



ECRA Collaborative Programme on Sea Level Change and Coastal Impacts

ECRA – General Assembly, March 7–8th - 2017, Brussels

Gianmaria Sannino



Italian National Agency for
New Technologies, Energy and
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WHY do we need a CP on Sea Level Change?

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- Present-day sea-level rise is a **major indicator of climate change** (IPCC AR5)

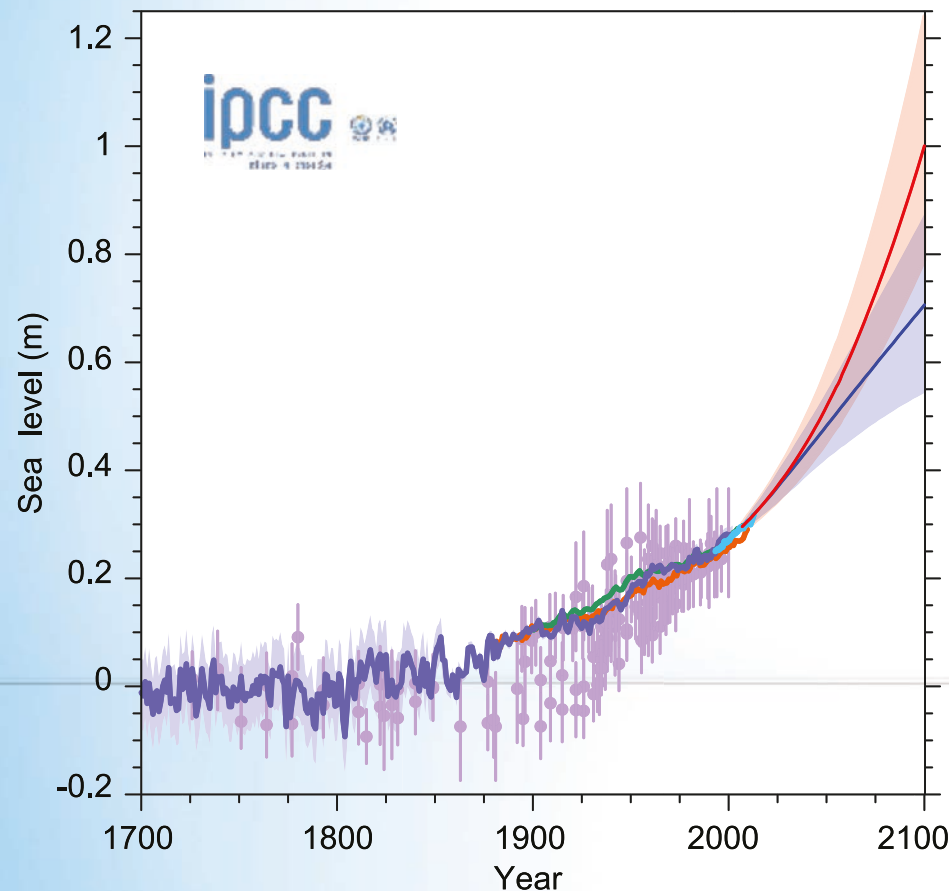
WHY do we need a CP on Sea Level Change?

- Present-day sea-level rise is a **major indicator of climate change** (IPCC AR5)
- Climate sea level rise and its impact on coastal areas has **serious implications** on more than **10% of the world population** that is currently living in coastal areas less than 10m above sea level

WHY do we need a CP on Sea Level Change?

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- Climate sea level rise and its impact on coastal areas has **serious implications** on more than **10% of the world population** that is currently living in coastal areas less than 10m above sea level
- Scientists predict that even if world manages to limit global warming to 2° C — the target value for current climate negotiations (COP21) — **sea levels may still rise at least 70 cm** above their current levels, radically reshaping the world's coastline and affecting millions of people in the process.

WHY do we need a CP on Sea Level Change?



Rate during 1901-1990 was $1.5 \pm 0.2 \text{ mm yr}^{-1}$

Rate during 1993-2010 was $3.2 \pm 0.4 \text{ mm yr}^{-1}$

Compilation of paleo sea level data, tide gauge data, altimeter data, and central estimates and *likely* ranges for projections of global mean sea level rise for **RCP2.6** (blue) and **RCP8.5** (red) scenarios, all relative to pre-industrial values.

