



EUROPEAN UNION



**EU-ASEAN DIALOGUE ON EUROCODES**  
**2<sup>nd</sup> EU-ASEAN**  
**Regional Workshop on Eurocodes:**  
**Raising Awareness of the Eurocodes and Elaboration of Climatic Maps**  
**and Adaptation of Structural Design to Climate Change**

**Booklet**

Organised by the Enhanced Regional EU-ASEAN Dialogue Instrument (E-READI)

**Novotel on Stevens, Singapore, 9-10 October 2023, Hybrid event**

## Table of Contents

|   |    |
|---|----|
| Background .....                                | 1  |
| Objectives of the workshop .....                | 1  |
| Programme and Agenda.....                       | 2  |
| Speaker Bios (in the order of speaking) .....   | 6  |
| EN Eurocodes: Synopsis .....                    | 9  |
| Links for Further Information on Eurocodes..... | 13 |

## BACKGROUND

The Enhanced Regional EU-ASEAN Dialogue Instrument (E-READI), funded by the EU, is a development cooperation programme that facilitates dialogue forums between the EU and ASEAN in priority policy areas of joint interest across all three ASEAN Community pillars (Political and Security, Economic and Socio-Cultural). Drawing on relevant EU regional integration experience, the E-READI dialogue facility further strengthens both the ASEAN regional integration as well as the overall ASEAN-EU partnership.

As part of the EU-ASEAN Cooperation for Regional Integration through economic growth, connectivity, trade and business development, the E-READI supported EU-ASEAN dialogue on Eurocodes has been established through a multi-annual concept note with the ASEAN Buildings and Construction Working Group (BCWG), ASEAN Secretariat and the European Commission's Joint Research Centre (JRC). The Eurocodes dialogue aims to bring a coherent approach to the adoption of the design standards for the construction sector across the ASEAN member states, through a regional approach. ASEAN Member States (AMS) are currently at various stages of awareness of the Eurocodes concepts and/or their adoption at the national level.

## Objectives of the workshop

The E-READI assistance provides an opportunity for ASEAN countries to benefit from greater awareness and understanding of the content, principles, and benefits of the Eurocodes, building upon the recent developments in their adoption by some ASEAN countries. Under the EU-ASEAN Eurocodes Dialogue facilitated by E-READI, it is foreseen to offer support for AMS in the form of the organisation of regional and national workshops, conducting necessary studies and a possible community of practice. Such activities would support trade, the business sector and climate-resilient cities.

Many countries outside the EU have shown interest to update their National Standards based on technically advanced codes. The Eurocodes have also been adopted by some AMS while more have shown interest in them. For example, in Singapore the Eurocodes are the only standards for structural design since April 2015. Malaysia has already adopted several Eurocodes, including “Eurocode: Basis of Structural Design” (EN 1990) and selected parts of “Eurocode 1: Actions on structures” (EN 1991), “Eurocode 2: Design of concrete structures” (EN 1992), “Eurocode 3: Design of steel structures” (EN 1993), “Eurocode 7: Geotechnical Design (EN 1997)” and “Eurocode 8: Design of structures for earthquake resistance (EN 1998)”. To continue supporting Malaysia, the European Commission granted Malaysia access to its Nationally Determined Parameters (NDP) Database<sup>1</sup> through the European Commission's Joint Research Centre (JRC<sup>2</sup>). Malaysia is the first-ever ASEAN country to have access to this critical Eurocodes database (November 2022), made possible under the E-READI Eurocodes Dialogue cooperation. At the beginning of 2022, the Cambodian Ministry of Land Management Urban Planning and Construction, MLMUPC, has officially expressed interest in receiving complementary technical and scientific support from the European Union in the development of a National Building Code and supporting sub-decrees under the Construction Law, possibly using the Eurocodes as a basis. This interest was confirmed at the recent meeting with MLMUPC representatives held on September 19, 2023. Brunei Darussalam has formed a Eurocodes Task Force, which continues to be active in engaging with the Eurocodes team.

### Key Elements of the Workshop

The regional workshop will outline the needs and the availability of technical assistance in support of the elaboration of maps for climatic actions for structural design with the Eurocodes and adaptation of structural design to climate change in ASEAN MS.

Experts from the EU MS and ASEAN will share knowledge with representatives from competent organisations in AMS on the development and elaboration of maps for climatic actions (wind and thermal maps) for structural design with the Eurocodes. The event will provide an opportunity to learn and build on the experience, initiatives and difficulties concerning the topic.

The regional workshop will serve the following main objectives:

- Strengthen the capacities of the stakeholders from AMS for the elaboration of maps for climatic actions for structural design with the Eurocodes;
- Increase the awareness of the adaptation of structural design to climate change and the feasibility offered through the implementation of the Second generation of the Eurocodes;
- Facilitate regional cooperation and networking among AMS aiming at a better understanding of the Eurocodes;
- Present European Union support for increasing awareness, adoption and implementation of the Eurocodes.

