

**THE NEED FOR  
INTEGRATING  
STRUCTURAL / SEISMIC UPGRADE  
OF EXISTING BUILDINGS,  
TOGETHER WITH  
ENERGY EFFICIENCY  
IMPROVEMENTS**

**Platonas Stylianou**  
**Joint ECCE – WCCE 3S Group Initiative Chair**



## The 3S Approach

➤ The European Council of Civil Engineers (ECCE) and the World Council of Civil Engineers (WCCE) are joining forces in a common initiative which aims to raise awareness on the need of "Safe - Sound - Sustainable" (3S) buildings which can be fulfilled by integrating structural/seismic upgrade of the existing buildings together with energy efficiency improvements.



➤ What started as an ECCE Initiative and became an **ECCE statement in 2020** focusing on Europe, is now being extended together with WCCE on a Global Level.

# The 3S Approach - Revised Manifesto



# The 3S Approach – REVISED 2023

The majority of the existing building stock in most countries built in the 80s, 70s or earlier, lacks modern design and construction standards and techniques, including the requirements for resilience, robustness, seismic safety and energy efficiency. One of the most important Human rights is to possess **Safe, Sound and Sustainable buildings (3S)**. Adequate housing was recognized as part of the right to an adequate standard of living in article 25 of the 1948 Universal Declaration of Human Rights and in article 11.1 of the 1966 International Covenant on Economic, Social and Cultural Rights.

Based on their date of construction, the vast majority of buildings are deficient in terms of energy, durability and seismic resistance. This creates the need for society (public and engineers) to take immediate actions to maintain the aging existing building stock in an operational, reliable and resilient state, in order to ensure primarily the safety of the users. That will also greatly contribute to United Nations Sustainable Development Goal 11 - Make cities and human settlements inclusive, safe, resilient and sustainable and other related UN initiatives such as the Sendai Framework for Disaster Risk Reduction or UN Habitat's Global Housing Strategy, the Sustainable Development Goal for Safe and Resilient Cities.

The extent to which a building can resist loads depends mainly on the characteristics of its lateral load resisting system - LLRS (i.e. columns, beams, foundations, floor slabs and supporting walls). Most existing buildings do not pose significant Lateral Load Resistance and require upgrading to increase the efficiency of one or more of the above. For many EU countries and many others around the world, the structural performance and safety are intertwined with seismic vulnerability.

In the case of the aging existing buildings, the lack of consideration for structural stability and durability means that such building stock becomes more vulnerable to natural (earthquakes, flooding, tsunami, extreme weather events, drought, landslides, volcanic events) or man made (transport disasters and explosions) disasters. In addition, as buildings' design life is coming to an end, interventions will be required to ensure habitability and basic services provision along with any other structural stability and durability assessments ensuring safety and comfort for the users.

In the last decade, the importance on the energy front has been highlighted enough; increased energy consumption led to adverse environmental impact (e.g. climate change). Therefore, the building sector introduced the energy efficiency concept, highlighted by Europe's goal to reduce the Greenhouse gas emissions by 20% and achieve 20% energy savings by 2020. The building sector accounts for large energy consumption in the EU with European households consuming nearly 70% of the energy demand in the form of electrical energy. **Unfortunately, the importance of safety has not been highlighted or considered likewise.**

Currently, from a sustainability perspective, emphasis has been placed on developing an integrated structural and energy design methodology for new buildings to override individual actions to ensure a **Sustainable Structural Design (SSD)**.

However, in aging existing buildings, the issue of structural, seismic and energy inefficiency becomes of primary importance and a similar overarching concept approach is required to provide upgrading on both fronts and if possible, in an integrated common holistic approach.

A common method of evaluation of the seismic and structural vulnerability of buildings is of paramount importance for governmental authorities to quantify the required resources, plan investment schemes and define prioritisation strategies for seismic and structural risk mitigation and corresponding sustainable retrofiting.

**The new trend nowadays is...  
smart financing for smart buildings.**

**But a building can only be called smart... once it fulfills the 3S approach "Safe, Sound and Sustainable".**

**So, the World Council of Civil Engineers (WCCE) and the European Council of Civil Engineers (ECCE) would like to declare the urgent need to follow and implement the 3S Approach.**

**3S** Approach  
**Safe - Sound - Sustainable**  
(ECCE Moto for 2020)





# The 3S Approach



Read more

THE **3S** APPROACH  
SAFE - SOUND - SUSTAINABLE



## Context for 3S 1.0 : Aging Building stock




The majority of the existing building stock in most countries was built at a time when modern design and construction standards and techniques, including the requirements for resilience, seismic safety, and energy efficiency, were not yet enforced. Thus, depending on their date of construction, the vast majority are deficient in terms of energy, durability and seismic resistance.




One of the most important human rights is the right to possess Safe, Sound and Sustainable buildings (3S). Adequate safe housing was recognized as part of the right to an adequate standard of living in Article 25 of the 1948 Universal Declaration of Human Rights and in Article 11.1 of the 1966 International Covenant on Economic, Social, and Cultural Rights.



## Are rules and priorities in place?

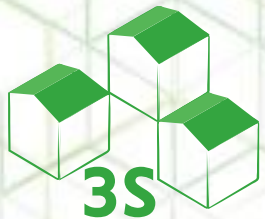
-  Seismic and structural risk assessment of buildings is of paramount importance in order to:
- define prioritization strategies,
  - quantify the required resources,
  - plan investments

-  However, quite a lot of countries **do not have modern and enforceable regulations** for the assessment and retrofitting of existing buildings.



