CRISI-ADAPT

Climate Risk Information for SupportIng ADAptation Planning and operaTion

This Earlier Stage Innovation Project has been founded by the European Institute of Innovation and Technology under the EIT SGA 2018, Call 3

Climate-KIC Partners involved

Stakeholders

With the participation of

Climate-KIC is supported by the EIT, a body of the European Union

Abstract

The challenge of the adaptation to climate-related risks is demanded for increasingly closer time horizons. Information on potential impacts modelled from near-term climate forecast is important to support adaptation planning and to deal with the main related natural disasters. CRISI-ADAPT aims to monitor and improve the adaptation planning through a real time implementation and validation according to near and seasonal range forecast of climate-related natural hazards. As risk management requires a holistic treatment of all interconnected sectors affected, CRISI-ADAPT will provide a democratisation of both the climate risk information required by each end-user and the vulnerability information of them that is required by each impact model. Therefore, identified available tools and data will be expanded and transparently used to support the adaptation and risk reduction activities planned by city governments, modellers, investors and traders related to all sectors potentially affected by climatic impacts. This includes public services or infrastructures, such as the water sector (treatment, supply and sanitation), energy (generation and supply), commodity (production and commercialisation) among others. In order to implement the project consistently, it plans standardisation of metrics and capacity building for the climatic analysis criteria to ensure a correct use and interpretation of the possible climate scenarios and forecast uncertainties.

Climate-KIC is supported by the
EIT, a body of the European Union

S2. Project Summary

S2.1. Background and Objectives

S.2.1.1. - Background

The challenge of the adaptation to climate-related risks is demanded for increasingly closer time horizons. Information on potential impacts modelled from near-term climate forecast is important to support adaptation planning and operation to deal with the main related natural disasters. Currently, European Horizon 2020 projects (e.g. BINGO, PLACARD or RESCCUE) are especially focused in long-term climate change projections, although they are beginning to explore closer horizons but without applying seasonal timescale for adaptation plans. The novel idea of CRISI-ADAPT is to extend the available climate services for monitoring extreme events thanks to early warning systems. Another novelty of proposed project is the standardisation of climate analysis criteria to consistently interpret and manage the uncertainty related with the climate scenarios. The monitoring of the extreme events will provide an excellent opportunity to test adaptation measures and operations. This real time validation will allow adjusting the used methodology and the standardised climate criteria.

S.2.1.1. - Objectives

Objective 01: Identify strategic sectors in urban areas and critical infrastructures affected by climate impacts. This is the first step to drive the following project tasks.
Objective 02: Collect and provide information on climate projections and extreme events forecasts at increasingly closer time horizons. This objective will contribute to the project outputs O1 and O2.
Objective 03: Identification of tools and models commonly used to estimate climate-related impacts. This objective will contribute to the project output O3.
Objective 04: Holistic analysis of the expected climate-related impacts. This objective will contribute to the project output O3.
Objective 05: Standardisation of climate analysis criteria. This objective will contribute to the project output O3.
Objective 06: Adaptation of the selected sectors to the expected impacts. This objective will contribute to the project output O3.

S.3 - Impact

S3.1. Summary

The CRISI-ADAPT project is aligning with the 11th Impact Goal of the EIT Climate-KIC's 2030, "Democratise climate risk information", since it enhances the access to risk information through capacity building and a great potential expansion of the climate services market thanks to two expected business products, which are interesting for any market segment affected by climate impacts. Particularly, the project will expand the availability of data, models and tools, and will support new users for maximum uptake at project and market-scale, including capacity building. Moreover, project aims to standardise the climate analysis criteria to consistently mainstream the climate information and the related uncertainty management to the identified market segments (all those affected by climate impacts).

