MINISTERUL EDUCAȚIEI NAȚIONALE

Universitatea de Vest din Timişoara

Universitatea Politehnica Timișoara

Horizon 2020 Days : Opportunity partneship and application

Potential project proposal :

Effect of Climate Change on Reliability and Durability of Constructions

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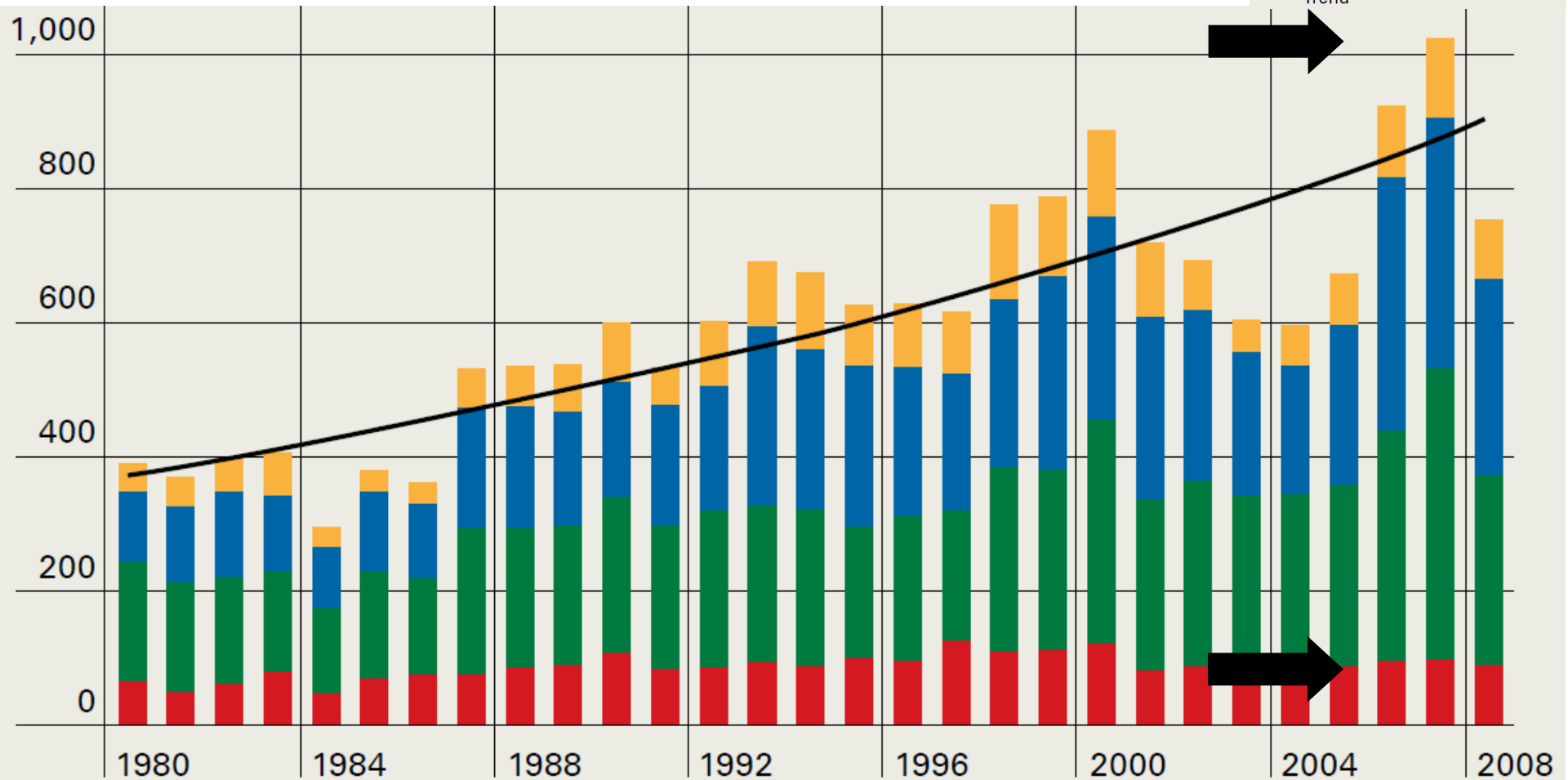
HORISON 2020 Framework

- **Societal Challenges**
  - **Climate action, resource efficiency & raw materials** – published Dec.2013, deadline 2014
  - **Call** – Growing a Low Carbon, Resource Efficient Economy with a Sustainable Supply of Raw Materials (*H2020-SC5-2014/2015*)
  - **Scope** : examining the link between climate change actions and sustainable development through international research collaboration
  - **Expected impact** : Support for technological, institutional and socio-economic innovation in the area of climate action. Reduction already in the short-term of the uncertainties in assessing and computing the costs, benefits and economic values of mitigation options