1. <https://eurocodes.jrc.ec.europa.eu/resources-tools/database-nationally-determined-parameters>

2. [https://joint-research-centre.ec.europa.eu/index\\_en](https://joint-research-centre.ec.europa.eu/index_en)

# PROGRAMME AND AGENDA

## PROGRAMME

### DAY 1

| <b>Time</b><br>Singapore<br>Time (UTC+8)<br>CET (UTC+1) | <b>Activities</b>   | <b>Moderator:</b>   |
|---|---|---|
| 08:30 – 09:00<br>02:30-03:00<br>CET                     | <b>Registration</b>   | <b>Ms. Minna-Liisa Saneri</b><br>E-READI Key Expert for ASEAN Economic Community  |
| 09:00 – 09:30<br>03:00-03:30<br>CET                     | <b>Welcome Remarks</b>  | <b>Mr. Thanabal Kaliannan</b><br>Group Director, Building Resilience/ Commissioner of Building Control, Building and Construction Authority, Singapore<br><b>Mr. François Augendre</b><br>Head of Unit E.3 “Safety and Security of Buildings”, Directorate for Space, Security and Migration, Joint Research Centre of the European Commission (recorded)<br><b>Prof. Steve Denton</b><br>Chairman CEN/TC 250 “Structural Eurocodes”, Head of Civil and Bridge Engineering, WSP, Visiting Professor, University of Bath (recorded)<br><b>H.E. Sujiro Seam</b><br>Ambassador of the EU to ASEAN (recorded)<br><b>Ms. Masdara Siregar Mohd Samsir</b><br>Deputy Under Secretary, Policy and International Division, Ministry of Works Malaysia/Chair of the ASEAN BCWG<br><b>Mr. Aldo Dell’Araccia</b><br>E-READI Team Leader |
| <b>Time</b><br>Singapore<br>Time (UTC+8)                | <b>Session 1: The Basis of Eurocodes</b>  | <b>Moderator:</b>   |
| 09:30 -10:15<br>03:30-04:15<br>CET                      | <b>The Eurocodes – standards for structural safety</b> <ol style="list-style-type: none"><li>1. Construction standards in Europe and the role of the European Committee for Standardization (CEN)</li><li>2. The Eurocodes -standards for structural safety</li><li>3. Role of National Standardization Bodies (NSB) in adoption and implementation of Eurocodes</li><li>4. Process of adoption of Eurocodes and benefits</li></ol> | <b>Dr. Silvia Dimova</b><br>Deputy Head of Unit E.3 “Safety and Security of Buildings”, Directorate for Space, Security and Migration, Joint Research Centre of the European Commission<br><b>Dr. Mark Lurvink</b><br>Royal Netherlands Standardization Institute (NEN), Secretary of CEN/TC 250/WG 6 ‘Robustness’  |

|  |   |   |
|--|---|---|
| 10:15 – 11:00<br>04:15-05:00<br>CET        | <b>EN 1990: Basis of structural design</b><br>1. Principles and requirements for safety, serviceability and durability of structures<br>2. Principles of limit state design and basic variables<br>3. Verification by the partial factor method<br>4. Structural reliability<br>5. Basis of structural design in the second generation of the Eurocodes<br>6. Q&A (5 minutes)   | <b>Prof. Dr. Paolo Formichi</b><br>University of Pisa, Italy, Chair of CEN/TC 250 “Structural Eurocodes”, Sub-Committee 10 “Basis of Design”                    |
| 11:00– 11:30<br>05:00–05:30<br>CET         | Coffee Break  |   |
| 11:30 – 12:30<br>05:30–06:30<br>CET        | <b>EN 1991: Actions on Structures; Part 1-4: General action -wind actions; Part 1-5: General action – thermal actions</b><br>1. Introduction to EN 1991: Actions on structures (overview)<br>2. Introduction to EN 1991-1-4: General action -wind actions (design situation, modelling of wind action, wind velocity and velocity pressure, wind actions, structural factors, pressure and force coefficients, wind action on bridges.<br>3. Introduction to EN 1991-1-5: General action - thermal actions (classification of actions, design situation, representation of actions, temperature change in buildings, bridges, industrial chimneys, pipelines, silos, tanks and cooling towers).<br>4. Impact of climate change on wind and thermal maps | <b>Dr. Nick Malakatas</b><br>Chair of CEN/TC 250 “Structural Eurocodes”, Sub-Committee 1 “Action on Structures”   |
| 12:30 – 13:00<br>06:30–07:00<br>CET        | <b>Panel with the experts</b><br>Eurocodes – standards for structural safety<br>Basis of structural design<br>Action on structures  | <b>Dr. Mark Lurvink</b><br><b>Prof. Dr. Paolo Formichi</b><br><b>Dr. Nick Malakatas</b>   |
| 13:00– 14:00<br>07:00–08:00<br>CET         | Lunch break   |   |
| <b>Time<br/>Singapore<br/>Time (UTC+8)</b> | <b>Session 2: National Annexes (NA) to EN 1991-1-4 and EN 1991-1-5</b>  | <b>Moderator:</b><br><b>Prof. Dr. Roberta Apostolska</b><br>University Ss Cyril and Methodious, IZiIS, Skopje, RN Macedonia.<br>E-READI Eurocodes Senior Expert |
| 14:00– 15:00<br>08:00–09:00<br>CET         | <b>Elaboration of National Annexes to wind and thermal actions Eurocodes Parts</b><br>1. Elaboration of NA EN 1991-1-4: General action -wind actions and NA EN 1991-1-5: General action -thermal actions<br>2. EU MS experience in the elaboration of wind and thermal maps<br>3. Q&A (5 minutes)   | <b>Prof. Pietro Croce</b><br>University of Pisa, Italy, Convenor of CEN/TC 250 “Structural Eurocodes” Horizontal group “Bridges”                                |

