment and retrofitting of buildings	EN 1998-3:2005/AC:2013 (E)
EN 1999	Eurocode 9. Design of aluminium structures	1-1	General structural rules	EN 1999-1-1:2007/A1:2009 (E)
		1-3	Structures susceptible to fatigue	EN 1999-1-3:2007/A1:2011 (E)
		1-4	Supplementary rules for cold-formed sheeting	EN 1999-1-4:2007/AC:2009 (E)

Annex B. Uploading and acceptance of NDPs with RVs

EN	Part	Chapter	Clause	NDP type	# of uploaded NDPs with RV	# of accepted NDPs with RV	% of accepted NDPs with RV	Acceptance bar
1990	A-1	Annex A1.1	1	2.2	24	9	38%	
		Annex A1.2.1	1	3.1	26	19	73%	
		Annex A1.2.2 (1)	Table A1.1	2.1	24	13	54%	
		Annex A1.3.1 (1)	Table A1. 2(A) to (C)	2.2	22	7	32%	
		Annex A1.3.2 (1)	Table A1.3	3.7	21	10	48%	
	A-2	Annex A2.1.1	1 NOTE 3	2.2	16	7	44%	
		Annex A2.2.2	1	3.1	17	9	53%	
		Annex A2.2.2	4	3.1	16	5	31%	
		Annex A2.2.2	6	3.1	17	8	47%	
		Annex A2.2.3	2	3.1	17	9	53%	
		Annex A2.2.3	3	3.1	17	5	29%	
		Annex A2.2.3	4	2.1	17	14	82%	
		Annex A2.2.4	1	3.1	16	5	31%	
		Annex A2.2.4	4	3.1	17	8	47%	
		Annex A2.2.6	1 NOTE 1	2.1	13	4	31%	
		Annex A2.2.6	1 NOTE 2	1.1	15	6	40%	
		Annex A2.3.1	Table A2.4 (A) NOTE 1 and 2	2.1	14	7	50%	
		Annex A2.3.1	Table A2.4 (B) NOTE 1, 2 and 4	2.1	14	1	7%	
		Annex A2.3.1	Table A2.4 (C)	2.1	14	9	64%	
		Annex A2.3.2	1	3.7	13	6	46%	
		Annex A2.4.1	1 NOTE 1 (Table A2.6)	3.7	16	16	100%	
		Annex A2.4.3.2	1	3.1	16	10	63%	
		Annex A2.4.4.1	1 NOTE 3	3.1	16	4	25%	
		Annex A2.4.4.2.1	4	3.1	16	14	88%	
		Annex A2.4.4.2.2	2 Table A2.7	2.1	16	12	75%	
		Annex A2.4.4.2.2	3	1.1	16	14	88%	
		Annex A2.4.4.2.3	1	3.1	16	9	56%	
		Annex A2.4.4.2.4	2 Table A2.8 NOTE 3	2.1	16	15	94%	
		Annex A2.4.4.2.4	3	1.1	15	13	87%	
		Annex A2.4.4.3.2	6	6	16	7	44%	
1991	1-1	5.2.3	3	1.1	24	17	71%	
		5.2.3	4	1.1	24	19	79%	
		5.2.3	5	3.1	23	20	87%	
		6.3.1.1	1 Table 6.1	3.8	25	13	52%	
		6.3.1.2	1 Table 6.2	2.2	24	2	8%	
		6.3.1.2	10	3.1	25	12	48%	
		6.3.1.2	11	3.1	24	11	46%	
		6.3.2.2	1 Table 6.4	2.2	24	10	42%	
		6.3.3.2	1 Table 6.8	2.2	24	3	13%	
		6.3.4.2	1 Table 6.10	2.2	24	4	17%	
		6.4	1 Table 6.12	2.2	23	4	17%	
	1-2	2.4	4 NOTE 2	3.1	23	10	43%	
		3.3.1.3	1	3.1	24	16	67%	
		3.3.2	2	3.1	24	14	58%	
		4.3.1	2	3.3	24	9	38%	
	1-3	4.2	1	2.1	20	12	60%	
		4.3	1	1.1	18	6	33%	
		5.2	7	2.1	23	13	57%	
		5.3.5	1 NOTE 1	1.1	22	17	77%	
		5.3.6	1 NOTE 1	1.1	21	9	43%	
		5.3.6	1 NOTE 2	1.1	22	16	73%	
		6.3	1	3.1	22	7	32%	
		6.3	2	3.1	22	11	50%	
		Annex A	1 Table A.1	3.8	20	5	25%	
	1-4	4.2	2 NOTE 2	1.1	21	14	67%	
		4.2	2 NOTE 3	1.1	22	15	68%	
		4.2	2 NOTE 5	1.1	21	17	81%	
		4.3.1	1 NOTE 1	1.1	21	12	57%	
		4.3.2	1	3.1	22	10	45%	

EN	Part	Chapter	Clause	NDP type	# of uploaded NDPs with RV	# of accepted NDPs with RV	% of accepted NDPs with RV	Acceptance bar
1991	1-4	4.3.2	2	3.1	22	13	59%	
		4.3.3	1	3.1	22	15	68%	
		4.3.4	1	3.1	22	16	73%	
		4.3.5	1	3.1	22	14	64%	
		4.4	1 NOTE 2	1.1	19	15	79%	
		4.5	1 NOTE 1	3.1	21	12	57%	
		4.5	1 NOTE 2	1.1	22	16	73%	
		5.3	5	3.3	20	11	55%	
		7.1.2	2	3.1	22	13	59%	
		7.2.1	1 NOTE 2	3.1	22	18	82%	
		7.2.2	1	3.1	22	16	73%	
		7.2.2	2 NOTE 1	2.1	21	16	76%	
		7.2.8	1	6	21	14	67%	
		7.2.10	3 NOTE 1	3.1	21	20	95%	
		7.2.10	3 NOTE 2	3.1	21	15	71%	
		7.4.1	1	2.1	22	21	95%	
		7.4.3	2	1.1	22	21	95%	
		7.6	1 NOTE 1	6	22	22	100%	
		7.7	1 NOTE 1	1.1	21	19	90%	
		7.8	1	2.1	21	19	90%	
		7.10	1 NOTE 1	6	22	21	95%	
		7.11	1 NOTE 2	3.1	22	18	82%	
		7.13	1	6	21	16	76%	
		7.13	2	6	21	14	67%	
		8.1	4	1.1	20	11	55%	
		8.1	5	1.1	20	12	60%	
		8.3	1	3.1	22	16	73%	
		8.3.1	2	3.3	22	17	77%	
		8.3.2	1	2.2	21	13	62%	
		8.3.3	1 NOTE 1	3.1	22	15	68%	
		8.3.4	1	1.1	22	17	77%	
		8.4.2	1 NOTE 1	3.1	22	11	50%	
		Annex E.1.3.3	1	1.1	20	13	65%	
		Annex E.1.5.2.6	1 NOTE 1	1.1	21	16	76%	
		Annex E.1.5.3	2 NOTE 1	1.1	20	14	70%	
		Annex E.1.5.3	6	3.1	21	13	62%	
	1-5	5.3	2 Table 5.1	2.1	22	14	64%	
		5.3	2 Table 5.2	2.2	21	12	57%	
		5.3	2 Table 5.3	2.1	22	15	68%	
		6.1.3.1	4	6	22	13	59%	
		6.1.3.3	3	3.1	21	14	67%	
		6.1.4.1	1	2.1	20	14	70%	
		6.1.4.2	1	3.1	21	12	57%	
		6.1.4.3	1	1.1	21	17	81%	
		6.1.4.4	1	1.1	21	14	67%	
		6.1.5	1	1.1	21	16	76%	
		6.1.6	1	1.1	20	16	80%	
		6.2.1	1	3.1	21	14	67%	
		6.2.2	1	1.1	21	17	81%	
		6.2.2	2	1.1	21	16	76%	
		7.5	3	1.1	20	16	80%	
		7.5	4	1.1	20	17	85%	
		Annex A.1	1 NOTE2	3.1	21	11	52%	
		Annex A.1	3	1.1	21	15	71%	
		Annex A.2	2	1.1	21	13	62%	
		Annex B	1 Tables B.1, B2 and B.3	2.2	19	16	84%	

EN	Part	Chapter	Clause	NDP type	# of uploaded NDPs with RV	# of accepted NDPs with RV	% of accepted NDPs with RV	Acceptance bar
1991	1-6	3.1	1	3.1	18	7	39%	
		3.1	5 NOTE 1	2.2	18	15	83%	
		3.1	5 NOTE 2	3.1	17	10	59%	
		4.11.1	2 Table 4.1	2.1	17	11	65%	
		4.11.2	1	3.1	18	10	56%	
		4.12	1 NOTE 2	1.1	17	12	71%	
		Annex A1.1	1	1.1	16	9	56%	
		Annex A1.3	2	3.1	18	11	61%	
		Annex A2.3	1	3.1	19	14	74%	
		Annex A2.4	2	3.1	19	12	63%	
		Annex A2.4	3	3.1	19	13	68%	
		Annex A2.5	2	1.1	19	15	79%	
		Annex A2.5	3	3.1	19	10	53%	
	1-7	3.3	2 NOTE 1	3.1	19	12	63%	
		3.3	2 NOTE 2	3.1	19	11	58%	
		3.4	1 NOTE 4	3.8	18	12	67%	
		4.3.1	1 NOTE 1	2.1	19	11	58%	
		4.3.1	2	3.1	20	15	75%	
		4.3.1	3	3.1	20	10	50%	
		4.3.2	1 NOTE 1	2.2	20	13	65%	
		4.3.2	1 NOTE 3	2.1	20	14	70%	
		4.3.2	1 NOTE 4	1.1	20	15	75%	
		4.3.2	2	3.1	20	12	60%	
		4.3.2	3	3.1	20	17	85%	
		4.4	1	3.1	20	11	55%	
		4.5.1.2	1 NOTE 1	3.7	17	13	76%	
		4.5.1.4	1	3.8	17	14	82%	
		4.5.1.4	3	1.1	16	12	75%	
		4.5.1.4	4	1.1	17	13	76%	
		4.5.2	4	1.1	17	15	88%	
		4.6.1	3 NOTE 1	2.2	18	15	83%	
		4.6.2	1	2.2	17	12	71%	
		4.6.2	2	1.1	18	16	89%	
		4.6.2	3 NOTE 1	3.8	18	15	83%	
		4.6.2	4	1.1	17	11	65%	
		4.6.3	1	2.2	17	11	65%	
		4.6.3	3	1.1	18	16	89%	
		4.6.3	4	3.1	18	15	83%	
	2	2.3	4	3.1	16	10	63%	
		4.2.1	2	3.1	15	6	40%	
		4.2.3	1	1.1	16	9	56%	
		4.3.1	2 NOTE 2	3.1	16	10	63%	
		4.3.2	3 NOTE 1	3.1	13	2	15%	
		4.3.2	3 NOTE 2	3.1	14	5	36%	
		4.3.3	2	3.1	14	10	71%	
		4.3.4	1	3.1	15	6	40%	
		4.4.1	2 NOTE 2	1.1	15	9	60%	
		4.4.1	5	3.1	14	13	93%	
		4.5.1	1 Table 4.4a	2.2	14	5	36%	
		4.5.2	1 NOTE 3	3.1	14	6	43%	
		4.6.1	3 NOTE 1	2.2	13	8	62%	
		4.6.1	6	3.1	15	12	80%	
		4.6.4	3	3.1	14	8	57%	
		4.6.6	1	3.1	14	5	36%	
		4.7.2.1	1	3.1	14	5	36%	
		4.7.3.3	1 NOTE 1	2.2	14	7	50%	
		4.7.3.3	1 NOTE 3	3.1	14	6	43%	
		4.7.3.3	2	3.1	15	14	93%	
		4.7.3.4	1	3.1	15	9	60%	