WHY do we need a CP on Sea Level Change?

Malè (Maldivian Archipelago)



WHY do we need a CP on Sea Level Change?



CP motivations

WHY do we need a CP on Sea Level Change?



WHY do we need a CP on Sea Level Change?



INDEPENDENT

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Venice will vanish underwater within a century if global warming is not stalled, climate change study warns

The ancient and iconic city will be flooded because the Mediterranean Sea is forecast to rise by up to 140cm

Peter Walker | @petejohn_walker | 20 hours ago | 74 comments

CP motivations

WHY do we need a CP on Sea Level Change?

 Tuesday, Mar 7th 2017 4PM 10°C  7PM 6°C  5-Day Forecast

MailOnline Science & Tech

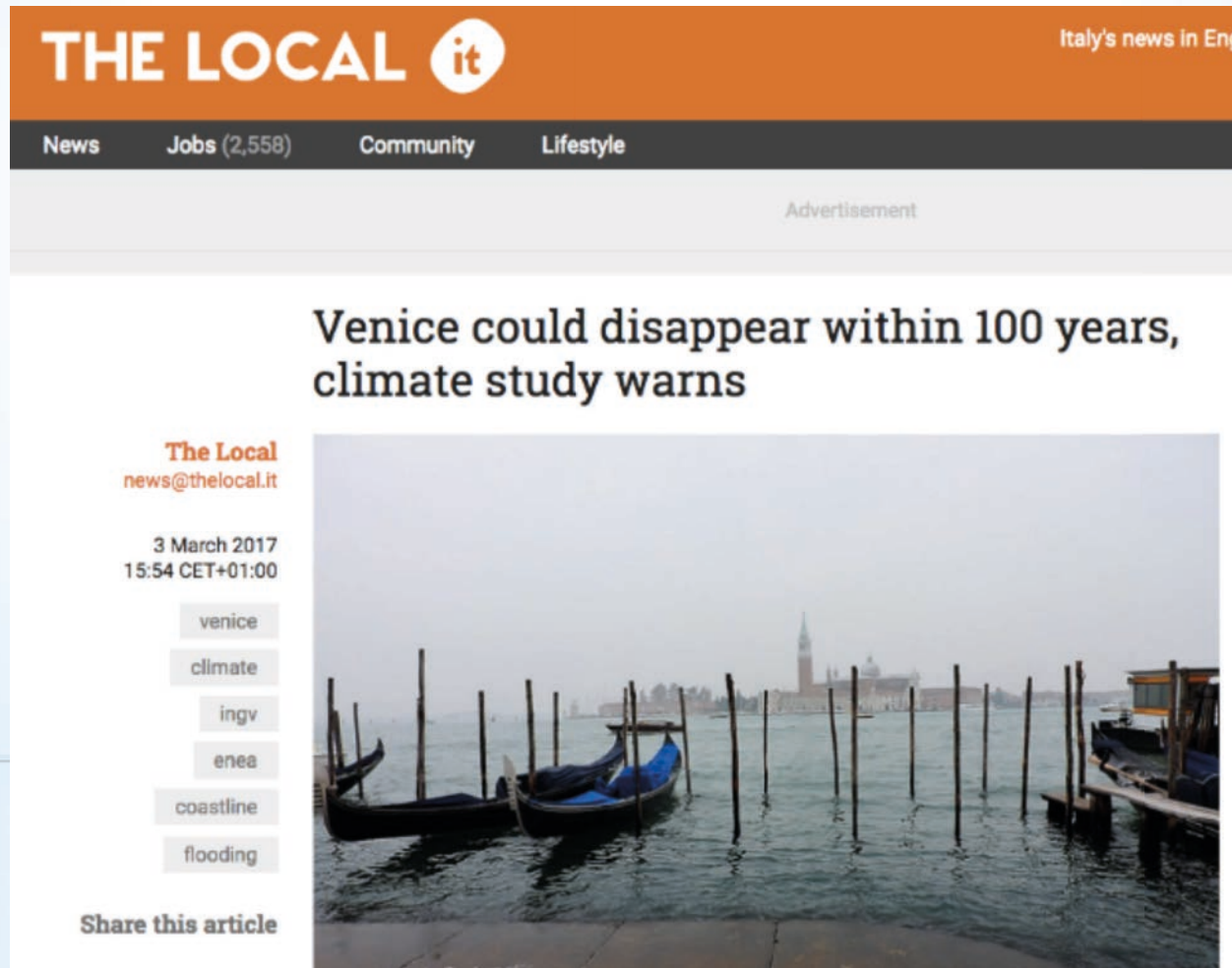
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Venice could DISAPPEAR within 100 years: Global sea level rise may sink the Italian city, warn experts