**SAFE SOUND  
SUSTAINABLE**



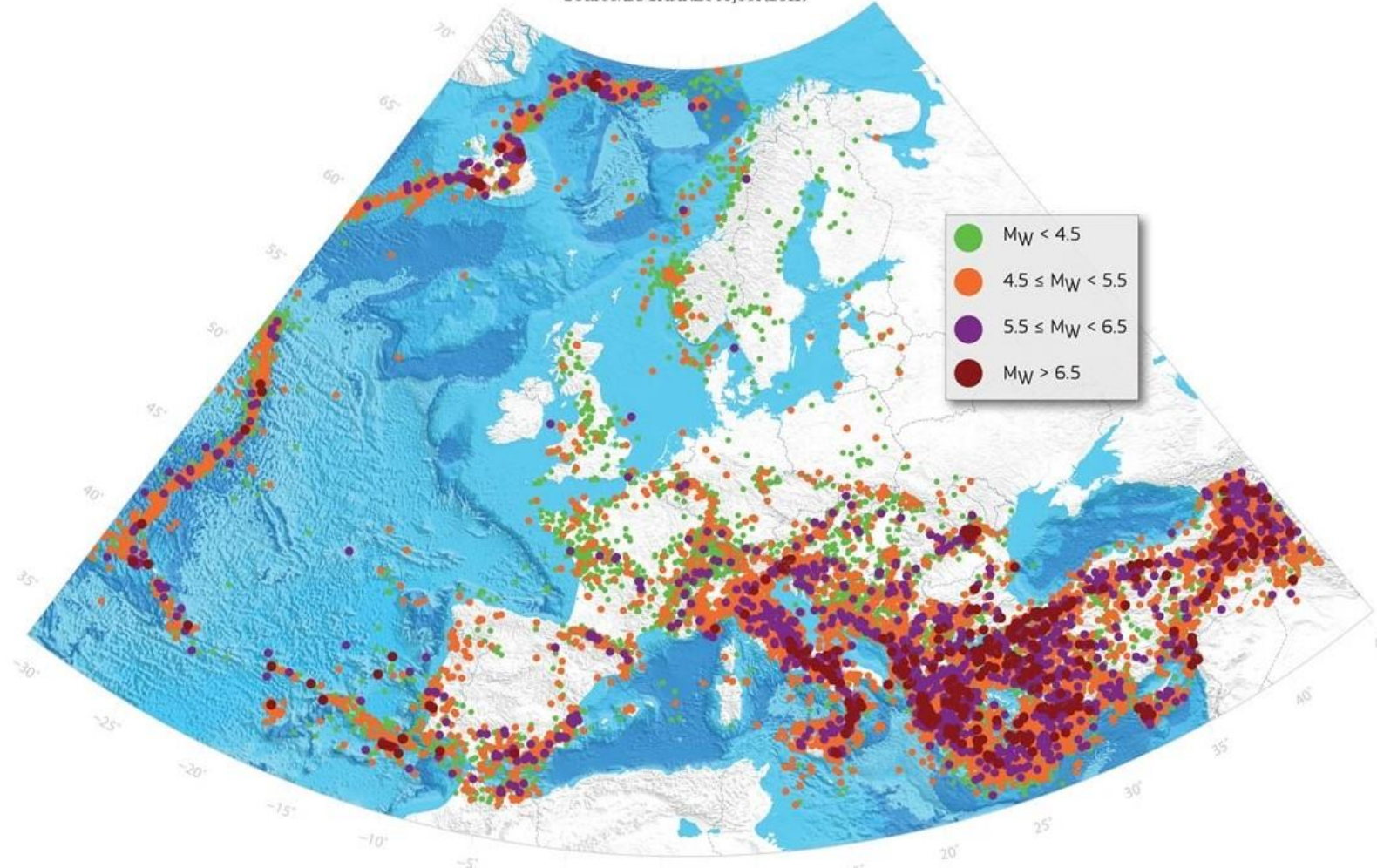


**3S**  
SAFE SOUND  
SUSTAINABLE



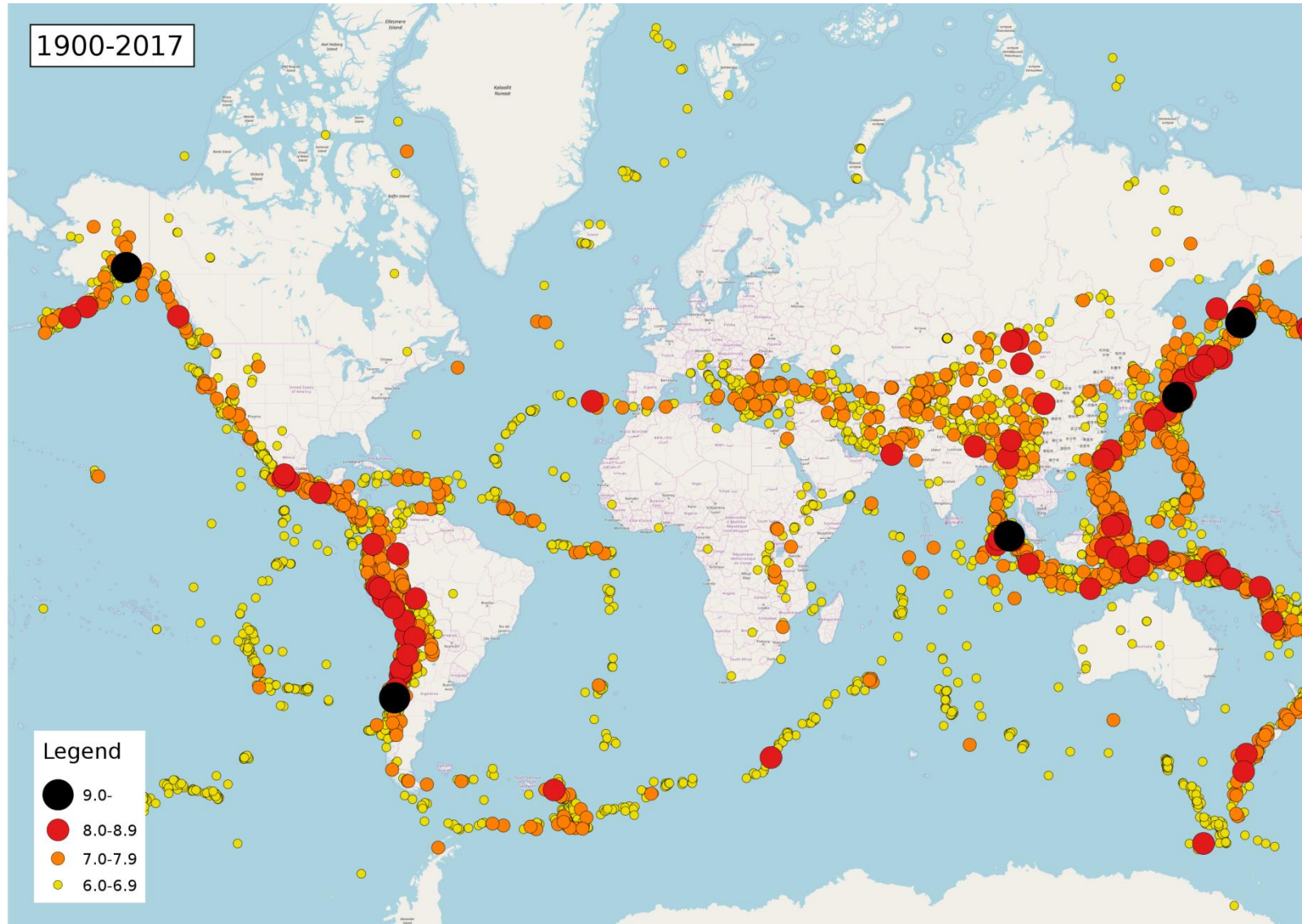
# The biggest Earthquakes in Europe

**Earthquake history in Europe**  
Distribution of over 30,000 earthquakes  
with magnitudes larger or equal to 3.5 for the period 1000 to 2007  
Source: EU SHARE Project (2013)

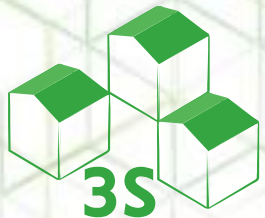


**3S**  
SAFE SOUND  
SUSTAINABLE

# Global map of earthquakes (1900-2017)



Americas / Europe / Africa / Asia / Australia



SAFE SOUND  
SUSTAINABLE



## Safety must come first

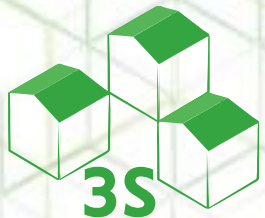


It is economically absurd for seismic-risk countries to invest solely in habitability measures - thermal insulation and – and energy upgrades – in unsafe buildings.

We simply apply makeup to an uninspected old structure, covering up everything and posing a life-threatening risk.



