

Case Study 1

Potential risk of loss of tourism destination attractiveness due to climate change.

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The project UNCHAIN is part of AXIS, an ERA-NET initiated by JPI Climate, and funded by FORMAS (SE), DLR/BMBF (D), AEI (ES) and ANR (FR) with co-funding by the European Union (Grant No. 776608).



Horizon 2020
European Union Funding
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Potential risk of loss of tourism destination attractiveness due to climate change.



- This case addresses a topic of **paramount interest** for local authorities and private companies.
- Regarding the implications for the policy, the methodology proposed will allow to assess the **sensitivity** to different indicators which will help to define the ***paths for adaptation*** and will provide a measure for the **robustness** of the risk estimate
- The main scientific contribution is the implementation of the uncertainty framework in the Impact Chain methodology.

PHASE I: Impact Chain Design

Face 2 Face Interviews with hand-picked stakeholders (12)

Design of the interviews with the help of
Åsa Gerger Swartling and Karin André (SEI)

Pere Jimenez está presentando

UNCHAIN
UNPACKING CLIMATE IMPACT CHAINS

UNCHAIN
«Riesgo en la pérdida de atractivo turístico
debido al cambio climático»

Miguel Agullés, Camilo Melo, Gabriel Jordà, Jaume Roselló

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JPI Climate Horizon 2000 European Union Funding AXIS

Activar subtítulos
Pere Jimenez está presentando

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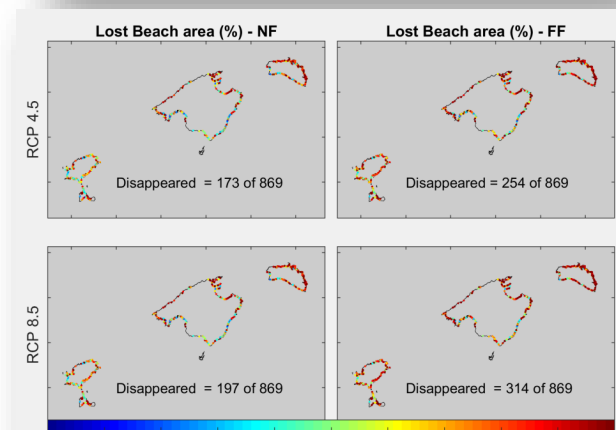
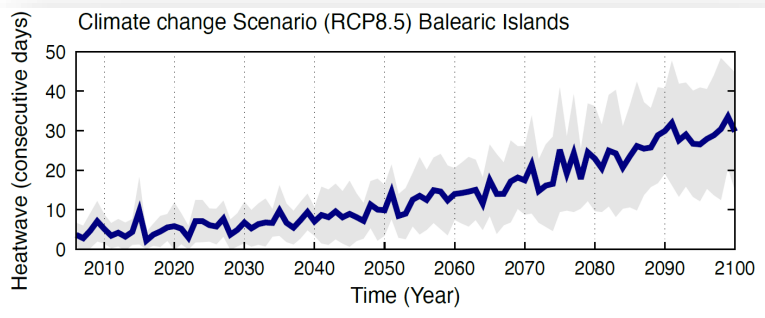
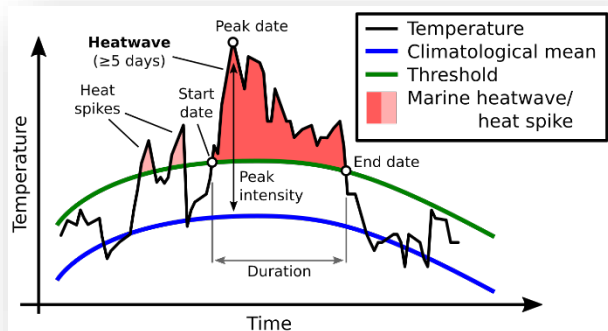
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PHASE I: Impact Chain Design

Two main **threats** have been identified:
Increase of temperatures (loss of comfort)
Sea level Rise (beach loss)

Water scarcity, extreme events and forest fires have been discarded



Beach area loss (%) under extreme conditions: Mid century (left panels) and for the end of the century (right panels)

RISK OF LOSS OF TOURIST ATTRACTIVENESS DUE TO HEAT WAVES

A_HAZARD

A1_Temperature
increase

Thermal
confort Index

RISK

B_EXPOSURE

B1_Age of the tourist

B2_Origin (Greek, English,
German, Norwegian..)

B3_Purchasing power

B4_Tourist profile (family,
young / retired couples,
sports)

B5_Comfort level in the
hotel (competition with
the environment)

C_VULNERABILITY

C1_Health system / security level

C2_Air conditioning measures (AC,
vaporizer at terraces, awnings,
green areas)

* C3_Strength of competitors

C4_Weather forecast system
(encourage tourists to come)

* C5_ Long term planning.
Coordination between sectors.