- The Mediterranean will rise by up to 5ft (140cm) before 2100, scientists warned
- Venice and much of Italy's north Adriatic coastline will be swallowed by water
- The predicted rise in sea levels can be explained by global warming

WHY do we need a CP on Sea Level Change?



WHY do we need a CP on Sea Level Change?

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Sea-level rise and potential drowning of the Italian coastal plains: Flooding risk scenarios for 2100

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ARTICLE INFO

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Marine flooding

Climate change

2100 Coastline scenario

ABSTRACT

We depict the relative sea-level rise scenarios for the year 2100 from four areas of the Italian peninsula. Our estimates are based on the Rahmstorf (2007) and IPCC-AR5 reports 2013 for the RCP-8.5 scenarios (www.ipcc.ch) of climate change, adjusted for the rates of vertical land movements (isostasy and tectonics). These latter are inferred from the elevation of MIS 5.5 deposits and from late Holocene sea-level indicators, matched against sea-level predictions for the same periods using the glacio-hydro-isostatic model of Lambeck et al. (2011). We focus on a variety of tectonic settings: the subsiding North Adriatic coast (including the Venice lagoon), two tectonically stable Sardinia coastal plains (Oristano and Cagliari), and the slightly uplifting Taranto coastal plain, in Apulia. Maps of flooding scenarios are shown on high-resolution Digital Terrain Models mostly based on Lidar data. The expected relative sea-level rise by 2100 will change dramatically the present-day morphology, potentially flooding up to about 5500 km² of coastal plains at elevations close to present-day sea level.