EN	Part	Chapter	Clause	NDP type	# of uploaded NDPs with RV	# of accepted NDPs with RV	% of accepted NDPs with RV	Acceptance bar
1991	2	4.8	1 NOTE 2	3.1	14	7	50%	
		4.8	3	3.1	15	15	100%	
		4.9.1	1 NOTE 1	3.1	14	7	50%	
		5.2.3	2	3.1	16	14	88%	
		5.3.2.1	1	1.1	16	13	81%	
		5.3.2.2	1	3.1	16	12	75%	
		5.3.2.3	1 NOTE 1	3.1	16	11	69%	
		5.4	2	3.1	16	13	81%	
		5.6.2.1	1	3.1	15	7	47%	
		5.6.3	2 NOTE 2	3.1	16	10	63%	
		6.3.2	3	1.1	12	1	8%	
		6.4.4	1	6	14	7	50%	
		6.4.5.2	3	3.1	15	7	47%	
		6.4.5.3	1	3.7	14	11	79%	
		6.4.6.3.1	3 Table 6.6	3.8	12	8	67%	
		6.4.6.4	4	3.1	14	7	50%	
		6.4.6.4	5	3.1	15	8	53%	
		6.5.4.3.	1	1.1	14	13	93%	
		6.5.4.5.1	2	1.1	14	8	57%	
		6.5.4.6		3.1	15	9	60%	
		6.5.4.6.1	1	3.1	16	13	81%	
		6.6.1	3	3.1	16	13	81%	
		6.7.1	2	3.1	16	10	63%	
		6.8.2	2 Table 6.11	3.8	16	14	88%	
		6.8.3.1	1	3.8	15	14	93%	
		6.8.3.2	1	3.1	16	15	94%	
		6.9	6	1.1	16	10	63%	
		Annex C	3	3.3	14	6	43%	
		Annex C	3	3.1	15	8	53%	
		Annex D.2	2	1.1	16	15	94%	
	3	2.5.2.1	2	1.1	17	16	94%	
		2.5.3	2	2.2	18	13	72%	
		2.7.3	3	1.1	18	17	94%	
		Annex A.2.2	1 Table A.1	2.1	18	15	83%	
		Annex A.2.2	2	2.1	17	15	88%	
		Annex A.2.3	1 Table A.2	2.1	18	16	89%	
	4	2.5	5 NOTE1	3.8	18	17	94%	
		5.2.4.3.1	3	1.1	18	17	94%	
		5.4.1	3 NOTE 1	3.1	18	16	89%	
		5.4.1	4	3.1	18	16	89%	
		Annex A.4	3	2.1	18	13	72%	
1992	1-1	2.3.3	3	1.1	25	15	60%	
		2.4.2.1	1	1.1	28	23	82%	
		2.4.2.2	1	1.1	27	19	70%	
		2.4.2.2	2	1.1	28	19	68%	
		2.4.2.2	3	1.1	28	24	86%	
		2.4.2.3	1	1.1	28	27	96%	
		2.4.2.4	1	2.1	27	22	81%	
		2.4.2.4	2	2.2	28	26	93%	
		2.4.2.5	2	1.1	28	21	75%	
		3.1.2	2	3.1	28	20	71%	
		3.1.2	4	1.1	28	13	46%	
		3.1.6	1	1.1	28	14	50%	
		3.1.6	2	1.1	28	24	86%	
		3.2.7	2	1.1	27	18	67%	
		3.3.4	5	1.1	27	26	96%	
		3.3.6	7	3.1	27	21	78%	
		4.4.1.2	3	3.1	26	17	65%	
		4.4.1.2	5	3.8	24	9	38%	

EN	Part	Chapter	Clause	NDP type	# of uploaded NDPs with RV	# of accepted NDPs with RV	% of accepted NDPs with RV	Acceptance bar
1992	1-1	4.4.1.2	6	1.1	27	24	89%	
		4.4.1.2	7	1.1	26	17	65%	
		4.4.1.2	8	1.1	26	17	65%	
		4.4.1.2	13	1.1	27	23	85%	
		4.4.1.3	1	1.1	26	15	58%	
		4.4.1.3	3	3.1	26	17	65%	
		4.4.1.3	4	1.1	27	18	67%	
		5.1.3	1	3.1	27	18	67%	
		5.2	5	3.1	27	24	89%	
		5.5	4	3.7	27	22	81%	
		5.6.3	4	6	27	24	89%	
		5.8.3.1	1	3.1	27	20	74%	
		5.8.3.3	1	1.1	27	24	89%	
		5.8.3.3	2	1.1	27	25	93%	
		5.8.6	3	1.1	27	23	85%	
		5.10.2.1	1	1.1	27	24	89%	
		5.10.2.1	2	1.1	27	24	89%	
		5.10.2.2	4	1.1	27	24	89%	
		5.10.2.2	5	1.1	27	21	78%	
		5.10.3	2	1.1	27	24	89%	
		5.10.8	2	1.1	26	15	58%	
		5.10.8	3	2.1	25	20	80%	
		5.10.9	1	1.1	27	14	52%	
		6.2.2	1	3.1	27	20	74%	
		6.2.2	6	3.1	27	21	78%	
		6.2.3	2	1.1	26	10	38%	
		6.2.3	3	3.1	26	18	69%	
		6.2.4	4	3.1	27	22	81%	
		6.2.4	6	1.1	27	23	85%	
		6.4.3	6	6	26	23	88%	
		6.4.4	1	3.1	26	19	73%	
		6.4.5	3	3.1	25	12	48%	
		6.4.5	4	1.1	26	20	77%	
		6.5.2	2	3.1	26	21	81%	
		6.5.4	4	1.1	26	21	81%	
		6.5.4	6	1.1	26	22	85%	
		6.8.4	1 NOTE 1	1.1	26	24	92%	
		6.8.4	1 NOTE 2	2.2	22	21	95%	
		6.8.4	5	1.1	26	23	88%	
		6.8.6	1	1.1	26	22	85%	
		6.8.6	3	1.1	25	20	80%	
		6.8.7	1	1.1	26	24	92%	
		7.2	2	1.1	26	23	88%	
		7.2	3	1.1	26	25	96%	
		7.2	5	1.1	26	19	73%	
		7.3.1	5	2.2	25	14	56%	
		7.3.2	4	3.1	25	18	72%	
		7.3.4	3	1.1	26	23	88%	
		7.4.2	2	2.2	24	20	83%	
		8.2	2	1.1	26	19	73%	
		8.3	2	2.2	22	15	68%	
		8.6	2	3.1	26	23	88%	
		8.8	1	1.1	26	21	81%	
		9.2.1.1	1	3.1	26	17	65%	
		9.2.1.1	3	3.1	26	19	73%	
		9.2.1.2	1	1.1	26	16	62%	
		9.2.1.4	1	1.1	26	24	92%	
		9.2.2	4	1.1	25	22	88%	
		9.2.2	5	3.1	25	15	60%	

EN	Part	Chapter	Clause	NDP type	# of uploaded NDPs with RV	# of accepted NDPs with RV	% of accepted NDPs with RV	Acceptance bar
1992	1-1	9.2.2	6	3.1	24	17	71%	
		9.2.2	7	3.1	25	20	80%	
		9.2.2	8	3.1	25	16	64%	
		9.3.1.1	3	3.1	24	11	46%	
		9.5.2	1	1.1	25	9	36%	
		9.5.2	2	3.1	25	15	60%	
		9.5.2	3	3.1	26	19	73%	
		9.5.3	3	3.1	24	9	38%	
		9.6.2	1	3.1	25	13	52%	
		9.6.3	1	3.1	25	14	56%	
		9.7	1	3.1	25	18	72%	
		9.8.1	3	1.1	25	15	60%	
		9.8.2.1	1	1.1	25	14	56%	
		9.8.3	1	1.1	24	14	58%	
		9.8.3	2	1.1	26	21	81%	
		9.8.4	1	1.1	26	16	62%	
		9.8.5	3	2.2	26	22	85%	
		9.10.2.2	2	1.1	26	19	73%	
		9.10.2.3	3	1.1	26	19	73%	
		9.10.2.3	4	1.1	26	17	65%	
		9.10.2.4	2	1.1	26	18	69%	
		11.3.5	1	1.1	26	22	85%	
		11.3.5	2	1.1	26	23	88%	
		11.3.7	1	2.2	25	24	96%	
		11.6.1	1	3.1	25	15	60%	
		11.6.2	1	3.1	25	21	84%	
		11.6.4.1	1	1.1	26	23	88%	
		12.3.1	1	1.1	26	16	62%	
		12.6.3	2	1.1	25	24	96%	
		Annex A.2.1	1	1.1	26	19	73%	
		Annex A.2.1	2	1.1	26	18	69%	
		Annex A.2.2	1	1.1	26	19	73%	
		Annex A.2.2	2	1.1	26	20	77%	
		Annex A.2.3	1	1.1	26	18	69%	
		Annex C.1	1	2.2	25	22	88%	
		Annex C.1	1	1.1	25	25	100%	
		Annex C.1	1	3.1	22	21	95%	
		Annex C.1	3 NOTE 1	2.1	25	24	96%	
		Annex C.1	3 NOTE 2	3.7	25	22	88%	
		Annex E.1	2	2.1	19	8	42%	
		Annex J.1	2	3.1	26	18	69%	
		Annex J.2.2	2	1.1	25	19	76%	
		Annex J.3	2	1.1	25	18	72%	
		Annex J.3	3	1.1	25	20	80%	
	1-2	2.1.3	2	1.1	24	21	88%	
		2.3	2 NOTE 1	1.1	24	23	96%	
		3.2.3	5	3.3	22	10	45%	
		4.1	1 NOTE 3	3.1	23	10	43%	
		4.5.1	2	1.1	24	18	75%	
		5.3.2	2	3.1	24	18	75%	
		6.1	5	2.2	23	16	70%	
		6.4.2.1	3	2.2	24	19	79%	
		6.4.2.2	2	2.2	23	20	87%	
	2	3.1.2	102	3.1	22	7	32%	
		3.1.6	101	1.1	22	12	55%	
		3.1.6	102	1.1	22	18	82%	
		3.2.4	101	3.1	21	14	67%	
		4.2	105	3.1	22	15	68%	
		4.2	106 NOTE 1	1.1	22	16	73%	

EN	Part	Chapter	Clause	NDP type	# of uploaded NDPs with RV	# of accepted NDPs with RV	% of accepted NDPs with RV	Acceptance bar
1992	2	4.2	106 NOTE 2	3.1	18	13	72%	
		4.4.1.2	109	3.1	21	14	67%	
		5.2	105	3.1	22	21	95%	
		5.3.2.2	104	3.1	22	19	86%	
		5.5	104 NOTE 1	2.1	21	15	71%	
		5.7	105 NOTE 1	3.1	21	13	62%	
		6.1	109	3.1	22	20	91%	
		6.1	110	1.1	40	37	93%	
		6.1	110	1.1	40	37	93%	
		6.2.2	101	3.1	21	14	67%	
		6.2.3	103	3.1	20	12	60%	
		6.2.3	109	1.1	22	22	100%	
		6.8.7	101 NOTE 1	1.1	22	22	100%	
		7.2	102	1.1	22	19	86%	
		7.3.1	105	2.2	18	7	39%	
		8.9.1	101	3.1	21	15	71%	
		8.10.4	105	1.1	21	18	86%	
		8.10.4	105	2.2	21	21	100%	
		8.10.4	107	3.1	21	12	57%	
		9.1	103	3.1	21	14	67%	
		9.2.2	101	3.1	22	18	82%	
		9.5.3	101	1.1	21	10	48%	
		9.7	102	3.1	22	18	82%	
		9.8.1	103	1.1	21	17	81%	
		11.9	101	3.1	21	10	48%	
		113.2	102	1.1	22	16	73%	
		113.3.2	103	1.1	21	17	81%	
	3	7.3.1	111	3.8	21	17	81%	
		7.3.1	112	3.8	21	20	95%	
		8.10.1.3	103	1.1	20	19	95%	
		9.11.1	102	1.1	21	18	86%	
1993	1-1	3.2.2	1	1.1	21	15	71%	
		3.2.3	3B NOTE B	3.1	21	16	76%	
		3.2.4	1 NOTE 3B	2.2	21	17	81%	
		5.3.2	3	2.2	21	17	81%	
		5.3.4	3	1.1	21	17	81%	
		6.1	1 NOTE 1	3.1	21	12	57%	
		6.1	1 NOTE 2B	1.1	21	12	57%	
		6.3.2.2	2	2.2	20	18	90%	
		6.3.2.3	1	1.1	20	15	75%	
		6.3.2.3	1	2.2	18	13	72%	
		6.3.2.3	2	3.1	21	16	76%	
		6.3.2.4	1B NOTE 2B	3.1	21	16	76%	
		6.3.2.4	2B NOTE B	1.1	21	19	90%	
		6.3.4	1	3.1	20	5	25%	
	1-2	2.3	1	1.1	25	23	92%	
		2.3	2	1.1	25	24	96%	
		4.1	2	3.1	24	7	29%	
		4.2.3.6	1 NOTE 2	1.1	24	19	79%	
		4.2.4	2	3.1	24	9	38%	
	1-3	2	3	1.1	18	13	72%	
		2	5	1.1	18	16	89%	
		3.1	3 NOTE 1	2.2	16	13	81%	
		3.2.4	1	1.1	16	11	69%	
		5.3	4	1.1	16	16	100%	
		8.3	5	1.1	17	14	82%	
		8.4	5	1.1	17	14	82%	
		8.5.1	4	1.1	17	15	88%	
		10.1.1	1	3.1	16	12	75%	