We bear the risk of a collapse during a strong seismic event or natural disaster hazard event. If that happens, all of the money spent on such measures will be wasted. **However**, the economic risk pales in comparison to the potential for injury and loss of life.



SAFE SOUND  
SUSTAINABLE



## We need a new approach



We need global, national and regional regulations and standards on vulnerability assessment and retrofitting measures.

The new trend is: smart financing for smart buildings.



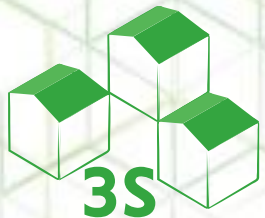
But a building can only be called smart when it is **Safe, Sound and Sustainable.**



**We need to apply:**

a. **Holistic Approach on Concurrent Structural/Seismic and Energy Retrofitting, on existing Buildings.**

b. **Sustainable Structural Design, on new Buildings.**



**SAFE SOUND  
SUSTAINABLE**

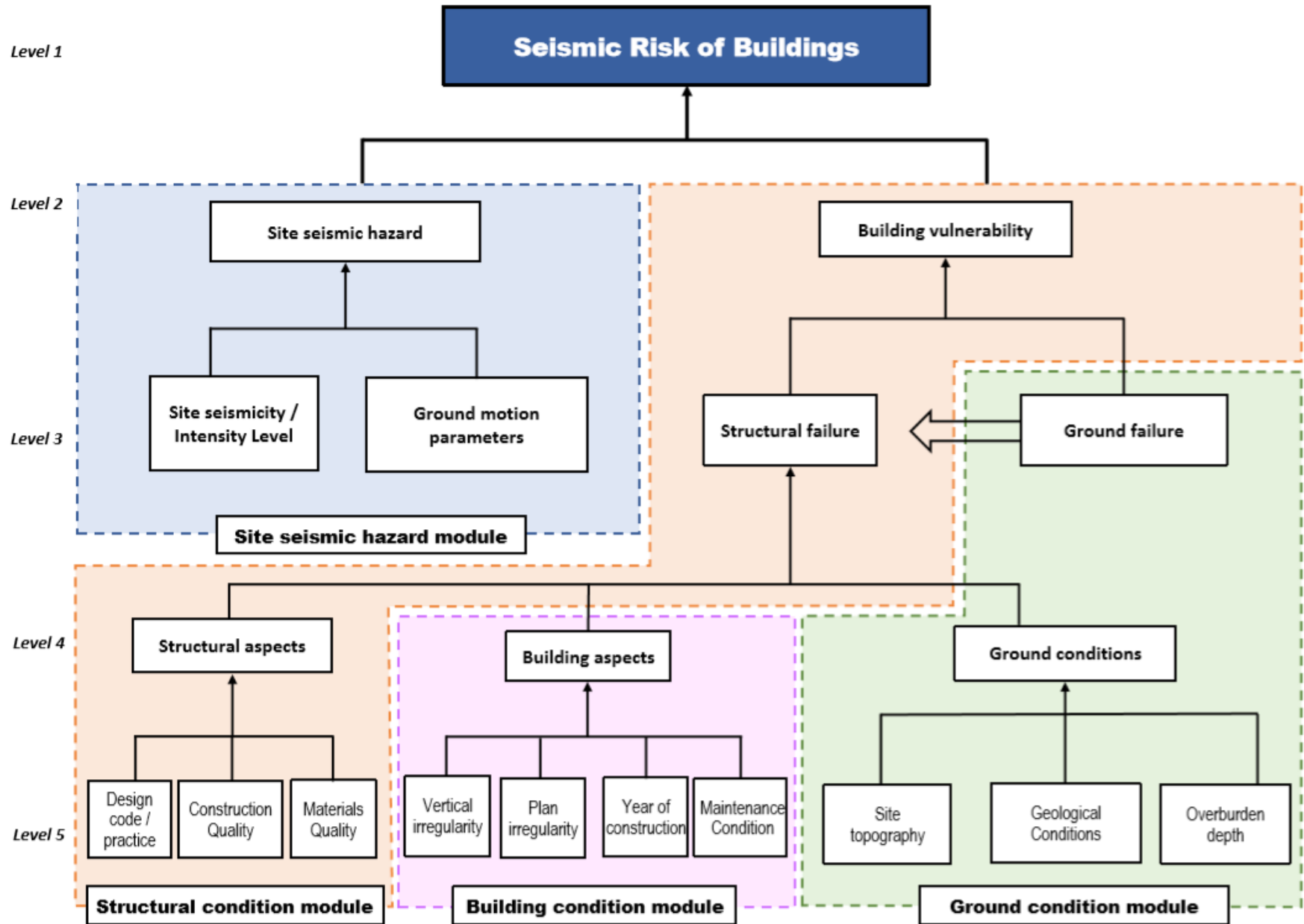
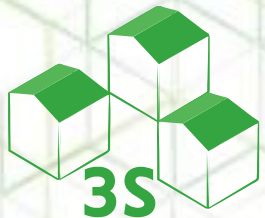