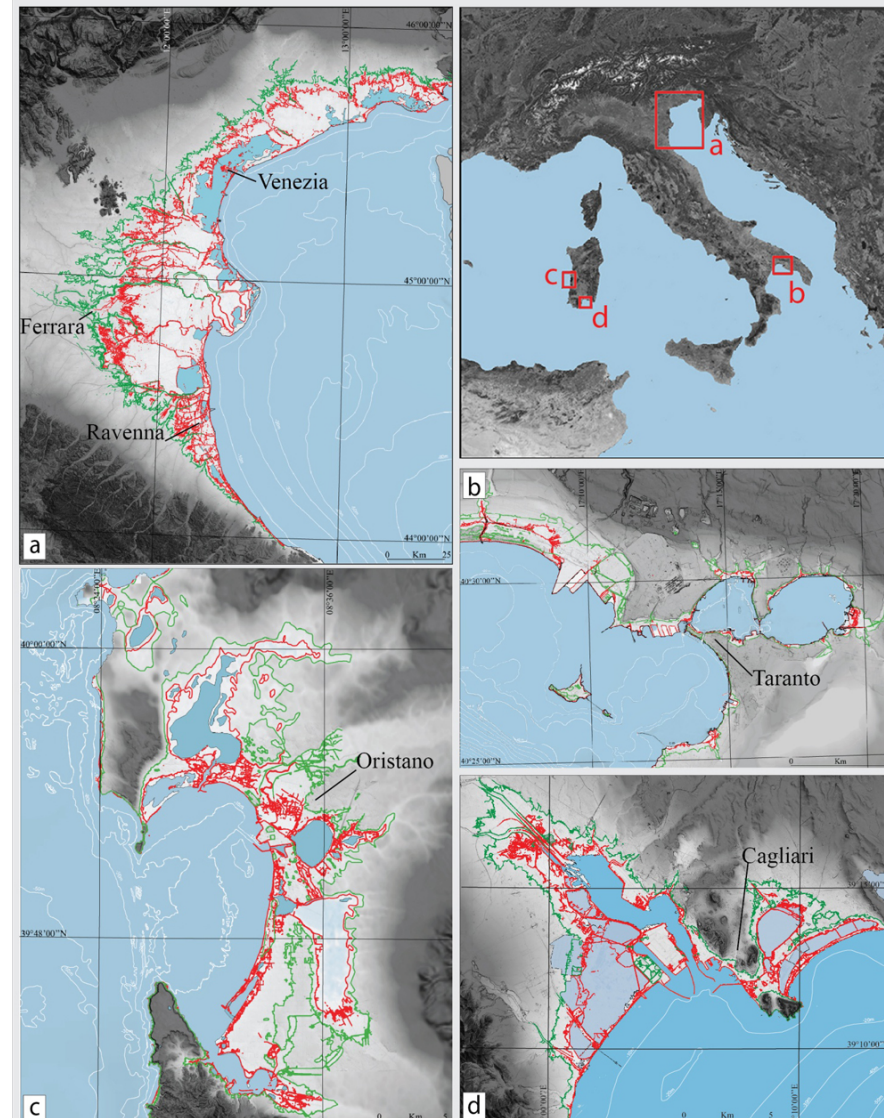
The subsequent loss of land will impact the environment and local infrastructures, suggesting land planners and decision makers to take into account these scenarios for a cognizant coastal management. Our method developed for the Italian coast can be applied worldwide in other coastal areas expected to be affected by marine ingression due to global climate change.

Published by Elsevier Ltd.

1. Introduction

Instrumental and observational data show that in the past two centuries global sea level has risen at faster rates than in the last two or three millennia (Veerman and Rahmstorf, 2009; Church et al., 2010; Church and White, 2011; Kemp et al., 2011), with values up to 3.2 mm/yr in the last decades (Meyssignac and Cazenave, 2012; Mitchum et al., 2010; Jevrejeva et al., 2008, 2014;

The recent report on global climate change (Church et al., 2013) warned countries on the risk induced by sea-level rise (Fig. 1). This warning must be seriously considered for the assessment of coastal vulnerability and flooding hazard in response to the fast retreat of the coastline (Schaeffer et al., 2012; Rahmstorf et al., 2011). In addition, natural or anthropogenic coastal subsidence at rates of several mm/yr may represent a critical factor for accelerating local coastal changes, especially when in combination with sea-level rise



Overall plan

The ECRA Collaborative Program on Sea Level and Climate Change focus on the **regional aspects** of sea level change, which is a challenging theme for European research and **coastal management**. The program aims to facilitate integration of several activities developed concerning the Atlantic and Baltic European coasts and the Mediterranean area.

The goal is the development of an **integrated view** of regional aspects of sea level change in Europe, in terms of observations, technological development, modeling improvements, as well as cross-disciplinary communication between sea level scientists, coastal engineers, coastal managers and stakeholders.

Overall plan

- Regional aspects of sea level change and adaptation
- Atlantic, Baltic, and Mediterranean European coasts
- European research and coastal management
- Facilitate integration of activities
- Integrated view and cross-disciplinary collaboration
- Sea level scientists, coastal engineers, coastal managers, and stakeholders



Dare to come out of the water



Targeted and purposeful



Collaboration, not
escape back to the
science

Summary of activities

- **1st Workshop (Utrecht, March 2012)**
- **2nd Workshop (Hamburg, November 2013)**
- **Change CP coordinators (October, 2014)**
- **Sea level session @ the ECRA GA (Brussels, March 2015)**
- **1st ECRA Collaborative Project meeting (Mallorca, June 2015)**
- **3rd Workshop, co-sponsored by ECRA (Mallorca, June 2015)**
- **COST-action proposal “Sustainable Coastal Management under Sea Level Change (SEaMANTIC)” (April 2016)**
- **4th Workshop, co-sponsored by BCCR (Bergen, July 2016)**