EN	Part	Chapter	Clause	NDP type	# of uploaded NDPs with RV	# of accepted NDPs with RV	% of accepted NDPs with RV	Acceptance bar
1993	1-3	Annex A.6.4	4	3.1	17	12	71%	
	1-4	5.1	2	1.1	18	16	89%	
		5.5	1 NOTE 1	3.1	18	16	89%	
		5.6	2	1.1	18	17	94%	
		6.2	3	1.1	18	18	100%	
	1-5	2.2	5 NOTE 1	1.1	22	22	100%	
		3.3	1 NOTE 1	3.3	22	13	59%	
		4.3	6	1.1	22	21	95%	
		5.1	2 NOTE 2	2.2	21	19	90%	
		6.4	2	3.1	22	17	77%	
		9.2.1	9	1.1	21	20	95%	
		Annex C.2	1	3.1	21	9	43%	
		Annex C.5	2	3.1	22	17	77%	
		Annex C.8	1 NOTE 1	1.1	21	16	76%	
		Annex C.9	3	1.1	20	13	65%	
		Annex D.2.2	2	3.1	21	17	81%	
	1-6	4.1.4	3	1.1	19	18	95%	
		5.2.4	1	1.1	19	19	100%	
		6.3	5	1.1	19	17	89%	
		7.3.2	1	1.1	19	17	89%	
		8.4.2	3	3.8	19	19	100%	
		8.4.3	2	2.1	19	18	95%	
		8.4.3	4 NOTE 1	2.1	19	19	100%	
		8.4.4	4 NOTE 1	2.1	19	19	100%	
		8.4.5	1	1.1	19	18	95%	
		8.5.2	4	3.1	18	15	83%	
		8.7.2	7	1.1	18	18	100%	
		8.7.2	18 NOTE 1	1.1	18	18	100%	
		8.7.2	18 NOTE 2	2.1	18	17	94%	
	1-7	6.3.2	4 NOTE 1	1.1	18	16	89%	
	1-8	2.2	2	2.1	21	16	76%	
		3.1.1	3	3.1	22	10	45%	
	1-9	2	2	3.1	22	11	50%	
		3	7	2.2	21	12	57%	
	1-10	2.2	5 NOTE 1	3.1	21	16	76%	
		2.2	5 NOTE 4	3.3	21	6	29%	
		3.1	1	3.3	20	6	30%	
	1-11	2.4.1	1	2.2	19	18	95%	
		3.1	1 NOTE 6	1.1	17	15	88%	
		5.2	3	1.1	19	19	100%	
		6.2	2 NOTE 4	2.1	18	16	89%	
		6.3.2	1	1.1	19	19	100%	
		6.3.4	1	1.1	19	19	100%	
		6.4.1	1 NOTE 1	1.1	19	18	95%	
		7.2	2 NOTE 1	3.7	18	17	94%	
	1-12	2.1	3.1(2)	2.2	20	16	80%	
		2.1	3.2.2(1)	3.1	20	15	75%	
		2.1	6.2.3(2)	1.1	20	19	95%	
	2	2.1.3.2	1 NOTE 1	1.1	20	16	80%	
		3.2.3	3	2.2	18	14	78%	
		3.2.4	1	3.8	20	15	75%	
		6.1	1 NOTE 2	1.1	19	13	68%	
		6.3.4.2	1	3.1	20	16	80%	
		6.3.4.2	7	3.1	20	14	70%	
		7.3	1 NOTE 2	1.1	20	19	95%	
		9.3	1	1.1	20	20	100%	
		9.3	2	2.2	19	14	74%	
		9.5.2	2	6	20	18	90%	
		9.5.2	5	1.1	20	17	85%	

EN	Part	Chapter	Clause	NDP type	# of uploaded NDPs with RV	# of accepted NDPs with RV	% of accepted NDPs with RV	Acceptance bar
1993	2	9.5.2	7	6	20	18	90%	
		Annex A.3.3	1	1.1	19	18	95%	
		Annex A.3.6	2	3.8	19	18	95%	
		Annex A.4.2.1	3	2.2	19	15	79%	
		Annex C.1.2.2	1 NOTE 1	3.1	19	16	84%	
		Annex C.1.2.2	2	6	18	18	100%	
		Annex E.2	1	6	20	19	95%	
	3-1	2.1.1	3	3.1	16	11	69%	
		2.3.1	1	3.1	15	10	67%	
		2.3.2	1	3.1	16	9	56%	
		2.3.6	2 NOTE 1	1.1	16	10	63%	
		2.6	1	1.1	16	7	44%	
		4.2	1	3.1	15	10	67%	
		6.1	1 NOTE 1	1.1	16	9	56%	
		6.4.1	1	2.2	13	10	77%	
		6.4.2	2	3.1	16	9	56%	
		6.5.1	1	3.1	15	13	87%	
		7.1	1	2.2	16	15	94%	
		9.5	1	2.2	17	11	65%	
		Annex A.1	1	3.7	16	13	81%	
		Annex A.2	1 NOTE 2	2.2	17	9	53%	
		Annex B.2.3	1	2.1	16	15	94%	
		Annex B.2.3	3	2.1	15	12	80%	
		Annex B.3.2.2.6	4 NOTE 1	1.1	16	15	94%	
		Annex B.4.3.2.2	2 NOTE 2	1.1	16	16	100%	
		Annex B.4.3.2.3	1 NOTE 2	1.1	16	16	100%	
		Annex B.4.3.2.8.1	4 NOTE 1	1.1	16	15	94%	
		Annex C.6	1	1.1	16	12	75%	
		Annex F.4.2.1	1	1.1	15	12	80%	
		Annex F.4.2.2	2	3.1	16	14	88%	
		Annex G.1	3	1.1	17	16	94%	
	3-2	2.3.3.1	1 NOTE 1	1.1	13	11	85%	
		2.6	1	1.1	14	11	79%	
		4.2	1	2.1	14	13	93%	
		5.2.1	3	3.1	13	11	85%	
		6.1	1	1.1	14	12	86%	
		6.2.1	6	3.1	14	12	86%	
		6.4.1	1	2.2	14	10	71%	
		7.2	1	1.1	14	14	100%	
		7.2	2	2.2	14	13	93%	
		9.5	1	2.2	14	11	79%	
		Annex A.1	1	2.2	13	13	100%	
		Annex A.2	1 NOTE 2	2.2	13	9	69%	
	4-1	2.9.2.2	3	1.1	16	11	69%	
		4.1.4	2	1.1	16	14	88%	
		4.2.2.3	6	1.1	16	16	100%	
		4.3.1	6	1.1	16	15	94%	
		4.3.1	8	1.1	16	12	75%	
		5.3.2.3	3	2.1	16	13	81%	
		5.3.2.4	10	1.1	16	16	100%	
		5.3.2.4	12	2.2	16	14	88%	
		5.3.2.4	15	1.1	16	16	100%	
		5.3.2.5	10	1.1	15	13	87%	
		5.3.2.5	14	1.1	16	14	88%	
		5.3.2.6	3	1.1	16	14	88%	
		5.3.2.6	6	1.1	15	12	80%	
		5.3.2.8	2	1.1	16	16	100%	
		5.3.3.5	1	1.1	16	15	94%	
		5.3.3.5	2	1.1	16	16	100%	

EN	Part	Chapter	Clause	NDP type	# of uploaded NDPs with RV	# of accepted NDPs with RV	% of accepted NDPs with RV	Acceptance bar
1993	4-1	5.3.4.3.2	2	1.1	16	15	94%	
		5.3.4.3.3	2	1.1	16	16	100%	
		5.3.4.3.3	5	1.1	16	14	88%	
		5.3.4.3.4	5	1.1	16	15	94%	
		5.3.4.5	3	1.1	16	16	100%	
		5.4.4	2	1.1	15	13	87%	
		5.4.4	3	1.1	16	15	94%	
		5.4.4	4	1.1	15	13	87%	
		5.4.7	3	3.1	16	15	94%	
		5.5.2	3	1.1	16	16	100%	
		5.6.2	1	1.1	16	14	88%	
		5.6.2	2	1.1	16	14	88%	
		6.1.2	4	1.1	16	15	94%	
		6.3.2.3	2	1.1	16	16	100%	
		6.3.2.3	4	1.1	16	15	94%	
		6.3.2.7	3	1.1	16	15	94%	
		7.3.1	4	1.1	16	15	94%	
		8.3.3	4	1.1	16	15	94%	
		8.4.1	6	1.1	16	14	88%	
		8.4.2	5	1.1	16	13	81%	
		8.5.3	3	1.1	16	14	88%	
		9.5.1	3	1.1	16	16	100%	
		9.5.1	4	1.1	16	16	100%	
		9.5.2	5	1.1	16	14	88%	
		9.8.2	1	1.1	16	13	81%	
		9.8.2	2	1.1	16	14	88%	
		Annex A.2	1	1.1	16	14	88%	
		Annex A.2	2	1.1	16	15	94%	
		Annex A.3.2.1	6	2.1	16	12	75%	
		Annex A.3.2.2	6	1.1	16	15	94%	
		Annex A.3.2.3	2	1.1	16	15	94%	
		Annex A.3.3	1	1.1	16	15	94%	
		Annex A.3.3	2	1.1	16	16	100%	
		Annex A.3.3	3	1.1	16	14	88%	
		Annex A.3.4	4	1.1	16	14	88%	
	4-2	2.2	3	3.1	14	12	86%	
		2.9.2.1	1	2.2	14	10	71%	
		2.9.2.1	2	2.2	14	11	79%	
		2.9.2.1	3	2.2	15	12	80%	
		2.9.2.2	3	1.1	15	10	67%	
		2.9.3	2	1.1	15	15	100%	
		4.1.4	3	1.1	15	15	100%	
		4.3.1	6	1.1	15	15	100%	
		4.3.1	8	1.1	15	11	73%	
	4-3	3.2	1	1.1	13	12	92%	
		3.2	2	1.1	14	13	93%	
		3.2	3	1.1	14	13	93%	
		3.2	4	1.1	14	14	100%	
		3.3	2	1.1	14	14	100%	
		3.3	3	1.1	14	14	100%	
		3.3	4	1.1	14	14	100%	
		3.4	3	1.1	14	14	100%	
		5.1.1	2	1.1	14	12	86%	
		5.1.1	3	1.1	14	14	100%	
		5.1.1	4	1.1	14	14	100%	
		5.1.1	5	1.1	14	14	100%	
		5.1.1	6	1.1	14	14	100%	
		5.1.1	9	1.1	14	13	93%	
		5.1.1	10	1.1	14	14	100%	

EN	Part	Chapter	Clause	NDP type	# of uploaded NDPs with RV	# of accepted NDPs with RV	% of accepted NDPs with RV	Acceptance bar
1993	4-3	5.1.1	11	1.1	14	14	100%	
		5.1.1	12	1.1	14	12	86%	
		5.1.1	13	1.1	14	13	93%	
		5.2.3	2	1.1	14	13	93%	
	5	3.7	1	1.1	19	18	95%	
		4.4	1	2.2	17	12	71%	
		5.1.1	4	1.1	17	11	65%	
		5.2.2	2 NOTE 2	3.1	16	5	31%	
		5.2.2	13	1.1	17	17	100%	
		5.2.5	7	1.1	18	18	100%	
		5.5.4	2	1.1	16	15	94%	
		6.4	3 NOTE 1	3.1	16	4	25%	
		7.1	4	1.1	18	16	89%	
		7.2.3	2 NOTE 1	1.1	18	10	56%	
		Annex A.3.1	3	2.2	18	16	89%	
		Annex B.5.4	1 NOTE 1	1.1	18	18	100%	
	6	2.1.3.2	1	2.2	17	13	76%	
		2.8	2	1.1	18	18	100%	
		3.2.3	2	2.2	18	15	83%	
		3.2.4	1 Table 3.2	3.8	18	16	89%	
		3.6.2	1	3.1	18	9	50%	
		6.1	1	1.1	17	10	59%	
		6.3.2.3	1	3.1	18	14	78%	
		7.3	1	3.8	16	14	88%	
		7.5	1	1.1	18	16	89%	
		8.2	4	3.1	18	13	72%	
		9.1	2	1.1	18	15	83%	
		9.2	1	1.1	18	17	94%	
		9.2	2	2.2	18	12	67%	
		9.3.3	1	3.1	18	13	72%	
		9.4.2	5	3.1	18	16	89%	
1994	1-1	2.4.1.1	1	1.1	26	21	81%	
		2.4.1.2	5	1.1	25	19	76%	
		2.4.1.2	6	1.1	25	22	88%	
		2.4.1.2	7	1.1	25	20	80%	
		3.1	4	2.2	26	21	81%	
		3.5	2	1.1	26	23	88%	
		6.6.3.1	1	1.1	25	17	68%	
		6.8.2	1	1.1	26	22	85%	
		9.1.1	2	1.1	26	25	96%	
		9.6	2	1.1	26	19	73%	
		9.7.3	4 NOTE 1	1.1	25	21	84%	
		9.7.3	8 NOTE 1	1.1	25	20	80%	
		9.7.3	9	1.1	25	22	88%	
		Annex B.2.5	1	1.1	25	18	72%	
		Annex B.3.6	5	1.1	25	19	76%	
	1-2	2.1.3	2	1.1	27	24	89%	
		3.3.2	9 NOTE 1	3.1	24	15	63%	
		4.3.5.1	10 NOTE 1	1.1	27	22	81%	
	2	2.4.1.1	1	1.1	22	16	73%	
		2.4.1.2	5	1.1	20	18	90%	
		2.4.1.2	6	1.1	21	15	71%	
		6.2.2.5	3	1.1	21	20	95%	
		6.6.3.1	1	1.1	20	18	90%	
		6.8.1	3	1.1	20	15	75%	
		7.4.1	4	2.2	21	16	76%	
		7.4.1	6	1.1	21	17	81%	
1995	1-1	2.3.1.2	2	3.8	19	5	26%	
		2.4.1	1 NOTE 2	2.2	19	10	53%	