Figure1 – Hierarchical Earthquake Risk Assessment of Buildings (Platonas Stylianou 2020)



**SAFE**  
**SOUND**  
**SUSTAINABLE**

## Sustainable Structural Design (SSD)

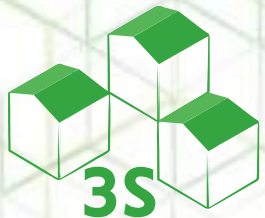


Modern Construction and Design techniques demand the use of energy and resilience, associated with construction, operation and maintenance of structures, to be investigated during planning and design phase.



**Key features of SSD are:**

1. Safe Structural Design and execution
2. Life cycle design optimization
3. Waste Reduction / Minimization of Environmental pollution
4. Design for use flexibility
5. Optimization of operational and maintenance practices
6. Durability of materials and components
7. Reuse, reduce and recycle

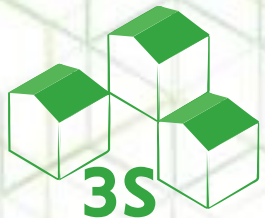


**SAFE SOUND  
SUSTAINABLE**



## Sustainable Structural Upgrade

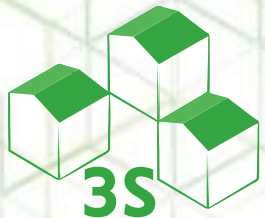
- Existing assets need urgent maintenance and retrofitting to keep their value and meet today's functional and safety standards.
- They need to be upgraded if the world wants to maintain its productive and humane standards.
- This represents a huge renovation and maintenance volume, that the world has to deal with during the next few years.
- This has to be done in a sustainable and innovative way.
- The application of advanced asset and risk management methodologies based on research is needed, in order to further increase the efficiency of interventions.



**SAFE SOUND  
SUSTAINABLE**

## Innovation

- A lot of scientific research has been done Globally during the last few years on seismic and other natural hazards assessment, structural vulnerability, retrofitting of existing structures with innovative materials, and sustainability.
- With this common language, comprehensive building upgrades under a sustainability framework will be possible.



**SAFE SOUND  
SUSTAINABLE**

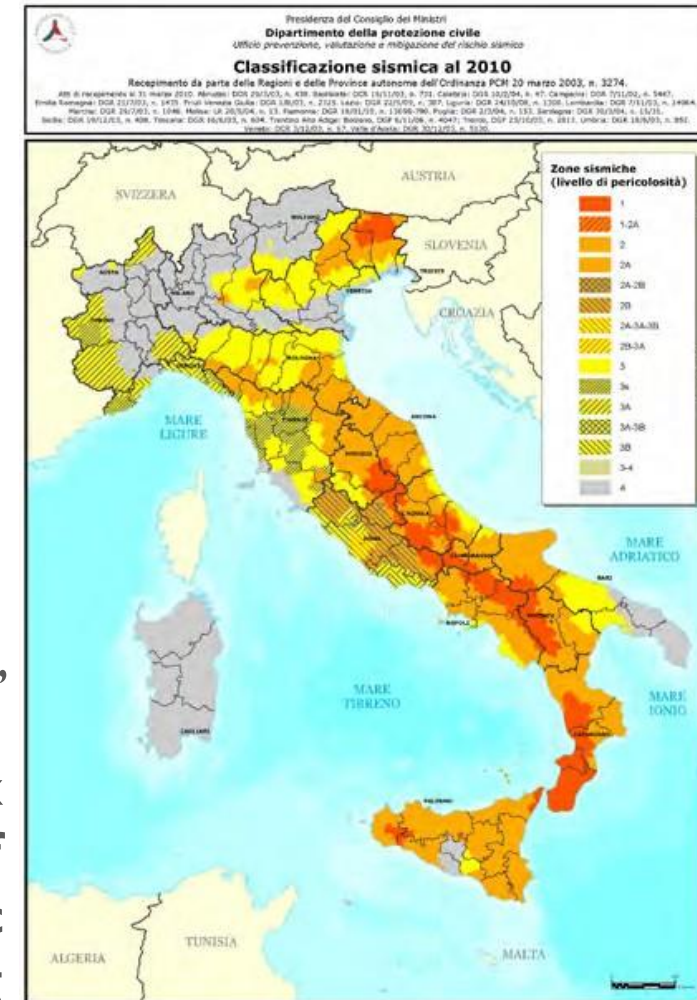


## The Italian case

➤ In 2014 a work group submitted to the Italian Minister a draft of the guidelines for a new seismic performance classification framework, based on expected annual losses (EAL) which was the basis for the Seismic Risk Classification introduced in Italy in February 2017.