S3.2. Impact Pathway on whole systems (Logic Model)

The business model of CRISI-ADAPT is based on two final products: (1) Climate Risk Information Tool (CRIT) and Monitoring Extreme EvenTs (MEET). Both climate services will be provided jointly by Meteogrid and Aquatec. Meteogrid will provide the climate projections (within CRIT) and weather forecast (within MEET) at local scale to monitor the probability of climate extreme events; while Aquatec will provide modelling tools integrated in both systems to predict the related climate impacts to the end-users. Moreover, Meteogrid and Aquatec will offer an added-value consulting service to interpret and manage the uncertainty associated to the extreme events predictions under a multi-sectorial holistic approach. Given the high level of detail provided by these services they are particularly suited for local applications by companies and cities in Europe and abroad. With an expected price about 12-25K€/year for each service, CRIT and MEET are complementary in the sense that they improve both, the adaptation plans and the operation against projected and monitored extreme events. The main strength of the services is the high degree of adjustment of predictions applied locally; the main opportunity is the need, but scarce availability, of this kind of services, for the minimisation of climate impacts.

S3.3. Potential Indirect Impacts including economic and/or Social Impact

The results of the project will allow cities to adapt to climate change and thus to minimise its impacts affecting not only to cities and their inhabitants but also to the environment (ecosystems, biodiversity, etc.). This will result, for example, in a minimisation of flooding impacts, a minimisation of heat waves and droughts impacts etc. Indirect impacts (or co-benefits) resulting from such adaptation to climate change include: economic co-benefits (cost savings from climate-related damages, reduced energy losses, reduced disruption to utilities and travel, increased economic production and property values, etc.); social co-benefits (stable delivery of essential services, reduced mortality and health impacts from disasters and specific diseases, reduced travel disruptions leading to productivity gains, etc.) and environmental co-benefits (improved air quality, reduced water pollution, reduced land contamination, improved biodiversity and ecosystems, etc.).

Climate-KIC is supported by the
EIT, a body of the European Union

Given the importance of the port as a critical infrastructure and of the port activities in the local economy, CRISI-ADAPT will cause positive effects to all related supply-chain dependent businesses. Specifically, the project will provide weather information and warnings contributing to prevent the negative impact of extreme events in port operations and infrastructures themselves. Moreover, having an early estimation of the temperature will allow the implementation of the appropriate measures in order to prevent port workers from having heat strokes, among other impacts in their health.

At the same time, the CRIT and MEET tools will allow the right flow of products through ports and other infrastructures, avoiding or minimising bottlenecks and interruptions when extreme storm events may occur and, hence, its economic impact. The climate projections through CRIT will also contribute to the prevention of the devastation of infrastructures which will reduce costs for reparation and maintenance.

S.4 - Climate Impact

S.4.1. Climate baseline and/or vulnerability

Climate has an important component of natural variability of the extreme events that are being magnified by the global warming. In addition, climate change is producing dramatic increments in extreme events as heat waves or extreme rainfall. One of the most remarkable examples is the extreme heat wave which took place in 2003 and had fatal consequences along Europe. These factors represent a major challenge for urban services as water (treatment, supply and sanitation), energy (generation and supply), transport or health that will directly cause impact on the citizens depending of such services and also on the environment, for example, extreme rainfall episodes may collapse the sewer system and thus untreated wastewater can reach receiving waters. Preventing disruptions in urban services due to climate change is a key aim, so an ambitious resilience plan is needed to cope with potential adverse situations.

S.4.2. Contribution to adaptation and/or mitigation

CRISI-ADAPT aims to reduce the impacts of the climate change in strategic sectors of urban areas and critical infrastructures through two fronts:

1) Democratising and mainstreaming climate risk information to the decision-making systems in order to support adaptation and operation. The project plans a Capacity Building for end user to translate technical climate information to specific indicators encompassing a holistic view.

2) Forecasting and monitoring climate impacts though an Early Warning System based on near, long and seasonal range forecast of extreme events. This climate service will allow validating the adaptation measures in a real time implementation.

S.4.3. Geographic Diversity

About the consortium

The consortium is formed by the Climate Research Foundation (Fundación para la Investigación del Clima, FIC) and the Fundación Valenciaport. In addition, the project has the support of two business companies (MeteoGrid and Aquatec) and of three city councils: Lisbon (Portugal), Valencia (Spain), San Sebastián (Spain).