EN	Part	Chapter	Clause	NDP type	# of uploaded NDPs with RV	# of accepted NDPs with RV	% of accepted NDPs with RV	Acceptance bar
1995	1-1	6.4.3	8	3.3	21	12	57%	
		7.2	2	3.8	19	5	26%	
		7.3.3	2	6	21	11	52%	
		8.3.1.2	4 NOTE 2	3.3	20	10	50%	
		8.3.1.2	7	3.1	21	10	48%	
		9.2.4.1	7	3.3	23	12	52%	
		9.2.5.3	1	2.1	21	11	52%	
	1-2	2.1.3	2	1.1	23	17	74%	
		2.3	1 NOTE 2	1.1	23	21	91%	
		2.3	2 NOTE 1	1.1	23	22	96%	
		2.4.2	3 NOTE 2	3.1	21	13	62%	
		4.2.1	1	3.3	22	17	77%	
	2	2.3.1.2	1	3.1	20	13	65%	
		2.4.1		2.2	18	12	67%	
		7.2	NOTE	2.2	19	9	47%	
1996	1-1	2.4.3	1	2.2	18	3	17%	
		2.4.4	1	2.2	20	17	85%	
		3.6.3	3	2.2	16	7	44%	
		3.7.2	2	1.1	17	12	71%	
		4.3.3	3	3.8	18	14	78%	
		4.3.3	4	2.2	17	13	76%	
		5.5.1.3	3	3.8	19	11	58%	
		6.1.2.2	2	2.2	19	12	63%	
		8.5.2.2	2	1.1	18	8	44%	
		8.5.2.3	2	1.1	18	12	67%	
		8.6.2	1	2.2	19	12	63%	
		8.6.3	1	2.2	19	15	79%	
	1-2	2.3	2	1.1	21	18	86%	
		Annex B	5 NOTE 4	3.1	17	8	47%	
		Annex C.2	4	2.1	15	8	53%	
	2	2.3.4.2	2 NOTE 1	2.2	17	9	53%	
		3.5.3.1	1	2.2	17	8	47%	
	3	2.3	2	2.2	15	1	7%	
		4.2.1.1	1	2.2	14	6	43%	
		4.2.2.3	1	1.1	14	6	43%	
		Annex D.1	1	2.2	15	3	20%	
		Annex D.2	1	2.2	15	7	47%	
		Annex D.3	1	2.2	15	7	47%	
1997	1	2.4.7.1	3	3.1	21	11	52%	
		2.4.8	2	2.2	21	19	90%	
		2.4.9	1	3.1	20	5	25%	
		Annex A.2	1	2.1	16	12	75%	
		Annex A.2	2	2.2	18	10	56%	
		Annex A.3.1	1	2.1	16	8	50%	
		Annex A.3.2	1	2.2	18	8	44%	
		Annex A.3.3.1	1	2.2	18	7	39%	
		Annex A.3.3.2	1	2.1	18	6	33%	
		Annex A.3.3.3	1	2.2	18	9	50%	
		Annex A.3.3.4	1	2.1	18	5	28%	
		Annex A.3.3.5	1	2.1	18	7	39%	
		Annex A.3.3.6	1	2.1	18	7	39%	
		Annex A.4	1	2.1	17	11	65%	
		Annex A.4	2	2.2	18	9	50%	
		Annex A.5	1	2.1	17	11	65%	
1998	1	2.1	1 NOTE 1	1.1	18	15	83%	
		2.1	1 NOTE 3	1.1	17	13	76%	
		3.1.2	1	2.2	16	9	56%	
		3.2.1	4	3.8	15	3	20%	
		3.2.1	5	3.8	15	5	33%	

EN	Part	Chapter	Clause	NDP type	# of uploaded NDPs with RV	# of accepted NDPs with RV	% of accepted NDPs with RV	Acceptance bar
1998	1	3.2.2.2	2	3.1	13	3	23%	
		3.2.2.3	1	2.2	15	4	27%	
		3.2.2.5	4	1.1	16	15	94%	
		4.2.4	2	2.2	15	12	80%	
		4.2.5	5	2.2	15	8	53%	
		4.4.2.5	2	3.1	17	14	82%	
		4.4.3.2	2	2.2	16	12	75%	
		5.2.2.2	10	2.2	16	10	63%	
		5.2.4	3 NOTE 2	3.1	17	6	35%	
		5.4.3.5.2	1	3.1	16	12	75%	
		5.8.2	3	2.2	15	12	80%	
		5.8.2	4	1.1	17	13	76%	
		5.8.2	5	1.1	17	15	88%	
		5.11.1.3.2	3	3.1	17	8	47%	
		5.11.1.4	1	2.2	15	12	80%	
		5.11.1.5	2	1.1	16	12	75%	
		5.11.3.4	7 e	1.1	17	17	100%	
		6.1.2	1 NOTE 1	1.1	16	13	81%	
		6.1.3	1 NOTE 1	3.1	17	8	47%	
		6.2	3 NOTE 2	1.1	17	16	94%	
		6.7.4	2 NOTE 2	1.1	17	14	82%	
		7.1.2	1 NOTE 1	1.1	17	14	82%	
		7.1.3	3	3.1	16	8	50%	
		7.1.3	4	1.1	16	16	100%	
		7.7.2	4	1.1	17	14	82%	
		9.2.2	1	1.1	17	7	41%	
		9.2.3	1	1.1	16	11	69%	
		9.2.4	1	3.1	17	3	18%	
		9.3	2 NOTE 1	3.1	17	5	29%	
		9.3	2 NOTE 2	2.1	15	5	33%	
		9.3	3	3.1	16	7	44%	
		9.3	4 NOTE 1 Table 9.1	2.2	15	6	40%	
		9.5.1	5	2.1	15	8	53%	
		9.6	3	3.7	16	12	75%	
		9.7.2	1	2.2	15	10	67%	
		9.7.2	2 b	1.1	17	16	94%	
		9.7.2	2 c	1.1	17	17	100%	
		9.7.2	5	1.1	16	15	94%	
		10.3	2	1.1	17	15	88%	
	2	2.1	3	1.1	14	10	71%	
		2.1	4	3.1	14	8	57%	
		2.1	6	2.2	13	7	54%	
		2.2.2	5	3.1	14	6	43%	
		2.3.5.3	1 NOTE 2	3.1	14	9	64%	
		2.3.6.3	5	1.1	14	14	100%	
		2.3.7	1 NOTE 1	3.1	14	5	36%	
		2.3.7	1 NOTE 2	3.1	13	5	38%	
		3.2.2.3	1	3.1	14	11	79%	
		3.3	1	3.8	14	12	86%	
		3.3	6 NOTE 1	2.2	13	13	100%	
		3.3	6 NOTE 2	2.2	14	14	100%	
		4.1.2	4	2.2	13	10	77%	
		4.1.8	2	1.1	14	13	93%	
		5.3	4	1.1	14	14	100%	
		5.4	1	3.1	14	10	71%	
		5.6.2	2	1.1	13	13	100%	
		6.2.1.4	1	3.1	14	9	64%	
		6.5.1	1 NOTE 2	3.1	14	7	50%	
		6.6.3.2	1	2.2	14	13	93%	

EN	Part	Chapter	Clause	NDP type	# of uploaded NDPs with RV	# of accepted NDPs with RV	% of accepted NDPs with RV	Acceptance bar
1998	2	6.7.3	7	2.1	14	11	79%	
		7.6.2	1	1.1	14	13	93%	
		7.6.2	5	1.1	14	8	57%	
		7.7.1	2	1.1	12	9	75%	
		Annex J.1	2	3.1	13	10	77%	
		Annex J.2	1 NOTE 2	3.1	13	11	85%	
	3	2.1	3	3.8	13	7	54%	
		3.3.1	4	1.1	14	11	79%	
		3.4.4	1	2.2	13	8	62%	
		4.4.2	1 NOTE 1	1.1	13	11	85%	
		AnnexA.4.4.2	5	1.1	13	13	100%	
		AnnexA.4.4.2	9	1.1	13	13	100%	
	4	2.1.2	4	1.1	14	11	79%	
		2.1.3	5	1.1	14	11	79%	
		2.1.4	8	2.2	14	12	86%	
		2.2	3	2.2	14	11	79%	
		2.3.3.3	2	1.1	14	14	100%	
		2.5.2	3	2.2	14	14	100%	
		3.1	2	2.2	13	12	92%	
		4.5.1.3	3	1.1	14	14	100%	
		4.5.2.3	2	1.1	14	14	100%	
	5	3.1	3	1.1	17	14	82%	
		4.1.4	11	1.1	17	17	100%	
		5.2	2	1.1	17	17	100%	
	6	3.1	1 NOTE 1	3.1	16	14	88%	
		3.5	2	1.1	16	13	81%	
		4.1	5	2.2	16	12	75%	
		4.3.2.1	2	3.1	16	14	88%	
		4.7.2	1	3.1	16	10	63%	
		4.9	4	2.2	15	10	67%	
1999	1-1	1.1.2	1	2.2	20	19	95%	
		2.3.1	1	3.1	20	14	70%	
		3.2.2	1	3.1	20	16	80%	
		3.2.2	2 NOTE 1	3.1	20	17	85%	
		3.2.3.1	1	3.1	18	16	89%	
		3.3.2.1	3 NOTE 1	3.1	19	16	84%	
		3.3.2.2	1	3.1	18	13	72%	
		5.2.1	3	3.1	18	17	94%	
		5.3.2	3	2.2	20	19	95%	
		5.3.4	3	1.1	19	18	95%	
		6.1.3	1 NOTE 1	1.1	20	17	85%	
		6.2.1	5 NOTE 2	1.1	20	17	85%	
		7.2.1	1	3.1	18	7	39%	
		7.2.2	1	3.1	18	7	39%	
		7.2.3	1	3.1	19	7	37%	
		8.1.1	2	2.2	19	13	68%	
		8.9	3	3.1	18	11	61%	
		Annex A	6	3.8	15	10	67%	
		Annex C.3.4.1	2	2.2	20	16	80%	
		Annex C.3.4.1	3	2.2	20	16	80%	
		Annex C.3.4.1	4	2.2	20	16	80%	
		Annex K.1	1	3.8	19	18	95%	
		Annex K.3	1 NOTE 1	3.3	18	12	67%	
	1-2	2.3	1	1.1	19	17	89%	
		2.3	2	1.1	19	17	89%	
		2.4.2	3 NOTE 1	3.1	18	11	61%	
		4.2.2.1	1	3.1	17	11	65%	
		4.2.2.3	5	3.1	17	10	59%	
		4.2.2.4	5	3.1	17	10	59%	

EN	Part	Chapter	Clause	NDP type	# of uploaded NDPs with RV	# of accepted NDPs with RV	% of accepted NDPs with RV	Acceptance bar
1999	1-3	2.1.1	1	3.1	18	11	61%	
		2.2.1	3	1.1	18	17	94%	
		2.3.2	6	1.1	19	17	89%	
		2.4	1 NOTE 1	1.1	19	16	84%	
		2.4	1 NOTE 2	2.2	18	17	94%	
		6.1.3	1 NOTE 1	3.1	18	15	83%	
		6.2.1	2 NOTE 2	1.1	17	11	65%	
		6.2.1	11	3.1	17	11	65%	
		Annex A.3.1	1	3.1	17	12	71%	
		Annex E	5	1.1	17	14	82%	
		Annex E	7	3.1	18	17	94%	
	1-4	2	3	1.1	16	14	88%	
		2	4	1.1	16	15	94%	
		Annex A.3.4	3	3.8	15	11	73%	
	1-5	2.1	3	1.1	16	14	88%	
		2.1	4	1.1	16	15	94%	
		Total			16089	11813	73%	

Annex C. List of NDPs type 1.1 used in the analysis of the convergence of the national choices