➤ The Classification has a structure similar to the Energy Performance Classification of Buildings and **allows ranking the buildings in 7 classes (from A to G).**

➤ To stimulate the adoption of risk mitigation measures, together with the Seismic Classification, the Italian government has **introduced an interesting tax deduction scheme where the amount of deductible costs is based on the level of seismic risk reduction achieved through retrofitting works.**

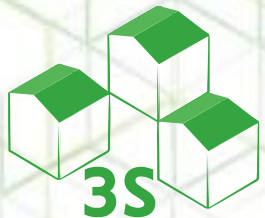




## EXAMPLES OF MAJOR, RECENT EARTHQUAKES IN EUROPE

### Izmit Earthquake (Turkey)-17 August 1999

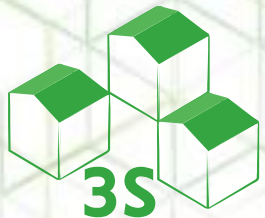
- On 17 of August, 1999 at 03:01:3 (Local Time) there was a strong earthquake,  $M = 7.4$  on the Richter Scale, with its epicentre South-West of Izmit town in northern Turkey and at a depth of 15-17Km.
- The duration of seismic vibration was 37 sec. The earthquake shook the cities of the wider area such as Istanbul, Bursa, Eskishir, Duze and Bolu.
- The impact was dramatic, 17,118 civilians died, 45,000 injured, 600,000 homeless and thousands were missing.
- The financial impact of the devastating earthquake amounts to appr 50 billion. dollars without taking into account all the long-term impact.



**3S**  
SAFE SOUND  
SUSTAINABLE

## Earthquake in the city of L'Aquila (Italy)

- On April 6, 2009, a strong earthquake excitation  $M_w = 6.3$  or  $5.9$  magnitude on the Richter Scale, occurred with its epicentre 7km outside of the city of L'Aquila at a depth of 10km deep.
- The earthquake was fatal and 319 people were killed, 1,600 were injured and more than 10,000 homes were damaged, 70,000 were forced to leave their homes where 30,000 were left homeless for several months.
- The economical impact of the earthquake Exceeded \$ 15 billion and created a major Unemployment problem. But the cultural impact was also great due to the damage or collapse of several Buildings and monuments.



**3S**  
SAFE SOUND  
SUSTAINABLE



## Earthquake of Parnitha (Athens) 1999

- On September 7, 1999, there was a strong earthquake excitation,  $M = 5.9$  on the Richter Scale with its epicentre, 18km north of downtown Athens.
- The horizontal acceleration exceeded 0.5 g in central Athens while vertical acceleration reached 1 g.
- The impacts of the earthquake were dramatic, 145 people lost their lives, 2,000 were injured and 50,000 were left homeless.
- The financial impact reached \$ 4 billion, with 110 buildings collapsing completely and more than 50,000 buildings were damaged.



SAFE SOUND  
SUSTAINABLE



## Earthquake of Albania 2019

- On November 26, 2019 there was a strong earthquake excitation,  $M = 6,4$  on the Richter Scale.
- The impacts of the earthquake were dramatic, 51 people lost their lives, more than 900 were injured and 10.000 were left homeless.
- The cultural impact was dramatic. The financial impact was huge for the country which still struggles...



**SAFE SOUND  
SUSTAINABLE**

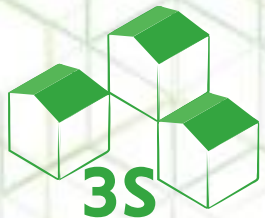
## Kahramanmaraş Pazarcık and Elbistan Earthquakes (2023)



On 6 February 2023 a Mw 7.8 earthquake struck southern and central Turkey and northern and western Syria. The epicenter was 37 km west–northwest of Gaziantep. It was followed by a Mw 7.7 earthquake. This earthquake was centered 95 km north-northeast from the first one.



The Mw 7.8 earthquake is the second largest in the history of Turkey. There were more than 10,000 aftershocks in the three weeks that followed. The seismic sequence was the result of shallow strike-slip faulting.



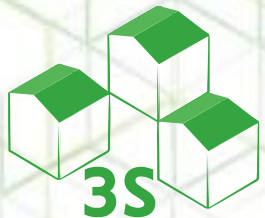
SAFE SOUND  
SUSTAINABLE



## Kahramanmaraş Pazarcık and Elbistan Earthquakes (2023)

➤ There was widespread damage in an area of about 350,000 km<sup>2</sup> (about the size of Germany). An unofficial estimated is that about 1.5 million people were left homeless.

➤ As of 20 March 2023, more than 57,300 deaths were confirmed: more than 50,000 in Turkey, and more than 7,200 in Syria. And the economic loss was also huge, estimated more than 100 billion dollars.