|                                      |  |   |
|--------------------------------------|--|---|
| 15:00– 15:15<br>09:00–09:15<br>CET   | <b>Eurocodes NDPs relevant to the climatic actions (snow, wind and temperature)</b><br>1. How can ASEAN MS benefit from JRC NDPs database?<br>2. Q&A (5 minutes)                       | <b>Dr. Maria Luisa Sousa</b><br>National Laboratory of Civil Engineering (LNEC), Lisbon, Portugal – formerly Unit E.3 “Safety and Security of Buildings”, Directorate for Space, Security and Migration, Joint Research Centre of the European Commission |
| 15:15– 15:45<br>09:15 – 09:45<br>CET | Coffee Break   |   |
| <b>Time Singapore Time (UTC+8)</b>   | <b>Session 3: European Union support for the adoption and implementation of the Eurocodes</b>  | <b>Moderator: Ms. Minna-Liisa Saneri</b><br>E-READI Key Expert for ASEAN Economic Community   |
| 15:45– 16:00<br>09:45–10:00<br>CET   | <b>European Union support to the adoption and implementation of the Eurocodes</b><br>JRC support to dissemination and training on the Eurocodes  | <b>Dr. Francesca Sciarretta</b><br>Unit E.3 “Safety and Security of Buildings”, Directorate for Space, Security and Migration, Joint Research Centre of the European Commission   |
| 16:00– 16:15<br>10:00–10:15<br>CET   | <b>Future steps supporting awareness and adoption of the Eurocodes in third countries</b><br>EU future support for the Eurocodes adoption<br>What can E-READI do to support AMS?       | <b>Dr. Adamantia Athanasopoulou</b><br>Unit E.3 “Safety and Security of Buildings”, Directorate for Space, Security and Migration, Joint Research Centre of the European Commission   |
| 16:15– 16:30<br>10:15–10:30<br>CET   | <b>Eurocodes in non-EU countries - Western Balkan Region’ success story</b><br>JRC support in raising awareness, adoption and national implementation of Eurocodes in non-EU countries | <b>Prof. Dr. Roberta Apostolska</b><br>University Ss Cyril and Methodious, IZIIS, Skopje, RN Macedonia,<br>E-READI Eurocodes Senior Expert  |
| 16:30– 17:00<br>10:30–11:00<br>CET   | <b>Q&amp;A</b><br><b>Discussion and Closure Remarks for Day 1</b><br><b>Feedback from the participants</b>   |   |

## DAY 2

|                                    |  |  |
|------------------------------------|--|--|
| <b>Time Singapore Time (UTC+8)</b> | <b>Session 4: Sharing of AMS best practices in safe and sustainable structural design with Eurocodes</b>   | <b>Moderator:</b><br><b>Dr. Adamantia Athanasopoulou</b><br>Project Officer Unit E.3 “Safety and Security of Buildings”, Directorate for Space, Security and Migration, Joint Research Centre of the European Commission |
| 09:00– 09:30<br>03:00–03:30<br>CET | <b>ASEAN Case Study</b> – Singapore Climate Change Study and Wind & Thermal Considerations of the Eurocode | <b>Mr. Kabi Subramaniam</b><br>Associate Principal/Building Advisory, Arup Singapore   |
| 09:30– 10:00<br>03:30–04:00<br>CET | <b>ASEAN Case study</b> – Malaysia’s experience in the elaboration of National Annexes to Eurocodes        | <b>Prof. Ir. Dr. Azlan bin Adnan</b> Professor of Earthquake Engineering, Universiti Teknologi Malaysia (UTM)  |
| 10:00 –10:30<br>04:00–04:30<br>CET | <b>Panel discussion</b><br>Opportunities for ASEAN sharing experiences and best practices in the region    | <b>Mr. Kabi Subramaniam</b><br><b>Prof. Ir. Dr. Azlan bin Adnan</b><br><b>Prof. Roberta Apostolska</b>   |
| 10:30 –11:00<br>04:30–05:00<br>CET | Coffee break   |  |

|  |   |   |
|--|---|---|
| <b>Time</b><br>Singapore<br>Time (UTC+8) | <b>Session 5: Adaptation of structural design to climate change</b>   | <b>Moderator:</b><br><b>Dr. Adamantia Athanasopoulou</b><br>Project Officer Unit E.3 “Safety and Security of Buildings”,<br>Directorate for Space, Security and Migration, Joint<br>Research Centre of the European Commission  |
| 11:00 – 11:30<br>05:00-05:30<br>CET      | <b>The second generation (2G) of Structural Eurocodes</b><br>1. Evolution, process and timing<br>2. Climate change issues and 2G of the Eurocodes   | <b>Prof. Paolo Formichi</b><br>University of Pisa, Italy, Chair of CEN/TC 250 “Structural Eurocodes”, Sub-Committee 10 “Basis of Design”  |
| 11:30 – 12:00<br>05:30-06:00<br>CET      | <b>Emerging climate issues and adaptation of structural design to climate change</b><br>1. Thermal design of structures and the changing climate<br>2. Expected implications of climate change on the corrosion of structures | <b>Prof. Pietro Croce</b><br>University of Pisa, Italy, Convenor of CEN/TC 250 “Structural Eurocodes” Horizontal group “Bridges”<br><b>Dr. Silvia Dimova</b><br>Deputy Head of Unit E.3 “Safety and Security of Buildings”, Directorate for Space, Security and Migration, Joint Research Centre of the European Commission |
| 12:00 – 12:30<br>06:00-06:30<br>CET      | <b>Panel Session</b><br>Adaptation of structural design to climate change – with the Eurocodes  | <b>Dr. Silvia Dimova</b><br><b>Dr. Mark Lurvink</b><br><b>Dr. Nick Malakatas</b>  |
| 12:30– 13:00<br>06:30-07:00<br>CET       | <b>Closing Remarks, way ahead and feedback from the participants</b>  | <b>Mr. Aldo Dell’Ariccia</b><br>E-READI Team Leader<br><b>Dr. Silvia Dimova</b><br>Deputy Head of Unit E.3, JRC, EC<br><b>Ms. Minna Saneri</b><br>E-READI Key Expert  |
| 13:00– 14:00<br>07:00-08:00<br>CET       | Lunch break   |   |
| 14:00 – 16:30<br>08:00-10:30<br>CET      | <b>Site visit</b>   | Department of Civil & Environmental Engineering, College of Design and Engineering,<br>National University of Singapore<br>Host: <b>Prof. Qian Xudong</b>   |