#	EN	Part	Section	Clause	Parameter
1	1990	A-2	Annex A2.2.6	1 NOTE 2	The values of $\psi_{1,infq}$ for gr1a (LM1), gr1b (LM2), gr3 (pedestrian loads), gr4 (LM4, crowd loading) and T (thermal actions)
2					The values of $\psi_{1,infq}$ for F_{Wk} in persistent design situations
3					The values of $\psi_{1,infq}$ in other cases (i.e. the characteristic value is used as the infrequent value)
4			Annex A2.4.4.2.2	3	The value for t_T (mm/3m)
5			Annex A2.4.4.2.4		The value for minimum lateral frequency for railway bridges, f_{h0} (Hz.)
1	1991	1-1	5.2.3		Upper deviation if a post-execution coating is included in the nominal value (%)
2					Lower deviation if a post-execution coating is included in the nominal value (%)
3					Upper deviation if such a coating is not included (%)
4					Lower deviation if such a coating is not included (%)
5				4	Upper deviation from the mean value of the self-weight (%)
6					Lower deviation from the mean value of the self-weight (%)
7		1-3	4.3	1	The coefficient for exceptional snow loads C_{esl}
8			5.3.5	1 NOTE 1	The upper value for μ_3
9			5.3.6		The snow load shape coefficient due to wind, $\mu_w \geq$
10					The snow load shape coefficient due to wind, $\mu_w \leq$
11				1 NOTE 2	A restriction for the drift length, $l_s \geq$ (m)
12					A restriction for the drift length, $l_s \leq$ (m)
13		1-4	4.2	2 NOTE 2	The value of the directional factor, c_{dir}, for various wind directions
14				2 NOTE 3	The value of the season factor, c_{season}
15				2 NOTE 5	The value for the shape parameter depending on the coefficient of variation of the extreme-value distribution, K
16					The value for the exponent, n
17			4.3.1	1 NOTE 1	The value of the orography factor, c_O
18			4.4	1 NOTE 2	The value of the turbulence factor, k_I
19			4.5		The value for the air density, ρ (kg/m^3)
20			7.4.3	2	The value of the horizontal eccentricity, e = [...] b
21			7.7	1 NOTE 1	The value for $c_{f,0}$
22			8.1	4	The value for $V^*_{b,0}$ (m/s)
23				5	The value of $V^{**}_{b,0}$ (m/s)
24			8.3.4	1	The longitudinal wind forces in y-direction in percentage of the wind forces in x-direction for plated bridges (%)
25					The longitudinal wind forces in y-direction in percentage of the wind forces in x-direction for truss bridges (%)
26			Annex E.1.3.3		The value of the air density ρ under vortex shedding conditions (kg/m^3)
27			Annex E.1.5.2.6	1 NOTE 1	The minimum value of the number of load cycles N caused by vortex excited oscillation $\geq$

#	EN	Part	Section	Clause	Parameter
28	1991	1-4	Annex E.1.5.3	2 NOTE 1	The value of the air density ρ under vortex shedding conditions (kg/m^3)
29		1-5	6.1.4.3	1	Linear temperature difference between the outer edges of the bridge independent of the width of the bridge (°C)
30			6.1.4.4		Value for a linear temperature difference (°C)
31			6.1.5		Numerical values of ω_N
32					Numerical values of ω_M
33			6.1.6		Values for the differences in the uniform temperature between main structural elements (e.g. tie and arch) (°C)
34					Values for the differences in the uniform temperature for light colour respectively between suspension/stay cables and deck (or tower) (°C)
35					Values for the differences in the uniform temperature for dark colour respectively between suspension/stay cables and deck (or tower) (°C)
36			6.2.2		For concrete piers (hollow or solid), the linear temperature differences between opposite outer faces (°C)
37				2	For walls, the linear temperature differences between the inner and outer faces (in °C)
38			7.5	3	For concrete pipelines, the linear temperature difference component between the inner and outer faces of the wall (in °C)
39				4	The value of the difference of temperature (°C)
40			Annex A.1	3	Value of the initial temperature, T_0 (°C)
41			Annex A.2	2	The values of the coefficients k_1
42					The values of the coefficients k_2
43					The values of the coefficients k_3
44					The values of the coefficients k_4
45		1-6	4.12	1 NOTE 2	Value of the dynamic amplification factor
46			Annex A1.1	1	The value of ψ_0 with in a recommended range of 0.6 to 1.0
47					The value of ψ_2 with a recommendation that values below 0.2 are not selected
48			Annex A2.5	2	The value of x (%)
49		1-7	4.3.2	1 NOTE 4	Upward inclination of the impact loads on the underside surfaces of bridge decks (degree)
50			4.5.1.4	3	The height above track level of the point of application for F_{dx} (m)
51					The height above track level of the point of application for F_{dy} (m)
52				4	The amount of the reduction of the equivalent static forces (%)
53			4.5.2		Design values for the static equivalent force due to impact on the end impact wall, F_{dx} (kN)
54					Design values for the static equivalent force due to impact on the end impact wall, F_{dy} (kN)
55					Level of application F_{dx} above track level (m)
56					Level of application F_{dy} above track level (m)
57			4.6.2	2	The value of the friction coefficient, μ
58				4	A value for the equivalent static force (MN)
59			4.6.3	3	The value of the friction coefficient, μ

#	EN	Part	Section	Clause	Parameter
60	1991	2	4.2.3	1	The minimum value of the height of the kerbs to be taken into (mm)
61			4.4.1	2 NOTE 2	The upper limit of the characteristic value of braking force, Q_{lk} (kN)
62			5.3.2.1	1	The characteristic value of the uniformly distributed load, q_{fk} (kN/m^2)
63			6.3.2	3	The factor α ≥
64			6.5.4.3.	1	For simplified calculations, a temperature variation of the superstructure, ΔT_N ± (Kelvin)
65			6.5.4.5.1	2	Straight track or track radius r ≥ (m)
66			6.9	6	The design working life (year)
67			Annex D.2	2	The value for the partial safety factor for fatigue loading, γ_{Ff}
68		3	2.5.2.1		The portion of the width of the rail head used to compute the eccentricity of application of a wheel load
69			2.7.3	3	The value of μ for steel - steel
70					The value of μ for steel - rubber
71		4	5.2.4.3.1		The value of k_1
72					The value of k_2
73					The value of k_3
1	1992	1-1	2.3.3		The value of d_{joint} (in meter)
2					For precast concrete - The value of d_{joint} (m)
3					The value of d_{joint} (m)
4			2.4.2.1	1	The value of γ_{SH}
5			2.4.2.2		The value of $\gamma_{P,fav}$
6				2	The value of $\gamma_{P,unfav}$ in the stability limit state
7				3	The value of $\gamma_{P,unfav}$ for local effects
8			2.4.2.3	1	The value of $\gamma_{F,fat}$
9			2.4.2.5	2	The value of k_f
10			3.1.2	4	The value of k_t
11			3.1.6	1	The value of α_{cc} (should lie between 0.8 and 1.0)
12				2	The value of α_{ct}
13			3.2.7		The value of ε_{ud} is [...] ε_{uk}.
14			3.3.4	5	The value of k
15			4.4.1.2	6	The value of $\Delta_{cdur,\gamma}$ (mm)
16				7	The value of $\Delta_{cdur,st}$ (mm)
17				8	The value of $\Delta_{cdur,add}$(mm).
18				13	The value of k_1 (mm)
19					The value of k_2 (mm)
20					The value of k_3 (mm)
21			4.4.1.3	1	The value of Δc_{dev} (mm)
22				4	The values of k_1 (mm)
23					The values of k_2 (mm)

#	EN	Part	Section	Clause	Parameter
24	1992	1-1	5.8.3.3	1	The value of k_1
25				2	The value of k_1
26			5.8.6	3	The value of γ_{CE}
27			5.10.2.1	1	The value of k_1
28					The value of k_2
29				2	The value of k_3
30			5.10.2.2	4	The values of k_4
31					The values of k_5
32				5	The values of k_6
33			5.10.3	2	The values of k_7
34					The values of k_8
35			5.10.8		The value of $\Delta\sigma_{p,ULS}$ (MPa)
36			5.10.9	1	The values of r_{sup} for pre-tensioning or unbonded tendons
37					The values of r_{inf} for pre-tensioning or unbonded tendons
38					The values of r_{sup} for post-tensioning or bonded tendons
39					The values of r_{inf} for post-tensioning or bonded tendons
40					The values of r_{inf} when appropriate measures (e.g. direct measurements of pretensioning) are taken
41					The values of r_{sup} when appropriate measures (e.g. direct measurements of pretensioning) are taken
42			6.2.3	2	The value of $\cot\theta \geq$
43					The value of $\cot\theta \leq$
44			6.2.4	6	The value of k
45			6.4.5	4	The value of k
46			6.5.4		The value of k_1
47					The value of k_2
48					The value of k_3
49				6	The value of k_4
50			6.8.4	1 NOTE 1	The values of $\gamma_{F,fat}$
51				5	The value of k_2
52			6.8.6	1	The value of k_1 (MPa)
53					The value of k_2 (MPa)
54				3	The value of k_3
55			6.8.7	1	The value of N ($\leq 10^6$ cycles)
56					The value of k_1
57			7.2	2	The value of k_1
58				3	The value of k_2
59				5	The values of k_3
60					The values of k_4

#	EN	Part	Section	Clause	Parameter
61	1992	1-1	7.2	5	The values of k_5
62			7.3.4	3	The values of k_3
63					The vaules of k_4
64			8.2	2	The value of k_1 (mm)
65					The value of k_2 (mm)
66			8.8	1	The value of Φ_{large} (mm)
67			9.2.1.2		The value of β_1 for beams
68			9.2.1.4		The value of β_2 for beams
69			9.2.2	4	The value of β_3 for beams
70			9.5.2	1	The value of Φ_{min} (mm)
71			9.8.1	3	The value of Φ_{min} for pile caps (mm)
72			9.8.2.1	1	The value of Φ_{min} for column and wall footings (mm)
73			9.8.3		The value of Φ_{min} for tie beams (mm)
74				2	The value of q_1 (kN/m)
75			9.8.4	1	The values of q_2 (MPa)
76					The values of Φ_{min} (mm)
77			9.10.2.2	2	Values of q_1 (kN/m)
78					Values of Q_2 (kN)
79			9.10.2.3	3	Values of $F_{tie,int}$ (kN/m)
80				4	Values of q_3 (kN/m)
81					Values of Q_4 (kN)
82			9.10.2.4	2	Values of $f_{tie,fac}$ (kN/m)
83					Values of $F_{tie,col}$(kN)
84			11.3.5	1	The value of α_{lcc}
85				2	The value of α_{lct}
86			11.6.4.1	1	The value k_2
87			12.3.1		The values of $\alpha_{cc,pl}$
88					The values of $\alpha_{ct,pl}$
89			12.6.3	2	The value of k
90			Annex A.2.1	1	The value of $\gamma_{S,red1}$
91				2	The value of $\gamma_{C,red1}$
92			Annex A.2.2	1	The values of $\gamma_{S,red2}$
93					The values of $\gamma_{C,red2}$
94				2	The value of $\gamma_{C,red3}$
95			Annex A.2.3	1	The value of η
96					The value of $\gamma_{C,red4}$
97			Annex C.1		The value of β

#	EN	Part	Section	Clause	Parameter
98	1992	1-1	Annex J.2.2	2	The lower limits of tanθ
99					The upper limits of tanθ
100			Annex J.3		The value of k_1
101				3	The value of k_2
102		1-2	2.1.3	2	The values of $\Delta\theta_1$ (K)
103					The values of $\Delta\theta_2$ (K)
104			2.3	2 NOTE 1	For thermal properties of concrete and reinforcing and prestressing steel: $\gamma_{M,fi}$
105					For mechanical properties of concrete and reinforcing and prestressing steel: $\gamma_{M,fi}$
106			4.5.1	2	The value of k
107		2	3.1.6	101	The value of α_{cc} (should lie between 0.80 and 1.00)
108				102	The value of α_{ct} (should lie between 0.80 and 1.00)
109			4.2	106 NOTE 1	The distance x (m)
110					The distance y (m)
111			6.1	110	The value of k_p
112					The value of k_{cm}
113			6.2.3	109	The absolute minimum value of h_{red} is COEF·h, with COEF
114			6.8.7	101 NOTE 1	The value of k_1
115			7.2	102	The value of k_1
116					The maximum increase in the stress limit above k_1f_{ck} in the presence of confinement (%)
117			8.10.4	105	The value of X of tendons to be coupled at a section (%)
118					The maximum percentage of tendons to be coupled at a section (%)
119			9.5.3	101	The values of Φ_{min} (mm)
120					The values of $\Phi_{min,mesh}$ (mm)
121			9.8.1	103	The value of d_{min} (mm)
122			113.2	102	The value of x (N/m^2)
123			113.3.2	103	The value of *k*
124		3	8.10.1.3		The value of k
125			9.11.1	102	The value of t_1 (mm)
126					The value of t_2 (mm)
1	1993	1-1	3.2.2	1	$f_u / f_y \geq$
2					Elongation at failure not less than (%)
3					$\varepsilon_u \geq$ [...]. ε_y, where ε_y is the yield strain ($\varepsilon_y = f_y / E$)
4			5.3.4	3	The value of k
5			6.1	1 NOTE 2B	γ_{M0}
6					γ_{M1}
7					γ_{M2}
8			6.3.2.3	1	The parameter $\lambda_{LT,0}$ (maximum value)