The FIC is a nonprofit, private and fully independent foundation whose objectives focus on research in the field of climate change, as well as in the areas of climatology, meteorology and environment. FIC is highly specialized in climate change research, with a strong scientific profile, and whose scope of work has been spreading from Europe to worldwide (Central and South America, Central Asia, etc). Its foundation objectives are: 1) Deepen and broaden the scientific knowledge about the performance and predictability of the climate system and its relationship to the natural and socioeconomic systems. 2) Deepen and broaden the scientific knowledge on issues related to the environment in general, 3) Disseminate this knowledge to contribute to the achievement of a society increasingly responsible and conscientious in their relations with nature and 4) Encourage and facilitate research activities of third parties in the areas of knowledge mentioned above.

The Valenciaport Foundation for Research, Promotion and Commercial Studies of the Valencian region (Valenciaport Foundation) is a non-profit private entity. It has been conceived to further expand the reach of the logistics-ports community by serving as a research, training and cooperation centre of excellence. The Valenciaport Foundation manifests an initiative of the Port Authority of Valencia (PAV), in collaboration with various other associations, companies and institutions. The Valenciaport Foundation is presently active in numerous cooperation and internationalisation projects in well over twenty countries, principally located in Europe, the Far East and Latin America.

Climate-KIC is supported by the
EIT, a body of the European Union

About the geographies of the pilot cities

In order to analyse the problem in this early stage, CRISI-ADAPT has selected three pilot cities of different sizes: Lisbon (2.8 million inhabitants), Valencia (800,000 inhabitants) and San Sebastian (190,000 inhabitants). These three cities are situated around the Iberian Peninsula, which thanks to its topographic characteristics and geographical situation becomes one of the places in the planet with wider set of climates and with higher natural variability. Because of this climate variability, premises applied to the three pilot cases can be assimilated to represent climate features of most of the European territory:

- San Sebastian is located in the northern coast of the Peninsula, facing the Cantabrian Sea within the Bay of Biscay. Their Atlantic climate presents a natural variability that includes most of the climate features of West Europe, specifically: UK, Ireland, all non-mountainous Atlantic France, Benelux, Denmark and most of Germany. On the other hand, some of these characteristics are as well shared for some parts of Balkan countries such as Slovenia and the shores of Croatia and Bosnia, or even most of the north of Italy.

- Lisbon, located in the Atlantic coast of the Iberian Peninsula right at the estuary of the Tagus River, enjoys a Mediterranean Climate with oceanic characteristics thanks to its more southern latitude even within the Atlantic influence. Thanks to this, Lisbon's climate could be also found in most of the western shores of Mediterranean countries such as those of Italy, Greece, Albania or Montenegro.

- Valencia is located in the eastern coast of the Iberian Peninsula, enjoying from a Mediterranean climate with semi-arid characteristics. This region lies on the leeward side since predominant winds come from the west (Atlantic Ocean) and must cross a series of mountainous ranges and plateaus, which leads to a sunny and dry weather practically all year long, except in autumn, when Valencia experience windstorms and extreme rainfall. All these characteristics are common with other areas of the Mediterranean countries, mainly east shores of Italy and Greece and other regions such as: Aegean Sea, coast of Turkey and south of France.

Climate-KIC is supported by the
EIT, a body of the European Union

S.5 - Results

S.5.1. What results/ assets will be produced from this project?

CRISI-ADAPT will identify the most important variables related to the climate change that can seriously affect urban services, infrastructures, local economies and the health of the citizens. The project will identify the risk associated to the climate change, and finally, provide a tool for early assessing and prevent the impact of the climate change in cities, citizens and critical infrastructures, such as ports. Specifically, the collected information will be used for adapting the port infrastructures to the climate change in order to avoid a significant impact in the local economy and health of port workers. Moreover, the more open access to the climate risk information will facilitate the adaptation in other sectors not included in this study.