## SITE VISIT PROGRAMME

| <b>Time</b><br>Singapore<br>Time (UTC+8) | <b>Activities</b>  | <b>Presenters</b>                     |
|--|--|---------------------------------------|
| 14:00                                    | <b>Departure to NUS</b>  |                                       |
| 14:20-14:30                              | <b>Brief introduction of the Department of Civil &amp; Environmental Engineering</b>       | <b>A/Prof Qian Xudong</b>             |
| 14:30-14:50                              | <b>Structural design (according to the Eurocodes) in educational process</b>               | <b>Dr Kong Kian Hau</b>               |
| 14:50-15:10                              | <b>Singapore’s pathways to a net-zero power sector in 2050”</b>                            | <b>Dr He Xiaogang</b>                 |
| 15:10-15:50                              | <b>Visit to the Structural Engineering Laboratory and Hydraulic Engineering Laboratory</b> | <b>Dr Du Hongjian and Dr Gary Lei</b> |
| 15:50-16:00                              | <b>Instruments for AMS regional collaboration</b>  | <b>Discussion</b>                     |
| 16:00-16:30                              | <b>Tea-break and networking</b>  |                                       |
| 16:30                                    | <b>Departure to the hotel</b>  |                                       |

## **SPEAKER BIOS** (In the order of speaking)

### **Dr. Mark Lurvink**

**Royal Netherlands Standardization Institute (NEN), Secretary of CEN/TC 250/WG 6 ‘Robustness’**

Mark L. Lurvink is a professional consultant with a long working experience in the non-profit organization management industry. He is an advisor of the Royal Netherlands Standardization Institute (NEN) and secretary of CEN/TC 250/WG 6 ‘Robustness’. His professional skills cover Standardization, Consensus Building, Project Management, Building Legislation, Construction, Structural Engineering and Geotechnics.

---

### **Prof. Paolo Formichi**

**CEN/TC250/SC10 Chair**

**The European Committee for Standardization (CEN) / University of Pisa**

Paolo Formichi, PhD, works at the University of Pisa since 1996 in the field of structural engineering. From 1996 to 1999 has been involved in a wide European research on Snow Loading, led by the University of Pisa. In 1998 started working in CEN standardization as a member of CEN/TC250/SC1 Actions on Structures. Since 2008 he has been involved in the works for the further development of EN 1990 “Basis of Structural Design” and in 2016 has been appointed as Chairman of CEN/TC250/SC10 “Basis of Structural Design”, contributing to the evolution of EN1990 towards the second generation of the Eurocodes.

---

### **Dr. Nikolaos (Nick) Malakatas**

**CEN/TC250/SC1 Chair**

**The European Committee for Standardization (CEN)**

Dr Nikolaos (Nick) Malakatas, is a civil and structural engineer who spent most of his career in the Greek Administration (Ministry of Infrastructure and Transports) being personally involved in various important bridge and tunnel projects, motorways and transport infrastructure concession projects and has served as Director in various relevant posts. He has been involved with the Eurocodes since the mid-'80s, initially as a national delegate for Greece and since 2008 as the Chairman of CEN/TC250/SC1 for EN 1991. After many years involved in the standardisation at a national level, he became 2014 the Chairman of the Greek Eurocodes Mirror Committee.

---

### **Prof. Pietro Croce**

**University of Pisa, Italy, Convenor of CEN/TC 250 “Structural Eurocodes” Horizontal group “Bridges”**

Pietro Croce, PhD, works at Pisa University. He was responsible for the Italian unit for several Leonardo da Vinci projects facilitating the implementation of Eurocodes. He is a member of the CEN/TC 250 Structural Eurocodes CG (Coordination Group). Within CEN/TC 250, he is the convenor of HG-B (Horizontal Group for Bridges) and AHG (Ad Hoc Group) for Crane Supporting Structures, and vice-convenor of WG ‘Bridges’. He is also a member of AHGs ‘Fatigue’ and ‘Reliability Background’, of Sub-Committees SC1 (SC1) ‘Actions’ and SC10 ‘Basis of Design’, and WG2 “Existing structures”. He is also a member of the Italian Committee for Structural Engineering of UNI. As well, he is member of commissions entrusted by the National Council of Public Works to draft the new Italian Structural Codes, the National Annexes to Eurocodes, and the Guidelines for the seismic assessment of heritage structures.

---

### **Dr. Maria Luisa Sousa**

**National Laboratory of Civil Engineering (LNEC), Lisbon, Portugal – formerly Unit E.3 ‘Safety and Security of Buildings’, Directorate for Space, Security and Migration, Joint Research Centre of the European Commission**

Maria Luísa Sousa is a Research Officer at the Earthquake Engineering and Structural Dynamics Unit of the Structures Department of the Portuguese Laboratory for Civil Engineering in Lisbon, Portugal. She holds a PhD in Territorial Engineering and has more than 20 years of research experience in natural hazards risk assessment.



Between 2013 and 2022, she was a Research Officer at the Safety and Security of Buildings Unit of the Joint Research Centre of the European Commission in Ispra, Italy, contributing to activities in support of policies and standards for safe and sustainable construction and climate change adaptation for structural design.

---

## **Dr. Francesca Sciarretta**

**Unit E.3 'Safety and Security of Buildings', Directorate for Space, Security and Migration, Joint Research Centre of the European Commission**

Dr. Francesca Sciarretta is a Scientific Project Officer at the Safety and Security of Building Unit of the European Commission's Joint Research Centre (JRC) since 2022. She contributes to the activities in support of EU policies and standards for safe and sustainable construction, including facilitation of the implementation and further development of the Eurocodes.