Background and Motivation

- The losses from the extreme weather events has more than doubled in the last two decades
- There is evidence this trend is driven by climate change
- Protecting infrastructure and buildings to cope with these threats is a complex challenge
- Trans-national cooperation and multi-disciplinary approach are mandatory

Natural catastrophes



Background and Motivation

Risk and impact of climate change on built heritage (WHC)

Climate indicator	Climate change risk	Physical, social and cultural impacts on cultural heritage
Atmospheric moisture change	– Flooding (sea, river) – Intense rainfall – Changes in water table levels – Changes in humidity cycles – Sea salt chlorides	– Physical changes to porous building materials and finishes due to rising damp – Subsoil instability, ground heave and subsidence – Relative humidity cycles/shock causing splitting, cracking, flaking and dusting of materials and surfaces – Corrosion of metals
Temperature change	– Diurnal, seasonal, extreme events (heat waves, snow loading) – Changes in freeze-thaw and ice storms, and increase in wet frost	– Deterioration of facades due to thermal stress – Damage inside brick, stone, ceramics that has got wet and frozen within material before drying – Inappropriate adaptation to allow structures to remain in use: roofs failure, pipelines , electric and communication networks failure, etc
Wind	– Wind-driven rain – Wind-transported salt – Wind-driven sand – Winds, gusts and changes in direction	– Static and dynamic loading of historic or archaeological structures – Structural damage and collapse
Climate and pollution	– pH precipitation – Changes in deposition of pollutants	– Corrosion of metals
Climate and biological effects	– Proliferation of invasive species – Spread of existing and new species of insects (e.g. termites)	– Collapse of structural timber and timber finishes

Background and Motivation

- An integrated approach making the synergy of knowledge belonging to different disciplines
  - **climatology**
  - **science of materials**
  - **building physics**
  - **civil and structural engineering**
  - **cultural heritage**
- There is a strong need for systematic risk and vulnerability studies to evaluate and model the physical and structural impacts of climate changes on constructions
- Recommendations for preventive measures are necessary

Objectives and Benefits

- Develop a holistic approach on the evaluation of the reliability and durability of constructions during their designed life time, under the actions induced by climate change
- Propose new technical solutions , including adapted materials and technologies
- Provide guidelines and technical support and intervention strategies in order to enhance structural reliability and durability of built environment and optimize the cost of maintenance

Potential partnership

(previous cooperation experience IN COST, FP6, FP 7, RFCS projects)

- Romania : UP Timisoara, Romanian Academy, INCERC
- Finland : VTT, Technical Research Centre of Finland
- Germany : University of Munchen; Fraunhofer Inst.
- Itlaly : ENEA (Ente Nazionale per le Nuove tecnologie, l'Energia e l'Ambiente) - Unità Prevenzione dei rischi naturali e mitigazione effetti; University “Federico II” of Naples ; JRC ISPRA
- Portugal: University of Coimbra
- Belgium: University of Liege
- Czech R.: TU Prague
- Sweden : Lulea Univ.

Target groups/end users

- The academics and researchers
- Technical regulations and codification drafters, building authorities and insurance companies
- The professional engineers from design and consulting offices
- Constructions companies and construction materials fabricators
- Technical managers and decision makers from urban development and protection of building stock and urban facilities.

Scientific focus

- Activities within following scientific thematic areas:
  - Climate change effects with incidence for durability of building material and reliability of constructions
  - Models for characterization of mechanical properties of materials subjected to progressive degradation induced by clime effects
  - Performance based models and methods for structural evaluation and robust design
  - Intervention strategies to preserve and/or enhance safety and durability of building stock

Coordination and organization

WG 1: Climate change effects

WP1: State of art on Climate Change Effects and Built Environment
WP2: Models, characterization and quantifying parameters for structural action effects
WP3: Estimation of time-dependent physical properties of building materials

WG 2: Structural reliability and durability

WP4: Performance Based Evaluation and Design procedures associated with progressive exposure situations
WP5: Robustness models and evaluation criteria for existing construction
WP6: Design criteria and recommendations for new constructions

WG 3: Intervention strategies and new building technologies

WP7: Climate change dependent building conception
WP8: Target objectives and innovative technical solutions for building (adaptive building technology)
WP9: Recommendations for technical regulations, upgrade and maintenance of built environment

Estimated Budget and Duration

EUROs 8,000,000 – 10,000,000.

36-42 months