S.5.2. How will the project results be sustained and scaled in the future?

Both the climate service of the Climate Risk Information Tool (CRIT) and the early warning system, i.e. the Monitoring of Extreme EvenTs (MEET), can be expanded to any European or foreign city due to the great ability to be fitted at local scale for several timescales. This includes the generation of climate change scenarios, near-term decadal/climate prediction as well as seasonal, long and near-range forecast of extreme events.

The scalability is guaranteed because these services can be applied to any sector affected by the climate change or extreme events; i.e., water sectors (treatment, supply and sanitation), energy (generation and supply), other public services (as mobility or health systems), commodity (production and commercialisation) and a range of supply-chain dependent businesses.

W4. Task per EIT Climate-KIC Partner

W4a. Work Plan and Work Packages

The work plan of the project is divided into five work packages (WP). An initial WP is required to identify the strategic sectors involved in the project. This information will serve as a driver to collect all the climatic information in the second WP. The third WP is planned to identify potential climate-related impacts according to several models and a holistic approach based on all the previous information (strategic sectors identified in WP1 and collected data in WP2). The fourth WP is planned to generate adaptation measures through a capacity building of standardised climate analysis. Finally, the fifth WP is aimed to coordinate, communicate and disseminate project's results and promote all exploitation of their final products.

With this work planning, CRISI-ADAPT aims to monitor and improve the adaptation planning through a real time implementation and validation according to near, long and seasonal range forecast of climate-related natural hazards (Figure 1). Since risk management requires a holistic treatment of all interconnected sectors affected, CRISI-ADAPT will provide a democratisation of both the climate risk information required by each end-user and the vulnerability information of them that is required by each impact model. Therefore, identified available tools and data will be expanded and transparently used to support the adaptation and risk reduction activities planned by city governments, modellers, investors and traders related to all sectors potentially affected by climatic impacts. This includes public services or critical infrastructures, such as the port infrastructures, the water sector (treatment, supply and sanitation), energy (generation and supply), commodity (production and commercialisation), among others. In order to implement the project consistently, it plans a standardisation of metrics and capacity building for the climatic analysis criteria to ensure a correct use and interpretation of the possible climate scenarios and forecast uncertainties.

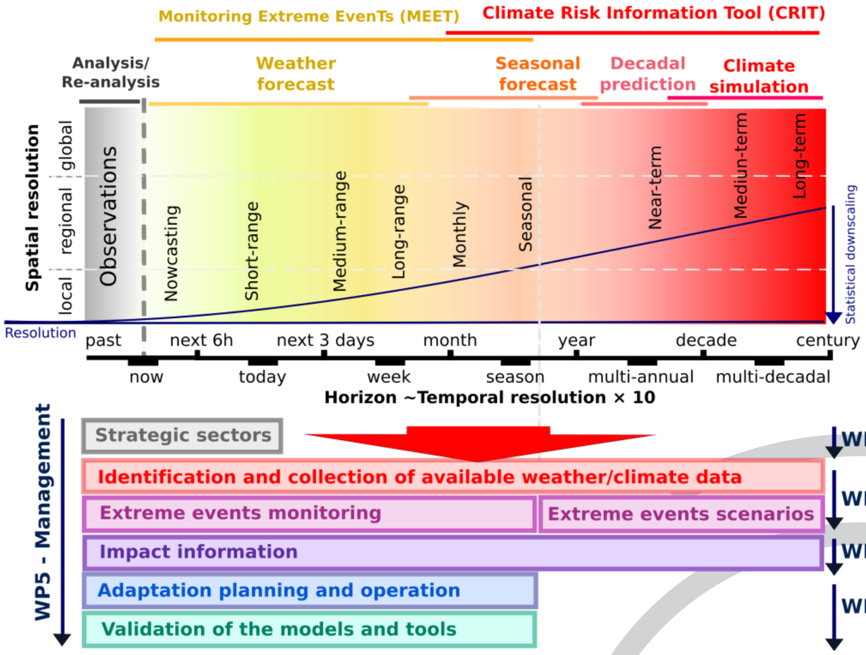

Figure 1. Scheme of the CRISI-ADAPT project.