---

## **Prof. Dr. Roberta Apostolska**

**E-READI Eurocodes Senior Expert**

**Professor of Seismic Design of RC, Masonry and Steel Structures at University Ss Cyril and Methodius, IZIS, Skopje, RN Macedonia.**

She has over 30 years of experience in seismic design and assessment of RC and masonry structures with more than 80 publications in the field. She participated in and was principal investigator of several national, bilateral and international projects. She was a seconded expert at the EC for providing scientific and technical contributions in the context of the JRC support work to DG ENTR for the implementation, harmonization and further development of the Eurocodes, (2013- 2014). Served as an Editor of the SPRINGER book "Experimental Research in Earthquake Engineering" (2015). She is a member of ISRSM – Mirror TC250-TC40 Committee on Eurocodes (2019-now); a Member of the Executive Board of MAEE and a national delegate to the EAEE (2018-now).

---

## **Dr. Adamantia Athanasopoulou, PhD, MEng, MSc, CEng.**

**Unit E.3 'Safety and Security of Buildings', Directorate for Space, Security and Migration, Joint Research Centre of the European Commission**

Dr. Adamantia Athanasopoulou is a Project Officer in the Safety and Security of Building Unit of the European Commission's Joint Research Centre (JRC) since 2016 having also served as a research fellow in the period 2009-2012. She undertakes activities supporting scientific studies, analysis and advice on issues related to the built environment, contributing to the JRC's portfolios "Understanding and acting on risks and opportunities of the future" and "Cities and buildings for better lives". Adamantia has long experience supporting EU policies and standards for safe and sustainable construction, including facilitation of the implementation of the European standards for structural design - the Eurocodes. Adamantia is particularly involved in the dissemination, promotion and training for the worldwide use of the Eurocodes.

Adamantia holds a Master degree in Civil Engineering from the University of Patras in Greece and a Master Degree and PhD in Structural Engineering from the University of Michigan in Ann Arbor (USA). She has more than 10 years of experience teaching topics related to structural engineering in universities in USA and Greece.

---

## **Dr. Silvia Dimova**

**Deputy Head of Unit E.3 'Safety and Security of Buildings', Directorate for Space, Security and Migration, Joint Research Centre of the European Commission**

Dr. Silvia Dimova is Deputy Head of Unit "Safety and security of buildings" at the Joint Research Centre (JRC) of the European Commission. The Unit leads the JRC activities on prospecting and assessment of innovative technologies and methods for a safe, sustainable and inclusive built environment. Silvia Dimova is responsible for the Pilot Project "Integrated techniques for the seismic and energy retrofit of buildings", <https://buildings-renovation-makerspace.jrc.ec.europa.eu/>. She is also responsible for the JRC support to DG GROW on policies and standards for sustainable construction (implementation and development of the Eurocodes, adaptation to climate change, design of underground structures, and implementation of fire safety engineering approach in the national regulatory frameworks, promotion of the use of the Eurocodes internationally), <https://eurocodes.jrc.ec.europa.eu/>.

Silvia Dimova has Master Degree in hydro-technical engineering, PhD in earthquake engineering, and more than 20 years of professional research experience in probabilistic safety assessment, modelling of structures, and development of methods for the design of structures in support of standardization. She coordinates European expert networks and working groups, participates in the work of CEN/TC250 “Structural Eurocodes”, and to several European Commission inter-service steering groups related to the enforcement of the European Green Deal in the built environment.

---

## **Mr. Kabi Subramaniam**

**Associate Principal / Building Advisory, Arup Singapore**

Kabi is a chartered engineer with close to 20 years as a specialist in existing assets. As the Building Advisory Leader, he is responsible for steering the business direction in the retrofit and repurposing of ageing infrastructure. He has managed a range of building retrofit projects with a specific focus on converting brown field assets to green assets. Kabi’s project management skills have enabled him to deliver major work from concept through to the construction of new build projects in Singapore and internationally.

With a keen interest in digital technology, Kabi is recognised for spearheading initiatives aimed at the use of digital tools to automate processes including the use of drones for remote asset and façade inspections and digital reporting, allowing data to be centralised and analysed remotely.

Kabi is passionate about Asset Resilience, where he helps clients future-proof their businesses with long-term operation plans. This includes not only asset/ portfolio decarbonisation and climate resilience but also working with several key developers, on retrofitting and repurposing existing assets.

He continues to present at various conferences and is the current President of Engineers Australia (Singapore Chapter).

---

## **Prof. Ir. Dr. Azlan bin Adnan**

**Head of the Research Group, Universiti Teknologi Malaysia**

Ir. Dr. Azlan Bin Adnan is a Professor of Earthquake Engineering at the Faculty of Civil Engineering, Universiti Teknologi Malaysia and a professional engineer under the Board of Engineers Malaysia. In 2020, he has been awarded as the Fellow of Academy of Science Malaysia. He is a member of several international associations such as the Earthquake Engineering Research Institute of the United States and the Seismological Society of America (SSA) and serves as a Malaysian Seismic Expert for the International Commission on Large Dams, Paris, France, International Atomic Energy Agency, Vienna, Austria and Global Earthquake Model, Pavia, Italy. He received the Fulbright US-ASEAN Visiting Scholar Award in the year 2019.

### The Eurocodes within the European Construction Sector

---

As in many countries across the world, the construction sector is of strategic importance also to the European Union (EU), contributing to about 5.5% of the EU's Gross Domestic Product with €800 billion in annual revenue and employing around 25 million people in over 5 million firms. The construction sector is the key element for the implementation of the Single Market and other construction-relevant EU policies, e.g. Sustainability, Environment and Energy, since 40% of Europe's energy consumption stems from buildings with a further 5-10% being used in processing and transport of construction products and components (Council of the EU, Press release 30 June 2023).