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Summary of activities: 4 Workshops

ECRA pilot workshop: Regional Sea Level Change: a cross cutting theme

DATES 14-16 March 2012

LOCATION KNMI, De Bilt, the Netherlands

ORGANIZATION Caroline Katsman (KNMI, Netherlands)
Paolo Ruti (ENEA, Italy)
Wilco Hazeleger (KNMI, Netherlands)

WEBSITE <http://www.ecra-climate.eu/index.php/collaborative-programmes/sea-level-and-climate-change>

REGISTERING This workshop is organized by the European Climate Research Alliance. Please register with Dr. C. Katsman (katsman@knmi.nl)

Goals of the workshop



- Review the contributions of the different processes to regional sea level change along European coasts using existing observations and model data
- Review ongoing research activities and projects in the field
- Discuss the observational requirements for attributing regional sea level change
- Discuss modeling requirements for predictions and projections from years to a century
- Identify critical knowledge gaps

We invite contributions on processes contributing to observed and modelled (including CMIP5 outcomes) of regional sea level change:

- Steric effects
- Land ice contributions
- Continental water storage
- Ice/ocean interactions
- Surges and waves

In particular, the impact of these processes on sea level in the Baltic, North Sea and Mediterranean will be addressed.

www.ecra-climate.eu

Joint ECRA / CEN / CIASAP / CLIVAR / WCRP workshop

HIGH-END SCENARIOS OF REGIONAL SEA LEVEL CHANGES AND THEIR UNCERTAINTIES

The workshop aims to:

- review regional sea level projections simulated for high-end climate change scenarios as they result from CMIP5 and other computations
- discuss implications for a range of regional sea level scenarios
- analyze in depth inherent uncertainties of and consistencies among existing estimates
- develop a strategy as to how to further improve regional sea level projections
- present studies resulting from downscaling to better address regional sea level projections and their uncertainties, e.g. for the North Atlantic, Baltic/North Sea and Mediterranean
- discuss the quality of models analyzed through dedicated model-data intercomparison studies

Key note presentations:

Antony (Tony) Busalacchi:
"Future Directions for the World Climate Research Programme: Grand Challenges for the Decade Ahead"

Mojib Latif:
"Initial value sensitivity of regional centennial sea level trends"

20. – 22. NOVEMBER 2013

UNIVERSITY OF HAMBURG

Results from the workshop will be important for impact studies and adaptation policies. They will be published in form of a white paper or a peer-reviewed paper on challenges and uncertainties of regional sea level change projections.

The workshop will be open, but limited in size (up to 50 participants).

REGISTER: events@ecra-climate.eu







Global and regional sea level variability and change



Travel student grant sponsored by ECRA

A presentation slot has been reserved to ECRA















ECRA



Mallorca, June 2015

1st Circular ECRA/BCCR Workshop

Sea Level Change and Coastal Impacts Towards adaptation strategies

21-22 June 2016, Bergen
Bjerknes Centre for Climate Research (BCCR)

Goals of the Workshop:

- Assessment of the most immediate research that can and should be done to improve knowledge of regional sea level changes in Europe
- Learn from novel approaches: Interdisciplinary research and cross-topical issues, co-designed projects
- Link communities of ECRA, Future Earth and JPI Climate (improve impact research by learning from social scientists)
- Advance ECRA Strategy for "Collaborative Programme on Sea Level Change and Coastal Impacts" (in particular exchange about research gaps in sea level change research)

Agenda

Day 1
14:00 - 18:00
Keynotes & Discussion

Day 2
9:00 - 16:00
Scientific presentations & Discussion


ECRA workshops are open (no workshop fees), but registration is required (max. 40 participants)

Expected participants:

- ECRA/Bjerknes Centre researchers
- Natural & Social scientists
- Future Earth
- Stakeholders

Registration and further practical information:
www.ecra-climate.eu

Please contact the organizers for scientific requests:
Jan Even Øle Nilsen: even@nersc.no
Gianmaria Sannino: gianmaria.sannino@enea.it