SAFE SOUND  
SUSTAINABLE

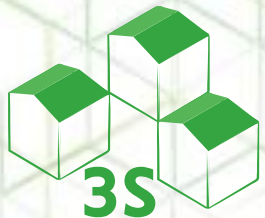
## Some First Measures



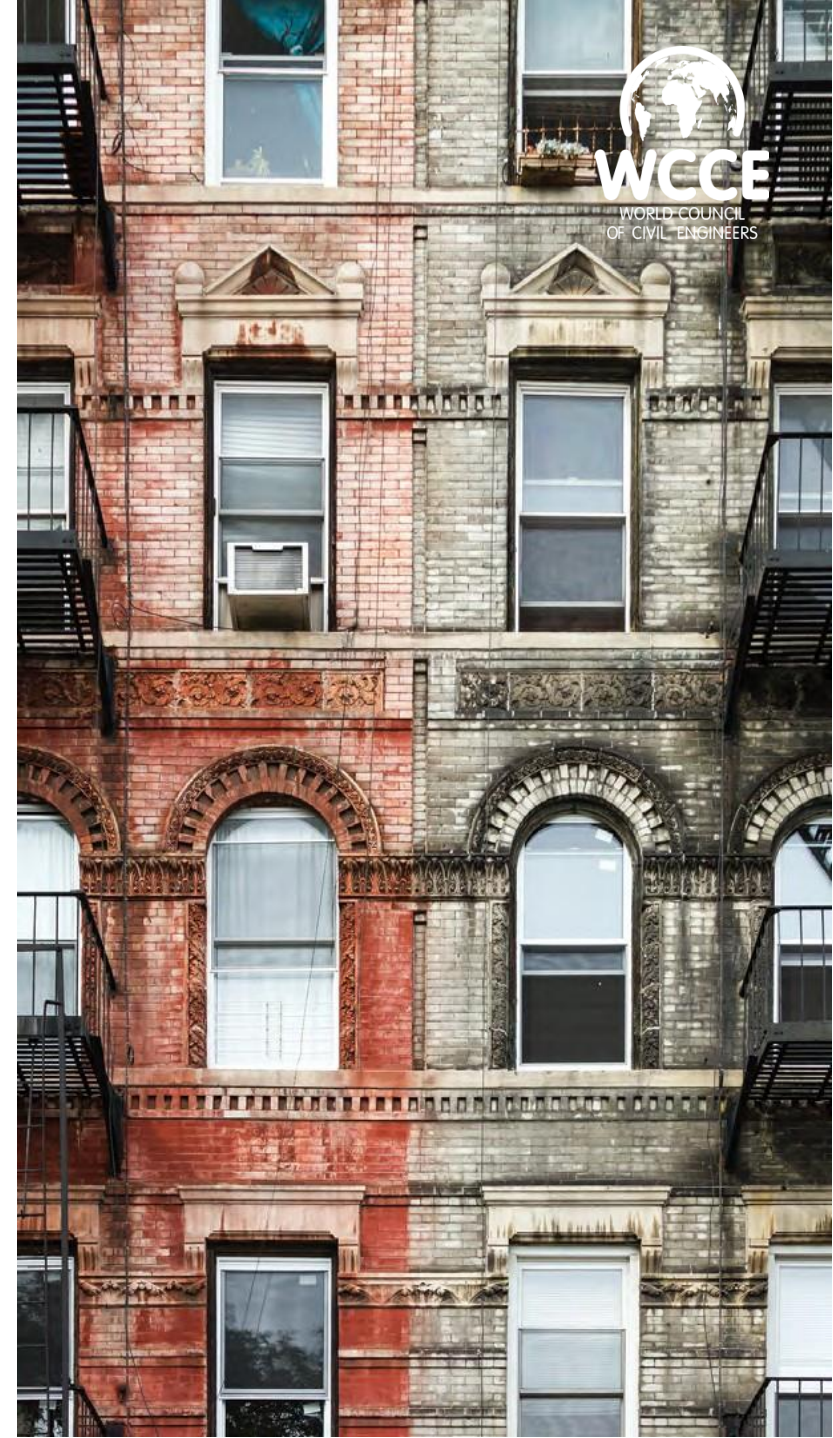
A new approach must be encouraged, by making some simple changes to legal texts and convincing the policy makers to allow funding for structural and/or seismic upgrades of buildings to be granted before, or at least concurrently with grants for improving building energy performance, under a global directive.



In cases of major renovation projects, the starting point for legally binding rules on structural upgrades should be all the state/government owned buildings and buildings of high importance, as well as buildings that gather a large number of people.



**3S**  
SAFE SOUND  
SUSTAINABLE

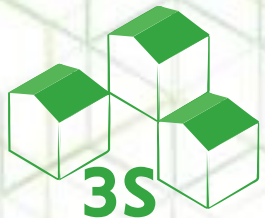




## Seismic Performance Classification

➤ ECCE and WCCE must contribute to the effort of developing a **Global common method for building seismic classification**. This could be combined with **the electronic identity of structures**, which is provided in many countries and become the basis for the **Seismic Risk Classification**, similar to the Energy Performance Classification of Buildings that we use already.

➤ Finally, **financial measures** similar to those that promote energy efficiency upgrades should be implemented, with the goal of minimizing expected annual losses (EAL), which is the economic justification for this prevention strategy.





**SAFE SOUND  
SUSTAINABLE**






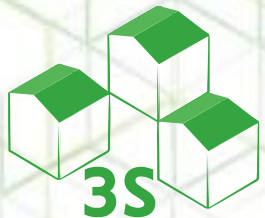
## A joint ECCE – WCCE Task Force

 Both ECCE and WCCE contribute to raise Awareness for the problem of safety of the existing building and infrastructure stock.