Climate-KIC is supported by the
EIT, a body of the European Union

The expected impacts of this work are guaranteed by several international projects that support local-scale application of our methodology (Ribalaygua *et al.*, 2013). As climate and seasonal forecasts present high uncertainty levels, it is planned to use ensemble-prediction strategies (Monjo et al., 2016). For instance, seasonal forecast will be provided combining dynamical models like the Copernicus C3S multi-system seasonal forecast (Manubens *et al.*, 2017) and statistical forecast outputs, obtained from the European RESCCUE project, whose method is based on multi-perturbation prediction of teleconnection indexes (Redolat *et al.*, 2018). Finally, three representative scenarios (low, medium and high probability/danger levels) will be selected for each time horizon in order to improve the management of uncertainty.

Work Packages

WP1- Initial identification (M1-M2)

1.1. **Information on strategic sectors**: For each involved city, strategic sectors and infrastructures will be identified as pilot cases. Moreover, information on vulnerability to the climate change and historical impacts will be collected.

WP2- Climatic information (M1-M3)

2.1. **Near- and long- term climate projections**: The most recent climate and decadal projections of the main atmospheric and oceanic variables will be collected to identify potential climate hazards in the pilot cases.

2.2. **Early Warning System**: The most skilful forecasts for the same climate variables will be identified for monitoring possible climate-related impacts in the pilot cases at near, long and seasonal ranges.

WP3- Impact information (M2-M4)

3.1. **Modelling of climate-related impacts**: This task will identify available models that simulate climate-related natural hazards and their corresponding impacts.

3.2. **Multi-sector holistic analysis**: Links between strategic sectors involved will be identified.

WP4- Training and adaptation (M3-M6)

4.1. **Standardisation and capacity building**: Climatic analysis criteria will be standardised to be interpreted in a consistent way and finally end-users will be trained to manage adequately the scenarios and forecast uncertainties.

4.2. **Adaptation planning and operation**: End-users will act in accordance with the expected climate-related risks and opportunities, and using the standardised climate criteria.

WP5- Project management (M1-M6)

5.1. **Coordination and communication**: Planning and scheduling of coordination meetings, internal documents on implementation plans, project deliverables and other project required requirements.

5.2. **Dissemination and exploitation**: Planning of a workshop in each pilot city to disseminate and to promote the exploitation of the final products.

Climate-KIC is supported by the
EIT, a body of the European Union

Table 1. CRISI-ADAPT project schedule.

Work packages (months) Tasks (week-persons)	July				August					September				October					November				December			
	M1				M2					M3				M4					M5				M6			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
WP1- Initial identification (M1-M2)									D1																	
1.1. Information on strategic sectors (2.5)									O1																	
WP2- Climatic information (M1-M3)													D2													
2.1. Near- and long- term climate projections (2)																										
2.2. Early Warning System (10)													O2													
WP3- Impact information (M2-M4)																		D3								
3.1. Modelling of climate-related impacts (2.5)																		O3								
3.2. Multi-sector holistic analysis (3.5)																										
WP4- Training and adaptation (M3-M6)																										D4
4.1. Standardization and capacity building (6.5)																										O4
4.2. Adaptation planning and operation (3.11)																									O5	D5
WP5- Project management (M1-M6)																										
5.1. Coordination and communication (6)																										
5.2. Dissemination and exploitation (9)																										

Legend: Timeline Output Deliverable Workshop X Effort

W4b. Outputs

Please detail the outputs you will achieve for the period in which you are receiving EIT funding. Please provide: a sensible name for the output, a brief description of the output, the anticipated delivery date and the partner accountable for delivery

O1. Identification of strategic sectors (M2): The main sectors and critical infrastructures will be enumerated for each pilot city.