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Key presentations:

- Regional sea level projections for the 21st century (Tony Busalacchi)
- Regional sea level projections for the 21st century: Grand Challenges for the Decade Ahead
- Initial value sensitivity of regional centennial sea level trends (Mojib Latif)

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1st Circular

ECRA/BCCR Workshop

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www.ecra-climate.eu

Bergen, July 2016



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- State of the art sea level projections and the impact on society
- How to improve sea level projections for the European coasts?
- Extremes, impacts, adaptation, and advising
- Cross-disciplinary research, co-designed projects, and societal aspects
- **White paper** “Sea Level related adaptation needs in Europe” finished.
- **Special issue** “Coastal Sea Levels, Impacts and Adaptation” in prep.

White paper

- **Key questions**

- How can coastal sea level projections be improved at global, regional, and local scales?
- How can coastal impact assessment, adaptation, and risk management be enhanced?
- How to best achieve a common understanding of the science and risks, amongst stake-holders, policy makers and scientists?



ECRA Collaborative Programme
Sea Level Change and Coastal Im

White Paper: Sea level related ... Europe

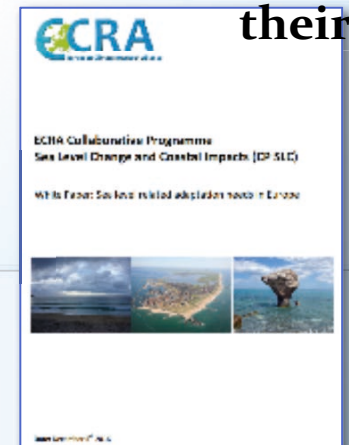
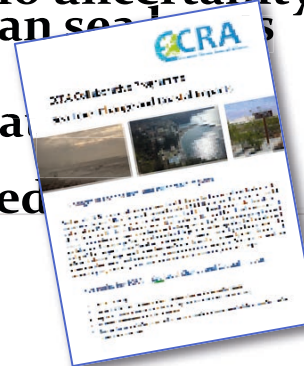


Date: December 5th 2016

**FIVE MOST IMPORTANT PRIORITIES FOR
EFFICIENT ADAPTATION MEASURES**

Recommendations for research priorities in H2020 and beyond

1. Continue and expand observations of sea level
 2. Improve regional ocean modelling
 3. Studies on the combination of sea level change and extremes
 4. Impact and adaptation strategies
 5. Improve collaboration between natural, social and economic scientists, stakeholders, policy makers, and the public
- Combined use of Earth System data
 - Assimilation and high quality data in focus
 - Models should resolve the regional physics
 - Reduced uncertainties and improved confidence in projections
 - Coping with risks on the ground/seaside with mean and extremes
 - Decadal prediction systems
 - Changes in storms, wave climate, tidal regimes, and reduction of emission scenario uncertainty
 - Interaction with changing mean sea level
 - Co-design of projects
 - Collaboration with other initiatives
- Read more about it! →
- Community engagement and education



Special journal issue

- Title: **"Coastal Sea Levels, Impacts and Adaptation"**
- Journal of Marine Science and Engineering
- Deadline: May 31st
- Editors: Thomas Wahl, J. Even Ø. Nilsen,
Ivan Haigh, Sally Brown
- **Topics**
 - Understanding of processes driving local changes at different time scales.
 - Robust projections and the uncertainties (including upper-tail risks)
 - Accurate estimates of present-day extreme sea levels and potential future changes in storminess
 - Models capable of simulating impacts from sea-level change and extremes taking into account socio-economic change and adaptation.
 - Co-designed projects and cross-disciplinary collaboration between engineers, natural, social, and economic scientists, stakeholders, and policy makers.