The EU has put in place a comprehensive legislative and regulatory framework for the construction sector, including corresponding European standards. Health and safety in construction and the free movement of engineering/construction services and products are important policy priorities. Concerning the construction activity itself, the focus is on the competitiveness of the sector, not least in the field of sustainable construction.

European legislation defines the essential requirements that goods must meet when they are placed on the market and the European standards bodies have the task of drawing up the corresponding technical specifications. In the construction sector, the Construction Products Regulation<sup>3</sup> (CPR) is delivered to enable the proper functioning of the internal market for construction products by establishing harmonised rules on how to express their performance. The review (COM(2022)144) of the Construction Products Regulation (Regulation (EU) No 305/2011) ensures that the design of new and renovated buildings at all stages is in line with the needs of the circular economy, and leads to increased digitalisation and climate-proofing of the building stock<sup>4</sup>.

Technical specifications shall be drawn by European standardisation bodies and shall be based on seven Basic Requirements (BR) of the CPR for construction works:

1. Mechanical resistance and stability
2. Safety in case of fire
3. Hygiene, health and the environment
4. Safety and accessibility in use
5. Protection against noise
6. Energy economy and heat retention
7. Sustainable use of natural resources

The free movement of construction-related products and services is facilitated by the EU-wide implementation of common European technical standards for the structural design of buildings and other construction works—the Eurocodes<sup>5</sup>. They are recommended means of giving a presumption of conformity with the basic requirements of the CPR in particular BR1 “Mechanical resistance and stability” and BR2 “Safety in case of fire”.

The European Standardisation system relating to the construction sector is a comprehensive system of design standards that comprises the Eurocodes, along with material and product standards, as well as execution and test standards (Fig. 1.1). Thus, for the design and construction of buildings and other civil engineering works, the Eurocodes are intended to be used in combination with execution, material, product and test standards. This set of standards covers all aspects of construction, namely design rules, material properties, execution of structures and special works, specifications for construction products, as well as quality control (Athanasopoulou et al., 2019).

---

3. <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:088:0005:0043:EN:PDF>

4. 2022/0094 (COD) Council of the EU, EU Commission's Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL laying down harmonised rules for the marketing of construction products, repealing Regulation (EU) 305/2011, Brussels, 23 June 2023; <https://data.consilium.europa.eu/doc/document/ST-10920-2023-INIT/en/pdf>

5. <https://eurocodes.jrc.ec.europa.eu/>



Figure 1.1 The European standard family for the construction sector  
(source: <https://eurocodes.jrc.ec.europa.eu/>)

## What are the Eurocodes?

The EN Eurocodes are a series of 10 European Standards, EN 1990 - EN 1999, (Fig. 1.2) providing a common approach for the design of buildings and other civil engineering works and construction products. The EN Eurocodes are the reference design codes. They cover the basis of structural design, actions on structures and the design of concrete, steel, composite steel-concrete, timber, masonry and aluminium structures, together with geotechnical, seismic and structural fire design. The EN Eurocodes are developed under the guidance and co-ordination of CEN Technical Committee 250 (CEN/TC250) "Structural Eurocodes". CEN/TC250 has the overall responsibility for all CEN work on structural design codes<sup>6</sup>.

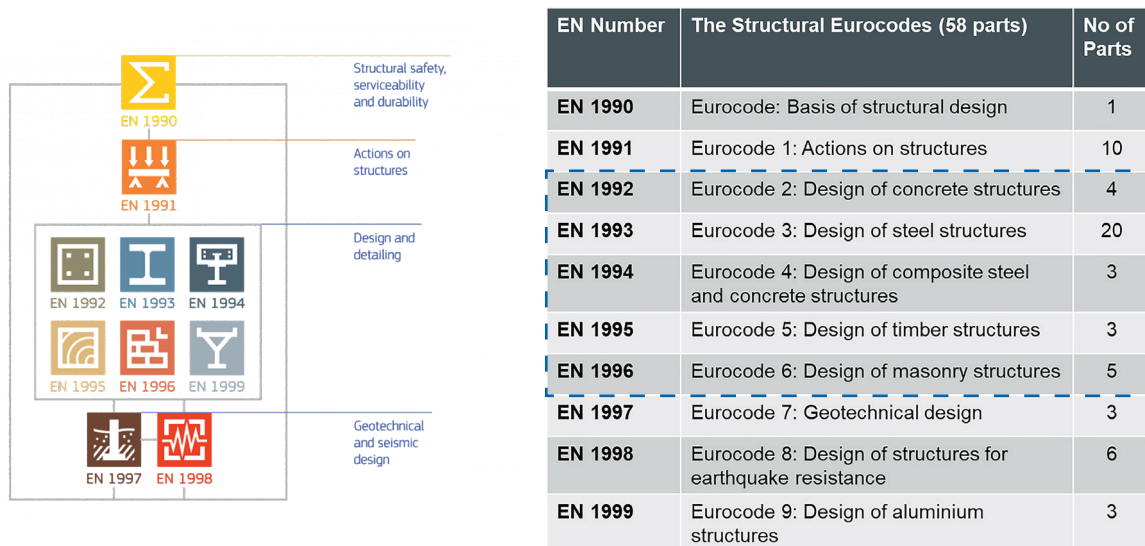


Figure 1.2 The Eurocodes at a glance  
(source: <https://eurocodes.jrc.ec.europa.eu/>)