O2. Climate change database (M3): All collected data (atmospheric and oceanic variables) from the most recent climate and decadal projections will be provided through an open and common server, centralised for the pilot cases.

O3. Impact models identification (M4). This output corresponds to the list of the identified models and tool commonly used to estimate the climate-related impacts to the strategic sectors previously defined.

O4. Manual about standard climate criteria for adaptation planning and operation (M6): This output is a guide of the most useful concepts and recommendations as a result of the standardisation process of the climate risk analysis for capacity building in adaptation planning and operation.

O5. Adaptation measures for the pilot cases (M6). The last output is a list of adaptation measures for the pilot cases according to the previous information.

Climate-KIC is supported by the
EIT, a body of the European Union

W4c. Deliverables

DR Project Performance Report (Q3): The project performance report summarises the progress and key achievements of the project for the reporting year. This is sent to the EIT.
Leader: FIC. Contributions: all partners

DC. Communications Deliverable (Q3): The project will agree with Climate-KIC appropriate/ reasonable communications deliverables which might include one or more of: **a high resolution image, a powerpoint slide**, a testimonial, or a case study.
Leader: FIC. Contributions: all partners

D1. Description of the study cases (Q3-M2): The first deliverable will present the identification of strategic sectors of the pilot cases, the vulnerability to climate change and the main historical impacts of climate extreme events.
Leader: FIC. Contributions: all partners

D2. Climate projections and monitoring information (Q3-M3): This report will enumerate the data sources on the most current information for the near and long term climate projections and it will describe of the data outputs. Moreover, the deliverable will present the identification of the most skilful forecast systems for several timescales to fit an Early Warning System.
Leader: FIC. Contributions: Meteogrid (from FIC)

D3. Tools for modelling climate-related impacts in a holistic approach (Q3-M4): This deliverable will describe available models and tools useful to simulate climate-related natural hazards and their corresponding impacts. Moreover, links between strategic sectors involved will be identified and analysed in this report.
Leader: Aquatec (from FIC). Contributions: Fundación Valenciaport and stakeholders

D4. Standardisation of climate risk analysis for capacity building in adaptation planning and operation (Q4-M6): In the last month of the project, a proposal of standardisation will be presented to homogenise the climatic analysis criteria for interpreting consistently the scenarios and their corresponding uncertainty level.
Leader: FIC. Contributions: Aquatec (from FIC), Meteogrid (from FIC)

D5. Adaptation planning for the pilot cases according to standardised climate criteria (Q4-M6): The last deliverable corresponds to a brief description on innovative measures of adaptation to the analysed climate change impacts according to the monitoring of extreme events and using standardised climatic criteria.
Leader: Fundación Valenciaport. Contributions: FIC and stakeholders

References

Manubens, N.; Hunter, A.; Bedia, J.; Bretonnière, P. A.; Bhend, J.; Doblas-Reyes, F. J. (2017). Evaluation and Quality Control for the Copernicus Seasonal Forecast Systems. American Geophysical Union, Fall Meeting 2017, IN33D-05.

Monjo, R.; Gaitán, E.; Pórtoles, J.; Ribalaygua, J.; Torres, L. (2016): Changes in extreme precipitation over Spain using statistical downscaling of CMIP5 projections. International Journal of Climatology, 36: 757-769. DOI: 10.1002/joc.4380

Redolat, D.; Monjo, R.; Lopez-Bustins, J.A.; Martin-Vide, J. (2018). Upper-Level Mediterranean Oscillation index and seasonal variability of rainfall and temperature. Theoretical and Applied Climatology. DOI: 10.1007/s00704-018-2424-6.

Ribalaygua, J.; Torres, L.; Pórtoles, J.; Monjo, R.; Gaitán, E.; Pino, M.R. (2013): Description and validation of a two-step analogue/regression downscaling method. Theoretical and Applied Climatology, 114: 253-269. DOI 10.1007/s00704-013-0836-x

Climate-KIC is supported by the
EIT, a body of the European Union