#	EN	Part	Section	Clause	Parameter
9	1993	1-1	6.3.2.3	1	The parameter β (minimum value)
10			6.3.2.4	2B NOTE B	Value of the modification factor k_{fl}
11		1-2	2.3	1	For the mechanical properties of steel, the value of the partial factor for the fire situation, $\gamma_{M,fi}$
12				2	For thermal properties of steel, the value of the partial factor for the fire situation, $\gamma_{M,fi}$
13			4.2.3.6	1 NOTE 2	The value of θ_{crit}(°C)
14		1-3	2	3	The value for γ_{M0}
15					The value for γ_{M1}
16					The value for γ_{M2}
17				5	The value for $\gamma_{M,ser}$
18			3.2.4	1	The core thickness t_{cor} for sheeting and members ≥ (mm)
19					The core thickness t_{cor} for sheeting and members ≤ (mm)
20			5.3	4	The value e_0/L for elastic analysis
21					The value e_0/L for plastic analysis
22			8.3	5	The value of γ_{M2}
23			8.4		The value of γ_{M2}
24			8.5.1	4	The value of γ_{M2}
25		1-4	5.1	2	The partial factor γ_{M0}
26					The partial factor γ_{M1}
27					The partial factor γ_{M2}
28			5.6		The value η
29			6.2	3	if the shear plane passes through unthreaded portion of the bolt, α
30					if the shear plane passes through the threaded portion of the bolt, α
31		1-5	2.2	5 NOTE 1	The value of ρ_{lim}
32			4.3	6	The value Φ_h
33			9.2.1	9	The value of θ
34			Annex C.8	1 NOTE 1	The value for the limiting of principal strain (%)
35			Annex C.9	3	The value of γ_{M1}
36					The value of γ_{M2}
37		1-6	4.1.4		The value of N_f
38			5.2.4	1	The value of $(r/t)_{min}$
39			6.3	5	The value of n_{mps}
40			7.3.2	1	The value of $n_{p,eq}$
41			8.4.5		The value of β_θ (radian)
42			8.7.2	7	The value of β (radians)
43				18 NOTE 1	The value of n_i
44		1-7	6.3.2	4 NOTE 1	The value of n_{eq}
45		1-11	3.1	1 NOTE 6	Steel round wires, nominal tensile grade (N/mm^2)

#	EN	Part	Section	Clause	Parameter
46	1993	1-11	3.1	1 NOTE 6	Steel Z-wires, nominal tensile grade (N/mm^2)
47					Stainless steel round wires, nominal tensile grade: (N/mm^2)
48			5.2	3	The value of γ_P
49			6.3.2	1	The partial factor for friction $\gamma_{M,fr}$ to prevent slipping of cables over saddles
50			6.3.4		The value k
51			6.4.1	1 NOTE 1	The partial factor for friction $\gamma_{M,fr}$ to prevent slipping of clamps
52		2	2.1.3.2		Design working life of a permanent bridge (years)
53			6.1	1 NOTE 2	γ_{M0}
54					γ_{M1}
55					γ_{M2}
56					γ_{M3}
57					$\gamma_{M3,ser}$
58					γ_{M4}
59					γ_{M5}
60					$\gamma_{M6,ser}$
61					γ_{M7}
62			7.3		The value γ_{Mser}
63			9.3	1	The partial factor γ_{Ff}
64			9.5.2	5	The design life of the bridge t_{Ld} (years)
65			Annex A.3.3	1	γ_μ for steel on steel
66					γ_μ for steel on concrete
67		4-1	2.9.2.2	3	γ_{M0}
68					γ_{M1}
69					γ_{M2}
70					γ_{M4}
71					γ_{M5}
72					γ_{M6}
73			4.1.4	2	The value of Δt_a (mm)
74			4.2.2.3	6	The value of n_{VS}
75			4.3.1		The value of n_S
76				8	The value of n_{ew}
77			5.3.2.4	10	The value of Ψ_b
78				15	The value of β
79					The value of η
80			5.3.2.5	10	The value of α_n
81				14	The value of k_1
82			5.3.2.6	3	The value of k_s

#	EN	Part	Section	Clause	Parameter
83	1993	4-1	5.3.2.6	6	The value of α_{τ}
84			5.3.2.8	2	The value of N_f
85			5.3.3.5	1	The value of k_s
86				2	The value of k_t
87			5.3.4.3.2		The value of α_x
88			5.3.4.3.3		The value of k_{dx}
89				5	The value of α_x
90			5.3.4.3.4		The value of k_s
91			5.3.4.5	3	The value of $k_{d\theta}$
92			5.4.4	2	The value of $(r/t)_{max}$
93					The value of k_1
94					The value of k_2
95					The value of k_3
96				3	The value of k_s
97				4	The value of k_L
98			5.5.2	3	The value of k_{d1}
99			5.6.2	1	The value of k_{d2}
100				2	The value of k_{d3}
101					The value of k_{d4}
102			6.1.2	4	The value of γ_{M0g}
103			6.3.2.3	2	The value of g_{asym}
104				4	The value of k_r
105			6.3.2.7	3	The value of α_{xh}
106			7.3.1	4	The value of α_p
107			8.3.3		The value of β_{lim} (degree)
108			8.4.1	6	The value of β_{lim} (degree)
109					The value of k_L
110					The value of k_R
111			8.4.2	5	The value of β_{lim} (degree)
112					The value of k_L
113					The value of k_R
114			8.5.3	3	The value of k
115			9.5.1		The value of C_{sc}
116					The value of C_{ss}
117				4	The value $k_L=k_{Lf}$ for bulk solids filling
118					The value $k_L=k_{Le}$ for bulk solids discharge
119			9.5.2	5	The value of k_s

#	EN	Part	Section	Clause	Parameter
120	1993	4-1	9.8.2	1	The value of k_1
121					The value of k_2
122				2	The value of k_3
123			Annex A.2	1	The value of k_M
124				2	The value of k_h
125			Annex A.3.2.2	6	The value of γ_{M1}
126			Annex A.3.2.3	2	The value of α_n
127					The value of γ_{M1}
128			Annex A.3.3	1	The value of γ_{M0g}
129				2	The value of g_{asym}
130				3	The value of k_r
131					The value of γ_{M2}
132			Annex A.3.4	4	The value of γ_{M0}
133		4-2	2.9.2.2	3	γ_{M0}
134					γ_{M1}
135					γ_{M2}
136					γ_{M4}
137					γ_{M5}
138					γ_{M6}
139			2.9.3	2	The value for the partial factor for serviceability γ_{Mser}
140			4.1.4	3	The value of N_f
141			4.3.1	6	The value of n_S
142				8	The value of n_{ew}
143		4-3	3.2	1	The partial factor γ_M
144				2	The value of Δf (MPa)
145				3	The value of $\gamma\gamma=f_{u,min}/f_{y,min}$
146				4	The value of $\varepsilon_{u,min}$ (%)
147			3.3	2	The value of x (%)
148				3	The value of the strain ε (%)
149				4	The value of y (%)
150			3.4	3	The value of z (%)
151			5.1.1	2	γ_{F1}=
152					γ_{F2}=
153					γ_{F3}=
154				3	val240
155					val360
156					val415

#	EN	Part	Section	Clause	Parameter
157	1993	4-3	5.1.1	3	val480
158				4	The value of D_{cover} (m)
159					The value of G_{eff} (kN/m^2)
160				5	The value of $t_{spec,min}$ (mm)
161				6	The value of d_s (mm)
162					The value of l (m)
163				9	The value of x
164				10	The value of T (°C)
165				11	The value of $T1$ (°C)
166					The value of $T2$ (°C)
167				12	The value of y
168					The value of $T3$ (°C)
169					The value of $D1$ (mm)
170					The value of $D2$ (mm)
171					The value of l (m)
172				13	The value of z
173					The value of γ_F
174					The value of $D2$ (mm)
175					val240
176					val360
177					val415
178					val480
179			5.2.3	2	The value of x
180		5	3.7	1	The value of $f_{y,spec,max}$ (N/mm^2)
181			5.1.1	4	The partial factor γ_{M0}
182					The partial factor γ_{M1}
183					The partial factor γ_{M2}
184			5.2.2	13	The value of l (mm)
185			5.2.5	7	The value of β_R
186			5.5.4	2	The value of h (m)
187			7.1	4	The partial factors γ_{M2}
188					The partial factors $\gamma_{Mt,ser}$
189			7.2.3	2 NOTE 1	The value of k_t
190			Annex B.5.4	1 NOTE 1	The value of η_{sys}
191		6	2.8	2	The value of partial factor $\gamma_{F,test}$ for crane test loads
192			6.1	1	The value of γ_{M0}
193					The value of γ_{M1}

#	EN	Part	Section	Clause	Parameter
194	1993	6	6.1	1	The value of γ_{M2}
195					The value of γ_{M3}
196					The value of $\gamma_{M3,ser}$
197					The value of γ_{M4}
198					The value of γ_{M5}
199					The value of $\gamma_{M6,ser}$
200					The value of γ_{M7}
201			7.5		Partial factors $\gamma_{M,ser}$ for resistance for serviceability limit states
202			9.1	2	The value for number of cycles C_0
203			9.2	1	Partial factors γ_{Ff} for fatigue loads
204		3-1	2.3.6	2 NOTE 1	Imposed loads on platforms (kN/m^2)
205					Horizontal loads on railings (kN/m)
206			2.6	1	The design service life of the structure (years)
207			6.1	1 NOTE 1	The partial factor for resistance of member to yielding γ_{M0}
208					The partial factor for resistance of member buckling γ_{M1}
209					The partial factor for resistance of net section at bolt holes γ_{M2}
210					The partial factor for resistance of guys and their terminations: γ_{Mg}
211					The partial factor for resistance of insulating material γ_{Mi}
212			Annex B.3.2.2.6	4 NOTE 1	Factor to allow for crosswind intensity of turbulence K_X
213			Annex B.4.3.2.2	2 NOTE 2	The scaling factor k_s accounting for the multi-modal response of guyed masts used in equation (B.24)
214			Annex B.4.3.2.3	1 NOTE 2	Scaling factor k_s accounting for the multi-modal response of guyed masts used in equation (B.25)
215			Annex B.4.3.2.8.1	4 NOTE 1	The value of factor K_X to allow for cross wind intensity of turbulence
216			Annex C.6	1	ψ_W
217					ψ_{ice}
218			Annex F.4.2.1		Maximum displacement of the tower top with respect to the tower height
219			Annex G.1	3	Reduction factor η for single angle members connected by one bolt at each end
220					Reduction factor η for single angle members connected by one bolt at one end and continuous or rigidly connected at the other end
221		3-2	2.3.3.1	1 NOTE 1	Imposed loads on platforms (kN/m^2
222					Horizontal loads on railings (kN/m)
223			2.6	1	The design service life of the structure (years)
224			6.1		γ_{M0}
225					γ_{M1}
226					γ_{M2}
227			7.2		The maximum value of deflection δ_{max} = h / [...].
228		1-12	2.1	6.2.3(2)	The value of γ_{M12}

#	EN	Part	Section	Clause	Parameter
1	1994	1-1	2.4.1.1	1	The value of the partial safety factor γ_P for favourable effects
2					The value of the partial safety factor γ_P for unfavourable effects
3			2.4.1.2	5	The value of the partial factor γ_V
4				6	The value of the partial factor γ_{VS}
5				7	The value of the partial factor, $\gamma_{Mf,s}$
6			3.5	2	The value for the minimum nominal thickness *t* of steel sheets (mm)
7			6.6.3.1	1	The value of the partial factor γ_V
8			6.8.2		The value of the partial factor $\gamma_{Mf,s}$
9			9.1.1	2	The value for the upper limit on the ratio b_r / b_s to define narrowly spaced webs
10			9.6		The value of the deflection $\delta_{s,max}$= L / [...] (where L is the effective span between supports)
11			9.7.3	4 NOTE 1	The value of the partial safety factor γ_{VS} for the ultimate limit state
12				8 NOTE 1	The value of the partial safety factor γ_{VS} for the ultimate limit state
13				9	The value for nominal factor μ
14			Annex B.2.5	1	The value of the partial safety factor for shear connection γ_V
15			Annex B.3.6	5	The value of the partial safety factor γ_{VS}
16		1-2	2.1.3	2	The value of $\Delta\theta_1$ (K)
17					The value of $\Delta\theta_2$ (K)
18			4.3.5.1	10 NOTE 1	The values for L_{ei}= [...] times the system length L
19					The values for L_{et}= [...] times the system length L
20		2	2.4.1.1	1	The value for the partial safety factor, γ_P for favourable effects
21					The value for the partial safety factor, γ_P for unfavourable effects
22			2.4.1.2	5	The value for the partial factor for shear connection, γ_V
23				6	The partial factor $\gamma_{Mf,s}$ for fatigue verification of headed studs in bridges
24			6.2.2.5	3	The value of $C_{Rd,c}$ =[...] / γ_C
25					The value of k_1 =
26					$\sigma_{cp,0}$ (N/m^2)
27			6.6.3.1	1	The value for the partial factor, γ_V
28			6.8.1	3	The value of factor k_s
29			7.4.1	6	Temperature difference between the concrete section and the steel section (concrete cooler) (K)
1	1995	1-2	2.1.3	2	The value of $\Delta\theta_1$ (K)
2					The value of $\Delta\theta_2$ (K)
3			2.3	1 NOTE 2	The partial safety factor for material properties in fire, $\gamma_{M,fi}$
4				2 NOTE 1	The partial safety factor for material properties in fire, $\gamma_{M,fi}$
1	1996	1-1	3.7.2	2	The value of K_E
2			8.5.2.2		The value of n_{tmin} for cavity walls
3					The value of n_{tmin} for veneer walls
4			8.5.2.3		The value of *j*