Open Call Collection OC-2016-1

Proposal Reference OC-2016-1-20479

Title: Sustainable coastal management under sea level change - Towards a participatory roadmap

Acronym: SEaMANTIC

Summary

Coastal areas are exposed to a number of sea level rise induced risks such as flooding and erosion that affect the lives and welfare of coastal communities. Long-term management tools are then necessary to maintain the sustainable environmental status of these areas, combining protection with the exploitation of emerging opportunities for development. The sectoral approaches adopted so far have been proved to be inadequate for the purpose, often leading to conflicting decisions. Moreover, broad scientific consensus is still to be reached as to how to assess and project sea level change at the scales relevant for policy implementation, also due to difficulties in setting up and maintaining an effective two-way information flow from climate scientists, to impact modellers, to decision makers at the local level, to the public, and in acknowledging not only the information providers' constraints, but also the user's needs and public attitudes and expectations. This COST Actions will address these challenges by developing a trans-national network of institutions and professionals aiming at increasing the level of integration of European research and services for a more effective sea-level science for present and future coastal zone management. It will promote a more rigorous evaluation of coastal sea level rise estimates under climate change, and help create common views on how to transfer scientific information to the level of its practical application, thus paving the way to the implementation of extensive services capable of objectively assessing the risks associated with sea level change and of defining optimal management strategies.

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Distribution of Affiliations

COST Country Institutions (18) : Austria  , Belgium  , Bulgaria  , Denmark  , Estonia  , Finland  , France  , Germany  , Greece  , Iceland  , Italy  , Malta  , Netherlands  , Norway  , Portugal  , Spain  , Sweden  , United Kingdom 

Near-Neighbour Country Institutions (2) : Egypt , Tunisia

COST International Partners (1) : United States

European Commission and EU Agencies (0)

European RTD Organisations (0)

International Organisations (1)

Number of Proposers

58

Core Expertise of Proposers: Distribution by Sub-Field of Science

Earth and related Environmental sciences

Civil engineering

Economics and business

Other social sciences

Sociology

Other

Unspecified

Gender Distribution of Proposers

58.6% Males

41.4% Females

Average Number of years elapsed since PhD graduation of Proposers with a doctoral degree

12.9

Number of Early Career Investigators

26

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To be resubmitted!

Welcome to participate!



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EU scientists are ready to face the sea level change challenge



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EU scientists are ready to face the sea level change challenge

Are the EU Institution ready too?



ECRA Collaborative Programme on Sea Level Change and Coastal Impacts

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Gianmaria Sannino



Italian National Agency for
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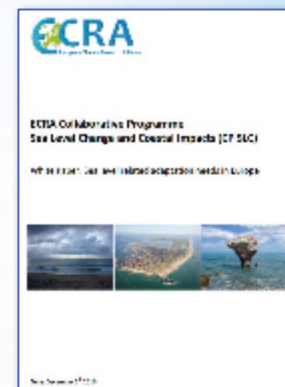


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Recommendations for research priorities in H2020 and beyond

1. *Continue and expand observations of sea level*

- Combined use of Earth System data
- Assimilation of high quality data
- Paleo sea-level records



2. *Improve regional ocean modelling*

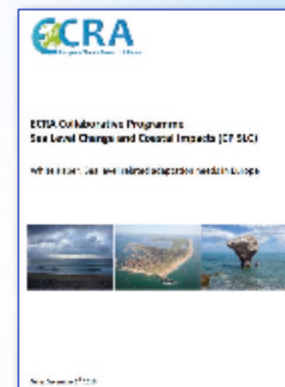
- The largest and the most uncertain contributions in focus
- Ocean models should resolve the regional physics
- Reduced uncertainties and improved confidence in projections
- Upper tail risks of regional sea level rise
- Decadal prediction systems
- Reduction of emission scenario uncertainty

FIVE MOST IMPORTANT PRIORITIES FOR EFFICIENT ADAPTATION MEASURES

Recommendations for research priorities in H2020 and beyond

3. *Studies on the combination of sea level change and extremes*

- Storm surges and flood risks
- Combining extreme sea level estimates with mean level projections, and predictions
- Changes in storms, wave climate, tidal regimes, and interaction with changing mean sea levels



4. *Impact and adaptation strategies*

- Socio-economic impacts of sea-level rise, extremes and adaptation
- Adaptation governance and risk management

5. *Improve collaboration between natural, social and economic scientists, stakeholders, policy makers, and the public*

- Co-design of projects
- Collaboration with other initiatives
- Community engagement and education