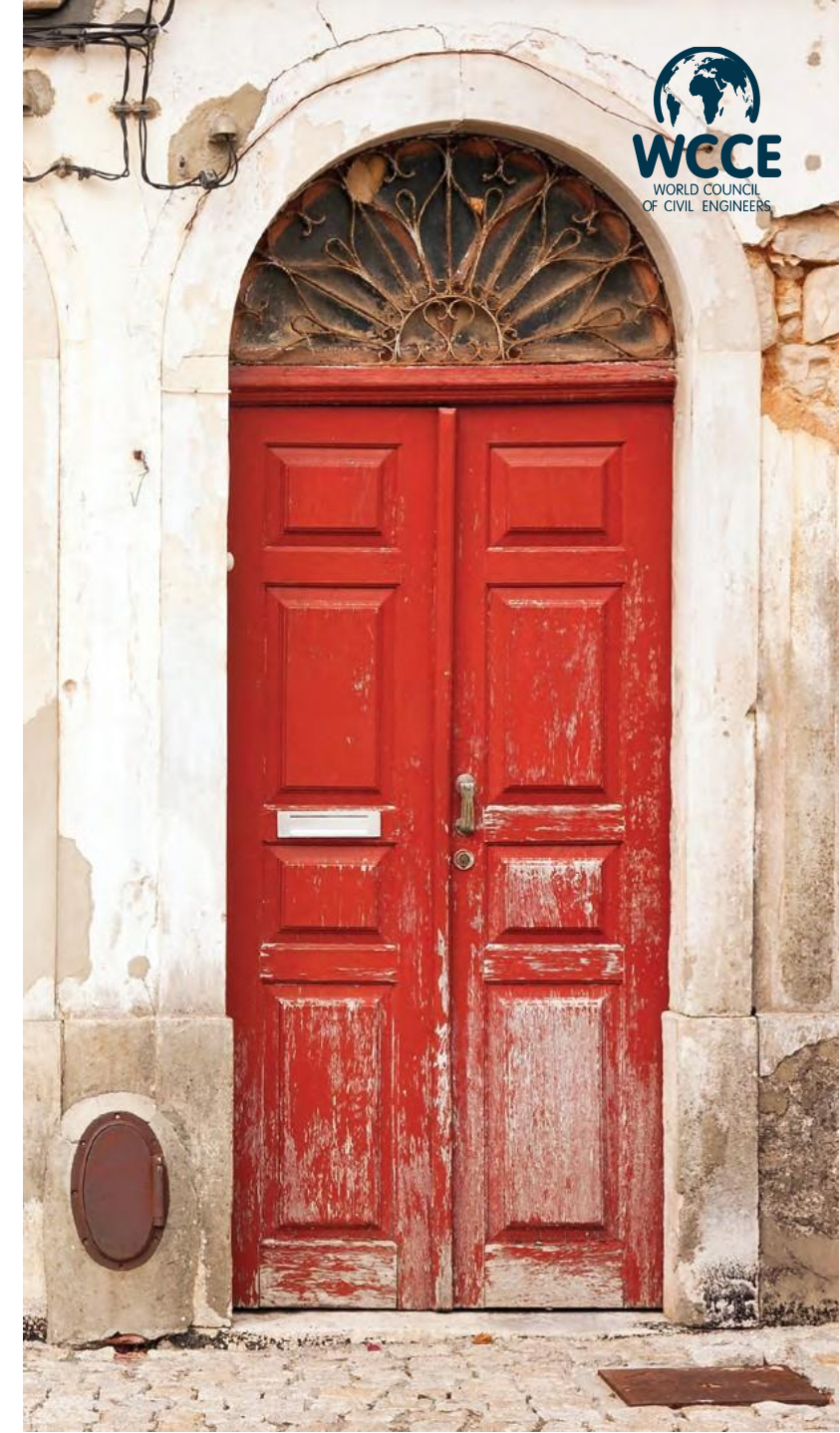
 **Safety is one the essential features of the human right on adequate housing, and no sustainable approach can forget this.**

 Decision-makers need to comprehend this. The new trend is smart financing for smart buildings - but, a building can only be called smart once it is safe, secure and sustainable, in the order stated above.

 **ECCE and WCCE have recently created a joint working team to elaborate on all these ideas.**



**SAFE SOUND  
SUSTAINABLE**

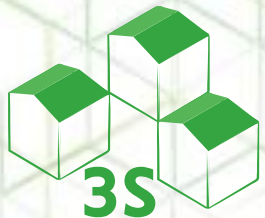


## A joint ECCE – WCCE Task Force




### Joint ECCE – WCCE Task Force members:


- Platonas Stylianou – Cyprus (Coordinator)
- Andreas Brandner – Austria
- Aris Chatzidakis – Greece
- Jeanette Muñoz Abela - Malta
- Nathaniel Matalanga – Kenya
- Juan Yacopino – Argentina
- Nickolas Kyriakides – Cyprus
- José Francisco Saez Rubio – WCCE Executive Director
- Maria Karanasiou – ECCE General Secretary



**SAFE SOUND  
SUSTAINABLE**

## World Engineering Day 2023

 The Joint ECCE-WCCE Task Force has recently revised and updated the Manifesto and Executive Summary of the 3S Approach. The revised version was unveiled by ECCE President Andreas Brandner during the World Engineering Day 2023 celebration in Madrid.

 At the **World Engineering Day 2023 (WED2023)**, the joint **ECCE-WCCE 3S Approach Manifesto** was **ceremoniously presented** to WFEO President Jose Vieira. This significant event saw the official handover of the manifesto, which was made available to all participants in both English and Spanish languages.

 The World Engineering Day 2023 on 4 March 2023 is the day that marks ECCE's and WCCE's commitment to continue fostering holistic approaches of renovation in support of the global policies and UN SDGs for a safe and sustainable world.





# Webinar on 3S – Safe, Sound, and Sustainable Housing in Africa



The banner features a background image of a traditional mud-brick building with a thatched roof. Overlaid on the image are several text and graphic elements:

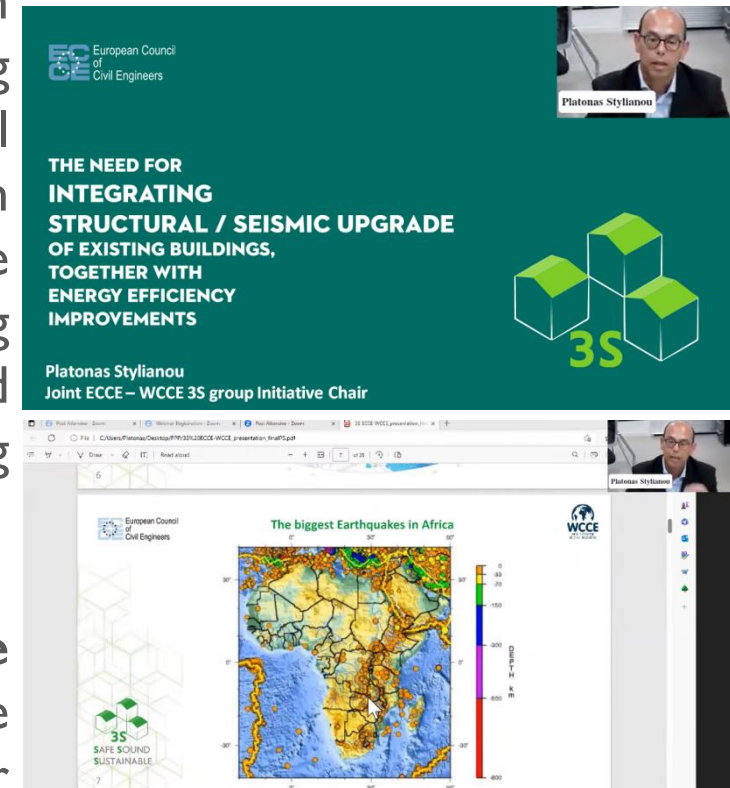
- Top Left:** A microphone icon with the text "Let's talk Civil Engineering".
- Center:** A green box containing three 3D cubes and the text "3S SAFE SOUND SUSTAINABLE".
- Right:** The main title "3S - Safe, Sound & Sustainable Housing in Africa" and the date/time "May 10<sup>th</sup> | 16:30 Central Africa Time".
- Far Right:** An orange box with the text "11 SUSTAINABLE CITIES AND COMMUNITIES" and a building icon.
- Bottom Right:** The text "Photo by David Clode on Unsplash".
- Bottom:** Logos for FAEO (Federation of African Engineering Organisations / Fédération des Organisations d'Ingénieurs en Afrique), WCCE (World Council of Civil Engineers), and ECE (European Council of Civil Engineers).



## Webinar on 3S – Safe, Sound, and Sustainable Housing in Africa

➤ The World Council of Civil Engineers (WCCE), in collaboration with the Federation of African Engineering Organizations (FAEO) and the European Council of Civil Engineers (ECCE), has united to host this webinar with the aim of promoting awareness regarding the imperative for "Safe - Sound - Sustainable" (3S) buildings. Achieving this goal necessitates the integration of structural and seismic design with energy efficiency upgrades in existing buildings (3S Approach).

➤ The workshop served as a platform to introduce the **3S Approach initiative** and foster a meaningful dialogue among participants, encouraging each interested partner country to explore their potential contributions to this global project.



## Webinar on 3S – Safe, Sound, and Sustainable Housing in Africa

### AGENDA

Watch the webinar on YouTube



Welcome by:

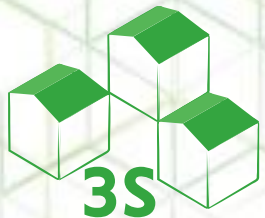
- Andreas Brandner, ECCE President
- Kazawadi Papias Dedeki, FAEO President
- Jorge Emilio Abramian, WCCE President

Speakers:

- Platonas Stylianou, 3S Approach Initiative Chair & ECCE President Elect [\[+\]](#)
- Prof. Sylvester Abuodha, Board Director, Engineers Board of Kenya [\[+\]](#)
- Martin Manuhwa, WCCE Vice president, Engineering Council of Zimbabwe [\[+\]](#)
- Aishatu Aliyu Umar, WCCE Representative for Africa, Federal Housing Authority of Nigeria [\[+\]](#)

Moderator:

- Nathaniel Matalanga, WCCE Treasurer, Immediate Past President of the Institution of Engineers of Kenya




SAFE SOUND  
SUSTAINABLE

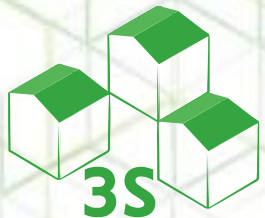


## Webinar on 3S – Safe, Sound, and Sustainable Housing in the Americas

 The World Council of Civil Engineers (WCCE) in collaboration with the Council of Professional Associations of Civil Engineering in Portuguese and Spanish speaking countries (CICPC) and the European Council of Civil Engineers (ECCE) ***will organize a webinar focused on the Americas on June 7, 2023.***

 ***This webinar will be conducted in Spanish, where the 3S Approach initiative will be introduced.*** The primary objective would be to encourage active participation from Latin American countries. Through engaging dialogue and the completion of the relevant online survey, we hope that we will receive contributions and valuable insights and perspectives to this project.

 For more information visit the [WCCE website](https://www.wccea.org/).



SAFE SOUND  
SUSTAINABLE

## Next steps



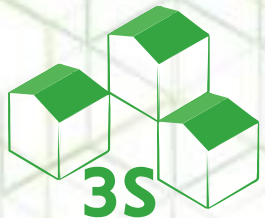
The online survey on the 3S Approach will be distributed to additional regions worldwide via the WCCE network.



By the year-end, we anticipate gathering a substantial number of responses.



Subsequently, the collected data will be analyzed and utilized firstly by each and then by the group in order to update the position paper on the 3S Approach, through the collaborative efforts of the ECCE-WCCE working group.



**SAFE SOUND  
SUSTAINABLE**

REMEMBER:

The new trend nowadays is...  
**smart** financing for **smart** buildings.

But a building can only be called **smart**...  
once it fulfills the **3S** approach  
“**S**afe, **S**ound and **S**ustainable”.





# Join us!! Check our Manifesto



The cover of the manifesto features the ECCE logo at the top left and the WCCE logo at the top right. The main title is "THE 3S APPROACH" in large green and white letters, with "SAFE - SOUND - SUSTAINABLE" in smaller green letters below it. A graphic of three green cubes is positioned above the "3S" text. The bottom section contains the text: "THE NEED FOR INTEGRATING STRUCTURAL / SEISMIC UPGRADE OF EXISTING BUILDINGS, TOGETHER WITH ENERGY EFFICIENCY IMPROVEMENTS".



**THANK YOU  
FOR YOUR  
ATTENTION!**