#	EN	Part	Section	Clause	Parameter
5	1996	1-2	2.3	2	For thermal properties of masonry, the value of the partial safety factor $\gamma_{M,fi}$ for the fire situation
6					For mechanical properties of masonry, the value of the partial safety factor $\gamma_{M,fi}$ for the fire situation
7		3	4.2.2.3	1	The value of n_{tmin}
1	1998	1	2.1	1 NOTE 1	The value of P_{NCR} (%)
2					The value of T_{NCR} (years)
3				1 NOTE 3	The value of P_{DLR} (%)
4					The value of T_{DLR} (years)
5			3.2.2.5	4	The value of lower bound factor, β
6			5.8.2		The values of t_{min} (m)
7					The values of $\rho_{s,min}$ (%)
8				5	The value $\rho_{b,min}$ (%)
9			5.11.1.5	2	The value of A_p (%)
10			5.11.3.4	7 e	The value of $\rho_{c,min}$ (%)
11			6.1.2	1 NOTE 1	Upper limit of q for low-dissipative structural behaviour concept within the range of Table 6.1may
12			6.2	3 NOTE 2	The value the overstrength factor used in design, γ_{ov}
13			6.7.4	2 NOTE 2	The value of γ_{pb}
14			7.1.2	1 NOTE 1	Upper limit of q for low-dissipative structural behaviour concept
15			7.1.3	4	The value the overstrength factor used in design, γ_{ov}
16			7.7.2		The value of the reduction factor, r
17			9.2.2	1	The value of $f_{b,min}$ (N/mm^2)
18					The value of $f_{b,min}$ (N/mm^2) (for low seismicity)
19					The value of $f_{bh,min}$ (N/mm^2)
20					The value of $f_{bh,min}$ (N/mm^2) (for low seismicity)
21			9.2.3		The value of $f_{m,min}$ for unreinforced or confined masonry (N/mm^2)
22					The value of $f_{m,min}$ for reinforced masonry (N/mm^2)
23			9.7.2	2 b	The value of λ_{min}
24				2 c	The value of p_{max} (%)
25				5	The values of $\Delta_{m,max}$ (%)
26					The values of $\Delta_{A,max}$ (%)
27			10.3	2	The value of γ_x
28		2	2.1	3	The value of T_{NCR} (year)
29			2.3.6.3	5	The value of p_E (for the design seismic displacement)
30					The value of p_T (for the thermal movement)
31			4.1.8	2	The value of ρ_0
32			5.3	4	The value of ovestrength factor γ_0 (for concrete)
33					The value of ovestrength factor γ_0 (for steel)
34			5.6.2	2	The value of additional safety factor γ_{Bd1} on shear resistance

#	EN	Part	Section	Clause	Parameter
35	1998	2	7.6.2	1	The value of amplication factor γ_{IS} on design displacement of isolator units
36				5	The value of γ_m in the seismic design situation
37			7.7.1	2	The value of δ_w
38					The value of δ_d
39		3	3.3.1	4	The values of CF_{KL1}
40					The values of CF_{KL2}
41					The values of CF_{KL3}
42			4.4.2	1 NOTE 1	Maximum value of the ratio ρ_{max}/ρ_{min}
43			AnnexA.4.4.2	5	The value of the partial factor, γ_{fd} for FRP (Fibre-Reinforced Polymers) debonding
44				9	The value of the partial factor, γ_{fd} for FRP (Fibre-Reinforced Polymers)
45		4	2.1.2	4	The value of T_{NRC} (years)
46			2.1.3	5	The value of P_{DLR} (%)
47					The value of T_{DLR} (year)
48			2.3.3.3	2	The value of ξ_{max} (%)
49			4.5.1.3	3	The value of the amplification factor γ_{p1}
50			4.5.2.3	2	The value for the overstrength factor γ_{p2}
51		5	3.1	3	The value of γ_{cu}
52					The value of γ_{tcy}
53					The value of γ_{qu}
54					The value of $\gamma_{\phi'}$
55			4.1.4	11	The value of λ
56			5.2	2	The value of p
57		6	3.5		The lower bound factor β on design spectral values, if site-specific studies have been carried out with particular reference to the long-period content of the seismic action
1	1999	1-1	5.3.4	3	The value of *k*
2			6.1.3	1 NOTE 1	The value of partial safety factors γ_{M1} for ultimate limit states
3					The value of partial safety factors γ_{M2} for ultimate limit states
4			6.2.1	5 NOTE 2	The constant *C* in criterion (6.15)
5		1-2	2.3	1	For mechanical properties of aluminium, the value of partial safety factor $\gamma_{M,fi}$for the fire situation
6				2	For thermal properties of aluminium, the value of partial safety factor $\gamma_{M,fi}$ for the fire situation
7		1-3	2.2.1	3	The value of D_{lim}
8			2.3.2	6	The value of k_F
9					The value of k_N
10			2.4	1 NOTE 1	The partial factor for fatigue loads γ_{Ff}
11			6.2.1	2 NOTE 2	The partial safety factor γ_{Mf} for a specific structural detail type
12			Annex E	5	The partial safety factor γ_{Mf} for specific constructional detail type
13		1-4	2	3	The values for γ_{M1}

#	EN	Part	Section	Clause	Parameter
14	1999	1-4	2	3	The values for γ_{M2}
15					The values for γ_{M3}
16				4	The values for $\gamma_{M,ser}$
17		1-5	2.1	3	The values for γ_{M1}
18					The values for γ_{M2}
19				4	The values for $\gamma_{M,ser}$

Annex D. Copyrights of maps of climatic and seismic actions

Country	Copyrights
Snow load maps	
AUT	©BMNT, ALDIS (OVE), ZAMG | Version 1.14, 2018
BGR	©BDS, 2015
CZE	©ČSN, 2017
FIN	© Ministry of Agriculture and the Environment, 2016
FRA	©AFNOR, 2007
GBR	©BSI, 2005
HRV	©HZN, 2014
IRL	©SAI GLOBAL ©NSAI, 2003
ITA	©UNI
LTU	©LST
LUX	©ILNAS, 2011
LVA	©LVS, 2015
PRT	©IPQ, 2009
ROU	©ASRO @INCERC, 2006
SVK	© Ministry of Transport, Construction and Regional Development of the Slovak Republic, 2010
SVN	©ARSO
SWE	©SIS, BFS, 2015
Wind maps	
BGR	©BDS, 2015
CYP	©CYS, 2010
CZE	©ČSN, Czech Hydrometeorological Institute, 2011
FRA	©AFNOR, 2008
GBR	©BSI, 2008
HRV	©HZN, 2014
IRL	©SAI GLOBAL ©NSAI, 2005
LUX	©ILNAS, 2011
LVA	©LVS, 2011
ROU	©ASRO, 2017
SWE	©SIS BFS, 2013
Thermal maps	
BGR	©BDS, 2015
CZE	© ČSN, 2013
FIN	©SFS, 2004
GBR	©BSI, 2008
HRV	©HZN, 2012
IRL	©NSAI, 2003
POL	©IMGW
PRT	©IPQ, 2009
ROU	©ASRO, 2017
SWE	©BFS, 2013
Seismic maps	
AUT	©ASI, 2011
BEL	©NBN, 2010
BGR	©BDS, 2015
CYP	©CYS, 2010
CZE	©UNMZ, 2016
DEU	©DIN, 2011
FRA	©République Française, Ministère de l'Ecologie, du Développement durable, des Transports et du Logement, 2011
GRC	©NQIS/ELOT, 2005
HRV	©HZN, 2014 ©DGU, 2011
HUN	©MSZ, Tóth et al., 2006
PRT	©IPQ, 2010
ROU	©ASRO, 2008
SVN	©ASRO ©Ministry of the Environment and Spatial Planning, 2001

Annex E. List of NDPs relevant to the definition of climatic and seismic actions

EN 1991-1: ACTIONS ON STRUCTURES; Part 1-3: General Actions - Snow loads
1.1 (2) Advice for the treatment of snow loads for altitudes above 1500 m
1.1 (3) Identification of different locations.
1.1 (4) Decision on the use of Annex B for shape coefficients to be used for the treatment of exceptional snow drifts
2 (3) The conditions of use (which may include geographical locations) of clause 2(3)
2 (4) The conditions of use (which may include geographical locations) of clause 2(4)
3.3 (1) Selection of the design situation for a particular local effect described in Section 6
3.3 (3) Selection of the design situation for a particular local effect described in Section 6
4.1 (1) The characteristic value of snow load on the ground (s_k)
4.1 (2) Further complementary guidance on the characteristic value of snow load on the ground (s_k)
4.2 (1) The values of ψ
4.3 (1) The coefficient for exceptional snow loads C_{esl}
5.2 (2) The use of Annex B for the roof shapes described in 5.3.4, 5.3.6 and 6.2 in specific locations
5.2 (5) Further guidance on suitable load arrangements when artificial removal or redistribution of snow on a roof is anticipated
5.2 (6) Further guidance on snow loads on roofs
5.2 (7) The values of the exposure coefficient C_e for different topographies
5.2 (8) The use of a reduced thermal coefficient, C_t
5.3.3 (4) Alternative drifting load arrangement based on local conditions
5.3.4 (3) Decision on the use of Annex B to determine the load case due to drifting for multi-span roofs
5.3.4 (4) Guidance on the snow load shape coefficients for the design of multi-span roofs, where one or both sides of the valley have a slope greater than 60 degrees
5.3.5 (1 NOTE 1) The upper value of μ_3
5.3.5 (1 NOTE 2) Rules for considering the effect of snow fences for snow loads on cylindrical roofs
5.3.5 (3) Alternative drifting load arrangement based on local conditions
5.3.6 (1 NOTE 1) The range for the snow load shape coefficient due to wind, μ_w
5.3.6 (1 NOTE 2) A restriction for the drift length, l_s
5.3.6 (3) Decision on the use of Annex B to determine the load case due to drifting for roofs abutting and close to taller construction works
6.2 (2) Decision on the use of Annex B to determine the load case due to drifting for quasi-horizontal roofs
6.3 (1) The conditions of use for Clause 6.3 (1)
6.3 (2) The values of a coefficient to take account of the irregular shape of the snow, k
Annex A (1 Table A.1) Definition of exceptional conditions and definition of design situations which apply for the particular local effects described in Section 6 for cases B1 and B3
Annex C ((1) to (7)) European ground snow load maps
Annex D ((1) to (4)) Adjustment of the ground snow load according to return period
Annex E ((1) to (2)) Bulk weight density of snow