The considerable interest in the implementation and adoption of the Eurocodes in the EU Member States but also in third countries is based on the opportunity to have an advanced common standardisation environment, which is adaptable to the particular requirements of each country and represents:

- a complete set of design standards that cover in a comprehensive manner all principal construction materials, all major fields of structural engineering and a wide range of types of structures and products
- the most up-to-date codes of practice

6. [https://standards.cencenelec.eu/dyn/www/f?p=205:7:0::::FSP\\_ORG\\_ID:6231&cs=1DE5F6AD2EA1D540EF59F3719FCDFE7FF](https://standards.cencenelec.eu/dyn/www/f?p=205:7:0::::FSP_ORG_ID:6231&cs=1DE5F6AD2EA1D540EF59F3719FCDFE7FF)

- flexible, offering the possibility for each country to adapt the Eurocodes to their specific conditions regarding climate, seismic risk, traditions, etc. through the Nationally Determined Parameters. Nationally Determined Parameters can also be adapted to the national approach and setup regarding risk and safety factors
- are a major tool for the successful removal of trade barriers for construction products and services;
- contribute to the safety and protection of the people in the built environment, on the basis of the best possible scientific advice;
- are a common basis for technical and scientific collaboration

The publication of the Eurocodes by CEN in May 2007 (Fig. 1.3) marked a major milestone in the European standardisation for the construction sector, since the Eurocodes introduced common technical rules for calculating the mechanical and fire resistance, and the stability of constructions and construction products.

## Timeline

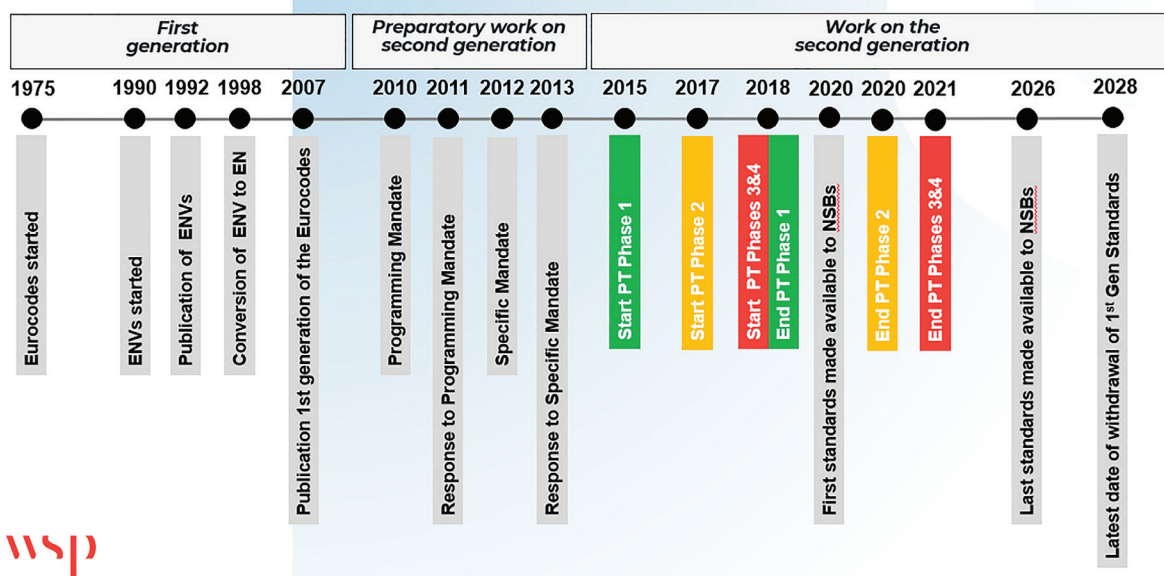


Figure 1.3 EN Eurocodes – timeline

(source: Denton S., Eurocodes Awareness Workshop Brunei Darussalam – 5-6 July 2022)

The national implementation of a Eurocode Part has three phases: 1. the translation period, 2. the national calibration period and 3. the coexistence period (Fig. 1.4).

The National Authorities and National Standardization Body (NSB) should:

- translate the Eurocode Part in authorised national languages;
- set the Nationally Determined Parameters (NDP)s to be applied on their territory;
- publish the National Standard transposing the EN Eurocode and the National Annex (NA), containing the national choice on the NDPs and reference to non-contradictory complementary information (NCCI), and notify the European Commission;
- adapt, as far as necessary, their National Provisions so that the Eurocode Part can be used on their territory: (i) as a means to prove compliance of construction works with the national requirements for “mechanical resistance and stability” and “resistance to fire” and (ii) as a basis for specifying contracts for the execution of public construction works and related engineering services;
- promote training on the Eurocodes.