EN 1991-1: ACTIONS ON STRUCTURES; Part 1-4: General Actions - Wind actions
1.1 (11 NOTE 1) Guidance on wind actions on lattice towers with non-parallel chords, wind actions on guyed masts and guyed chimneys, torsional vibrations, e.g. tall buildings with a central core, bridge deck vibrations from transverse wind turbulence, cable supported bridges, and vibrations where more than the fundamental mode needs to be considered
1.5 (2) Guidance on design assisted by testing and measurements
4.1 (1) National climatic information from which the mean wind velocity v_m, the peak velocity pressure q_p and additional values may be directly obtained for the terrain categories considered
4.2 (1 NOTE 2) The fundamental value of the basic wind velocity, $v_{b,0}$
4.2 (2 NOTE 1) Where the influence of altitude on the basic wind velocity v_b is not included in the specified fundamental value $v_{b,0}$, giving a procedure to take it into account
4.2 (2 NOTE 2) The value of the directional factor, c_{dir}, for various wind directions
4.2 (2 NOTE 3) The value of the season factor, c_{season}
4.2 (2 NOTE 5) The values for the shape parameter depending on the coefficient of variation of the extreme-value distribution, K and the exponent, n
4.3.1 (1 NOTE 1) The orography factor, c_0
4.3.1 (1 NOTE 2) Design charts or tables for $v_m(z)$
4.3.2 (1) The procedure for determining the roughness factor, $c_r(z)$
4.3.2 (2) Definitions of the angular sector and of the upstream distance
4.3.3 (1) The procedure to be used for determining the orography factor, c_0
4.3.4 (1) A procedure to take account of large and considerably higher neighbouring structures effect
4.3.5 (1) A procedure for the effect of closely spaced buildings and other obstacles
4.4 (1 NOTE 2) The value of the turbulence factor, k_I
4.5 (1 NOTE 1) Rules for the determination of the peak velocity pressure, $q_p(z)$
4.5 (1 NOTE 2) The values for the air density, ρ
5.3 (5) Determine whether lack of correlation may be applied generally or be restricted to walls as applied in 7.2.2 (3).
6.1 (1) Information on whether the structural factor c_sc_d should be separated or not
6.3.1 (1 NOTE 3) The procedure to be used to determine k_p, B and R
6.3.2 (1) A method for determining the along-wind displacement and the standard deviation of the along-wind acceleration.
7.1.2 (2) Procedures for asymmetric and counteracting pressures and forces for other structures
7.1.3 (1) Further information on effects of ice and snow
7.2.1 (1 NOTE 2) A procedure for calculating external pressure coefficients for loaded areas above 1 m^2 based on external pressure coefficients $c_{pe,1}$ and $c_{pe,10}$.
7.2.2 (1) The rules for the velocity pressure distribution for leeward wall and sidewalls (zones A, B, C and E, see Figure 7.5)
7.2.2 (2 NOTE 1) The values of $c_{pe,10}$ and $c_{pe,1}$
7.2.8 (1) The values of $c_{pe,10}$ and $c_{pe,1}$ to be used for circular cylindrical roofs and domes
7.2.9 (2) Additional information on the size and distribution of the openings in the building envelope
7.2.10 (3 NOTE 1) Values for the wind effects on external walls and roofs with more than one skin

EN 1991-1: ACTIONS ON STRUCTURES; Part 1-4: General Actions - Wind actions
7.2.10 (3 NOTE 2) Rules for cases where the extremities of the layer between the skins are air tight (Figure 7.14(a)) and where the free distance between the skins is less than 100 mm (the thermal insulation material being included in one skin, when there is no airflow within the insulation).
7.4.1 (1) Values of the resulting pressure coefficients $c_{p,net}$ for free-standing walls and parapets
7.4.3 (2) The value of the horizontal eccentricity, e
7.6 (1 NOTE 1) The values of ψ_r
7.7 (1 NOTE 1) The value for $c_{f,0}$ for the structural elements with sharp edged section
7.8 (1) The value for $c_{f,0}$ for the structural elements with regular polygonal section
7.10 (1 NOTE 1) The values of $c_{f,x}$
7.11 (1 NOTE 2) A reduction factor for scaffolding without air tightness devices and affected by solid building obstruction
7.13 (1) Values for λ and Ω_λ, taking the effect of turbulence into account
7.13 (2) Values for λ and ω_λ
8.1 (1 NOTE 1) Wind actions for other types of bridges (e.g. arch bridges, bridges with suspension cables or cable stayed, roofed bridges, moving bridges and bridges with multiple or significantly curved decks),
8.1 (1 NOTE 2) The angle of the wind direction to the deck axis in the vertical and horizontal planes
8.1 (4) A value for $V^{*}_{b,0}$
8.1 (5) A value for $V^{**}_{b,0}$
8.2 (1 NOTE 1) Criteria and procedures on a dynamic response procedure for bridges
8.3 (1) Force coefficients for parapets and gantries on bridges
8.3.1 (2) Decision on application of reduction to F_W, defined in 8.3.2
8.3.2 (1) C-values
8.3.3 (1 NOTE 1) Values for $c_{f,z}$
8.3.4 (1) The longitudinal wind forces in y-direction
8.4.2 (1 NOTE 1) Simplified rules for wind effects on piers
AnnexA (A.1 to A.5) Terrain effects
AnnexA.2 (1) The procedure on the transition between different roughness categories
AnnexB (B.1 to B.4) Procedure 1 for determining the structural factor c_sc_d
AnnexC (C.1 to C.5) Procedure 2 for determining the structural factor c_sc_d
AnnexD (1) c_sc_d values for different types of structures
AnnexE (E.1 to E.5) Vortex shedding and aeroelastic instabilities
AnnexE.1.3.3 (1) The value of the air density ρ under vortex shedding conditions
AnnexE.1.5.1 (1 NOTE 1) The choice of calculation approach or alternative calculation procedures on for calculating the vortex excited cross-wind amplitudes
AnnexE.1.5.1 (1 NOTE 2) Definition of the range of application for the approaches proposed for calculating the vortex excited cross-wind amplitudes
AnnexE.1.5.1 (3) Providing information on the regions where very cold and stratified flow conditions
AnnexE.1.5.2.6 (1 NOTE 1) The minimum value for the number of load cycles N caused by vortex excited oscillation
AnnexE.1.5.3 (2 NOTE 1) The value of the air density ρ under vortex shedding conditions
AnnexE.1.5.3 (4) More detailed information on the influence of the turbulence intensity on K_a
AnnexE.1.5.3 (6) The peak factor k_p
AnnexE.3 (2) Additional guidance on the combined stability parameter, a_{IG}
AnnexF (F.1 to F.5) Dynamic characteristics of structures

EN 1991-1: ACTIONS ON STRUCTURES; Part 1-5: General Actions - Thermal actions
5.3 (2 Table 5.1) Values for T_1 and T_2
5.3 (2 Table 5.2) Values of the maximum shade air temperature T_{max}, minimum shade air shade temperature T_{min}, and solar radiation effects T_3, T_4, and T_5,
5.3 (2 Table 5.3) The values of T_6, T_7, T_8, and T_9
6.1.1 (1 NOTE2) Values of the uniform temperature component and the temperature difference component for other types of bridges
6.1.2 (2) The selection of the approach on the vertical temperature difference component
6.1.3.1 (4) Values of $T_{e.min}$ and $T_{e.max}$
6.1.3.2 (1) Information (e.g. maps of isotherms) on minimum and maximum shade air temperatures
6.1.3.3 (3) The maximum expansion range of the uniform bridge temperature component, and the maximum contraction range of the uniform bridge temperature component for bearings and expansion joints
6.1.4 (3) Values of the initial temperature difference
6.1.4.1 (1) Values of $\Delta T_{M,heat}$ and $\Delta T_{M,cool}$
6.1.4.2 (1) Values of vertical temperature differences for bridge decks
6.1.4.3 (1) Numerical values for the temperature difference
6.1.4.4 (1) Temperature difference components within walls of concrete box girders
6.1.5 (1) Numerical values of ω_N and ω_M
6.1.6 (1) Values for the differences in the uniform temperature component
6.2.1 (1) The design procedure on consideration of temperature differences between the outer faces of bridge piers, hollow or solid
6.2.2 (1) For concrete piers (hollow or solid), the linear temperature differences between opposite outer faces
6.2.2 (2) For walls, the linear temperature differences between the inner and outer faces
7.2.1 (1) Information (e.g. maps of isotherms) on minimum and maximum shade air temperatures
7.5 (3) For concrete pipelines, the linear temperature difference component between the inner and outer faces of the wall
7.5 (4) The value of the difference of temperature
AnnexA.1 (1 NOTE1) Information (e.g. maps or tables of isotherms) on both annual minimum and annual maximum shade air temperature
AnnexA.1 (1 NOTE2) The adjustment procedure on the values of shade air temperature
AnnexA.1 (3) Value of the initial temperature, T_0
AnnexA.2 (2) The values of the coefficients k_1, k_2, k_3 and k_4 based on the values of parameters u and c
AnnexB (1 Tables B.1, B2 and B.3) Temperature differences for various other depths
AnnexC (1) Coefficients of linear expansion
AnnexD ((1) to (2)) Temperature profiles in buildings and other constructions works

EN 1998: Design of structures for earthquake resistance, Part 1: General rules, seismic actions and rules for buildings Chapters 2 & 3: Ground conditions and seismic action
2.1 (1 NOTE 1) Reference return period T_{NCR} of seismic action for no-collapse requirement (or, equivalently, reference probability of exceedance in 50 years, P_{NCR})
2.1 (1 NOTE 3) Reference return period T_{DLR} of seismic action for the damage limitation requirement. (or, equivalently, reference probability of exceedance in 10 years, P_{DLR})
3.1.1 (4) Conditions under which ground investigations additional to those necessary for design for non-seismic actions may be omitted and default ground classification may be used
3.1.2 (1) Ground classification scheme accounting for deep geology, including values of parameters S, T_B, T_C and T_D defining horizontal and vertical elastic response spectra in accordance with 3.2.2.2 and 3.2.2.3.
3.2.1 (2) Seismic zone maps and reference ground accelerations therein
3.2.1 (4) Governing parameter (identification and value) for threshold of low seismicity
3.2.1 (5) Governing parameter (identification and value) for threshold of very low seismicity
3.2.2.1 (4 NOTE 1) The selection of the shapes of the elastic response spectra
3.2.2.2 (2) Parameters S, T_B, T_C and T_D defining shape of horizontal elastic response spectra
3.2.2.3 (1) Parameters a_{vg} T_B, T_C and T_D defining shape of vertical elastic response spectra
3.2.2.5 (4) Lower bound factor β on design spectral values

EN 1998: Design of structures for earthquake resistance, Part 3: Assessment and retrofitting of buildings
2.1 (3) Return period of seismic actions under which the Limit States should not be exceeded

Annex F. List of NDPs with 100% of acceptance rate

EN	Part	section	clause	type
1990	A-2	Annex A2.4.1	1 NOTE 1 (Table A2.6)	3.7
1991	1-4	7.6	1 NOTE 1	6
	2	4.8	3	3.1
1992	1-1	Annex C.1	1	1.1
	2	6.1	110	1.1
		6.2.3	109	1.1
		6.8.7	101 NOTE 1	1.1
		8.10.4	105	2.2
1993	1-3	5.3	4	1.1
	1-4	6.2	3	1.1
	1-5	2.2	5 NOTE 1	1.1
	1-6	5.2.4	1	1.1
		8.4.2	3	3.8
		8.4.3	4 NOTE 1	2.1
		8.4.4	4 NOTE 1	2.1
		8.7.2	18 NOTE 1	1.1
			7	1.1
	1-11	5.2	3	1.1
		6.3.2	1	1.1
		6.3.4	1	1.1
	2	9.3	1	1.1
		Annex C.1.2.2	2	6
	3-1	Annex B.4.3.2.2	2 NOTE 2	1.1
		Annex B.4.3.2.3	1 NOTE 2	1.1
	3-2	7.2	1	1.1
		Annex A.1	1	2.2
	4-1	4.2.2.3	6	1.1
		5.3.2.4	10	1.1
			15	1.1
		5.3.2.8	2	1.1
		5.3.3.5	2	1.1
		5.3.4.3.3	2	1.1
		5.3.4.5	3	1.1
		5.5.2	3	1.1
1993	4-1	6.3.2.3	2	1.1
		9.5.1	3	1.1
			4	1.1
		Annex A.3.3	2	1.1

EN	Part	section	clause	type
	4-2	2.9.3	2	1.1
		4.1.4	3	1.1
		4.3.1	6	1.1
	4-3	3.2	4	1.1
		3.3	2	1.1
			3	1.1
			4	1.1
		3.4	3	1.1
		5.1.1	10	1.1
			11	1.1
			3	1.1
			4	1.1
			5	1.1
			6	1.1
	5	5.2.2	13	1.1
		5.2.5	7	1.1
		Annex B.5.4	1 NOTE 1	1.1
	6	2.8	2	1.1
1998	1	5.11.3.4	7 e	1.1
		7.1.3	4	1.1
		9.7.2	2 c	1.1
	2	2.3.6.3	5	1.1
		3.3	6 NOTE 1	2.2
			6 NOTE 2	2.2
		5.3	4	1.1
		5.6.2	2	1.1
	3	AnnexA.4.4.2	5	1.1
			9	1.1
	4	2.3.3.3	2	1.1
		2.5.2	3	2.2
		4.5.1.3	3	1.1
		4.5.2.3	2	1.1
	5	4.1.4	11	1.1
		5.2	2	1.1

KJ-NA-29732-EN-N

The European Commission's science and knowledge service

Joint Research Centre

JRC Mission

As the science and knowledge service of the European Commission, the Joint Research Centre's mission is to support EU policies with independent evidence throughout the whole policy cycle.

EU Science Hub
ec.europa.eu/jrc

@EU_ScienceHub

EU Science Hub - Joint Research Centre

Joint Research Centre

EU Science Hub

Publications Office

doi:10.2760/22104
ISBN 978-92-76-02911-3