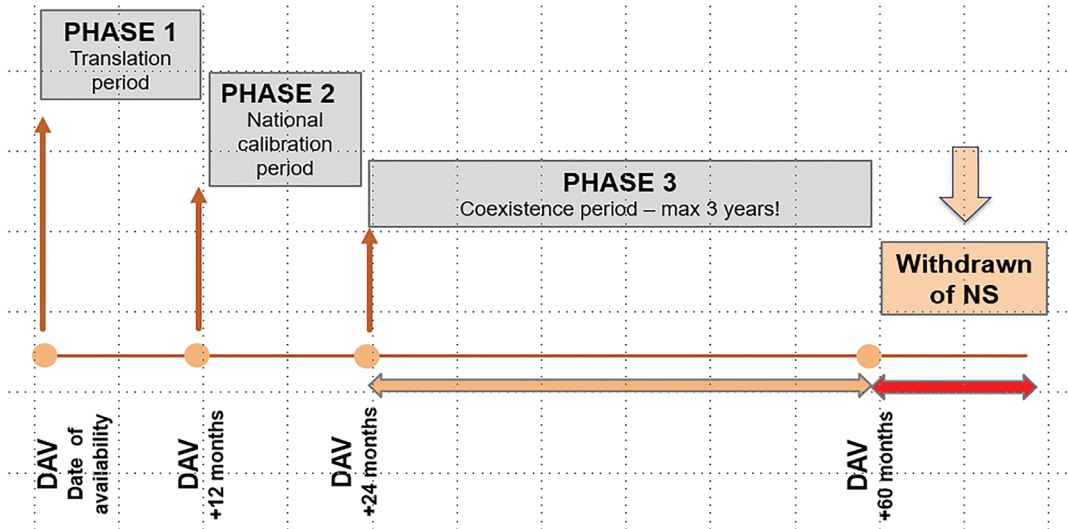


Figure 1.4 Phases in national implementation of the Eurocodes

The National Standard transposing the EN Eurocode Part, when published by NSB, will be composed of the EN Eurocode text (preceded by a National Title page and by a National Foreword), generally followed by a National Annex (Fig. 1.5). The NSBs should normally publish a National Annex, on behalf of and with the agreement of the national competent authorities.



Figure 1.5 National publication of EN Eurocode part (source: <https://eurocodes.jrc.ec.europa.eu/>)

Application of EN standards including the Eurocodes is voluntary according to the principle of the European Standardisation<sup>7</sup>. However, the national legislative provisions may refer to standards making compliance with them compulsory. Thus, in relation to the implementation procedure of the Eurocodes Parts, it is important to stress that the regulatory environment in each country is very important. In the different regulatory environments, the national regulations either refer to standards - thus making compliance with them compulsory- or introduce directly a set of design rules. In the latter case, no National Standards exist, and hence there is no need to withdraw conflicting standards. On the contrary, there are countries where the rules for structural design are enforced by legislative acts, i.e. national regulations (Athanasopoulou et al., 2019).

The complete Eurocodes glossary (abbreviations and definitions) can be found at <https://eurocodes.jrc.ec.europa.eu/showpage.php?id=7>.

7. Regulation (EU) 1025/2012 on European standardisation

## Standardisation for the Eurocodes second generation

The European Commission issued the mandates M/466 and M/515 to CEN for amending the existing Eurocodes and extending the scope of structural Eurocodes. The second generation of the Eurocodes incorporates improvements to the existing suite and extends its scope (Fig. 1.6). The new suite will ensure the standards remain fully up to date by embracing new methods, new materials, and new regulatory and market requirements, namely:

- Promoting further harmonisation and improving the practical use of Eurocodes for day-to-day calculations (ease-of-use);
- Introducing requirements for the assessment, re-use and retrofitting of existing structures;
- Strengthening of requirements for robustness;
- Developing a new Eurocode on structural glass;
- Advancing pre-normative work on fibre-polymer composite structures (FRP), tensioned membrane structures, and respective CEN technical Specifications.

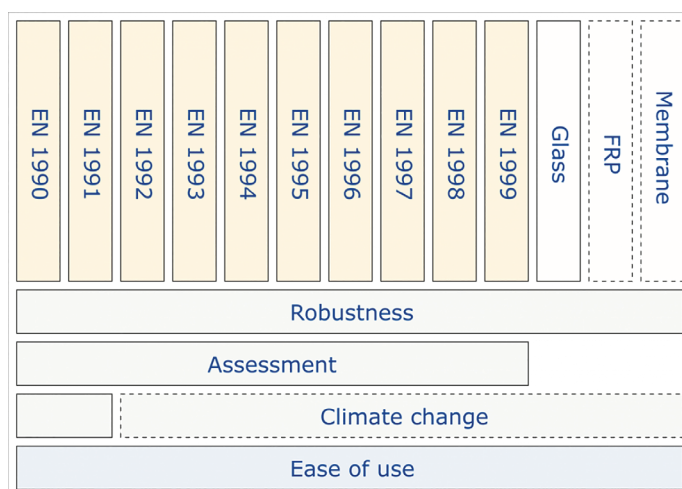


Figure 1.6 EN Eurocodes – timeline

(source: Denton S., *Eurocodes Awareness Workshop Cambodia – 24-25 March 2022*, *Second generation of the Eurocodes: what is new?* | Eurocodes: Building the future (europa.eu))

## Reference

Athanasopoulou A., P. Formichi, P. Spehl, I. Dabizheva, V. Gacesa-Moric, J. Markova, J. A. Calgaro, N. Malakatas, M. Lurvink, P. Croce, R. Apostolska, D. Sumarac, M. L. Sousa, S. Dimova, The implementation of the Eurocodes in the National Regulatory Framework, EUR 29601 EN, Publications Office of the European Union, Luxembourg, 2019, ISBN 978-92-79-98657-4, doi:10.2760/033434, JRC115175.

## Links for Further Information on Eurocodes

- European Commission's Joint Research Centre: [https://joint-research-centre.ec.europa.eu/index\\_en](https://joint-research-centre.ec.europa.eu/index_en)
- European Committee on Standardization (CEN): <https://www.cencenelec.eu/>
- Information on Eurocodes: <https://eurocodes.jrc.ec.europa.eu/>
- The Eurocodes Parts: <https://eurocodes.jrc.ec.europa.eu/en-eurocodes/eurocodes-family>
- National implementation of the Eurocodes: <https://eurocodes.jrc.ec.europa.eu/en-eurocodes/eurocodes-national-implementation>
- Use of Eurocodes outside EU: <https://eurocodes.jrc.ec.europa.eu/en-eurocodes/use-outside-euefta-member-states>
- Publications on the Eurocodes: <https://eurocodes.jrc.ec.europa.eu/learning-corner>