C6_Offer of alternative activities

C7_Overcrowding
(tourists/residents)

* C8_Dependence on source
markets

C9_Quality of beach services

C10_Quality of information for
tourists

* Phase III

RISK OF LOSS OF TOURIST ATTRACTIVENESS DUE TO BEACH REDUCTION

HAZARD

TOTAL WATER LEVEL
(SLR+WAVES+SS)

BEACH LOSS
(%)

RISK

EXPOSURE

B1_Number of users per
m2 of available beach

B2_Tourist wealth

B3_Age of the Tourist

B4_Tourist profile (family,
young / retired couples,
sports)

B5_Comfort level in the
hotel (competition with
the environment)

VULNERABILITY

C1_Health system / security level

C2_Beach cleaning and maintenance

C3_Beach nourishment *

C4_Strength of competitors *

C5_Weather forecast system
(to reduce coastal impacts)

C6_Long term planning. Coordination
between sectors. *

C7_Deseasonalization

C8_Offer of alternative activities

C9_Dependence on source markets *

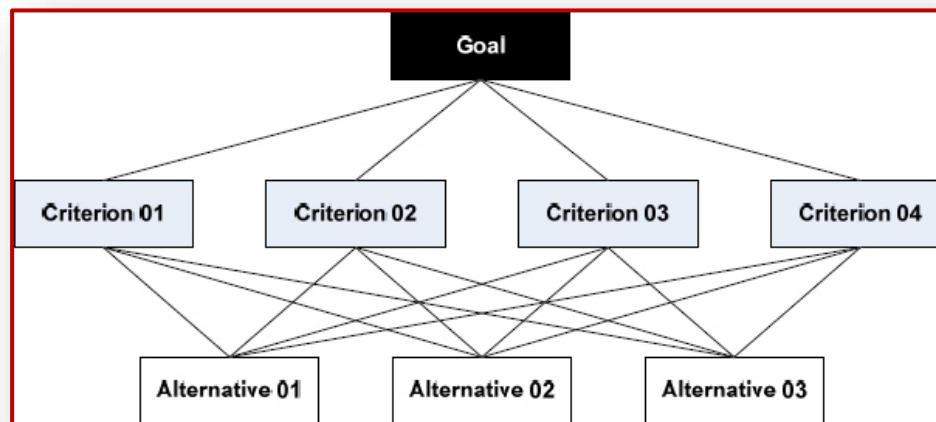
C10_Quality of beach services

C10_Quality of information for
tourists

* Phase III

PHASE II: Weight and Normalization estimates

Analytical Hierarchical Process (AHP) has been set up to assign relative weights for the indicators of the same class and between indicators aggregations.



MATRIZ DE COMPARACION DE CRITERIOS (FACTORES EXPOSURE)

CRITERIOS	sistema de alerta	sistema sanitario	aires acondicionados	elementos de protección	promoción turismo joven	promoción turismo alto estacional	promoción turismo países cálidos	MATRIZ NORMALIZADA							PONDERACION
sistema de alerta	1	0,2	0,2	1	7	5	7	0,080092	0,069444	0,055248619	0,114504	0,212121	0,206612	0,267176	0,14
sistema sanitario	5	1	1	5	7	5	7	0,400458	0,347222	0,276243094	0,572519	0,212121	0,206612	0,267176	0,33
aires acondicionados	5	1	1	1	7	7	7	0,400458	0,347222	0,276243094	0,114504	0,212121	0,289256	0,267176	0,27
elementos de protección	1	0,2	1	1	5	5	3	0,080092	0,069444	0,276243094	0,114504	0,151515	0,206612	0,114504	0,14
promoción turismo joven	0,142857143	0,14	0,14	0,2	1	0,2	1	0,011442	0,048611	0,038674033	0,022901	0,030303	0,008264	0,038168	0,03
promoción turismo alto estacional	0,2	0,2	0,14	0,2	5	1	0,2	0,016018	0,069444	0,038674033	0,022901	0,151515	0,041322	0,007634	0,05
promoción turismo países cálidos	0,142857143	0,14	0,14	0,333333333	1	1	1	0,011442	0,048611	0,038674033	0,038168	0,030303	0,041322	0,038168	0,04
TOTAL	12,48571429	2,88	3,62	8,733333333	33	24,2	26,2								1,00

sistema de alerta	sistema sanitario	aires acondicionadas	elementos de protección	promoción turismo	promoción turismo alto	promoción turismo países calurosos
0,14	0,33	0,27	0,14	0,03	0,05	0,04
0,11	0,25	0,3	0,08	0,1	0,01	0,15
0,12	0,2	0,22	0,16	0,08	0,09	0,13
0,25	0,15	0,2	0,25	0,06	0,05	0,04
0,12	0,22	0,33	0,08	0,02	0,09	0,14
0,33	0,2	0,2	0,02	0,1	0,1	0,05

PHASE II: Weight and Normalization estimates

AHP fed by the results of an on-line poll
(to be launched this month, after the high season ends)



UNCHAIN ENCUESTA

Hola compañer@!, necesitamos de vuestra ayuda. Estamos tratando de cuantificar el RIESGO de PÉRDIDA de ATRACTIVO TURÍSTICO de nuestras islas por los efectos del CAMBIO CLIMÁTICO. Solamente serán 5 minutos de vuestro valioso tiempo. La encuesta es anónima y de rápida resolución. MUCHAS GRACIAS POR TU TIEMPO!!!

bieljorda75@gmail.com (no compartidos) [Cambiar de cuenta](#)

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3= igual de importantes
7= más importante el de la derecha
9= mucho más importante el de la derecha
* 2, 4, 6 y 8 el grado de importancia intermedio entre los valores 1,3,5,7,9

Ante una OLA DE CALOR SOFOCANTE, escoge izquierda, si crees que no importa la edad que tengas. Elige derecha, si crees que la edad es relevante. *

edad del turista

sufrir calor muy intenso





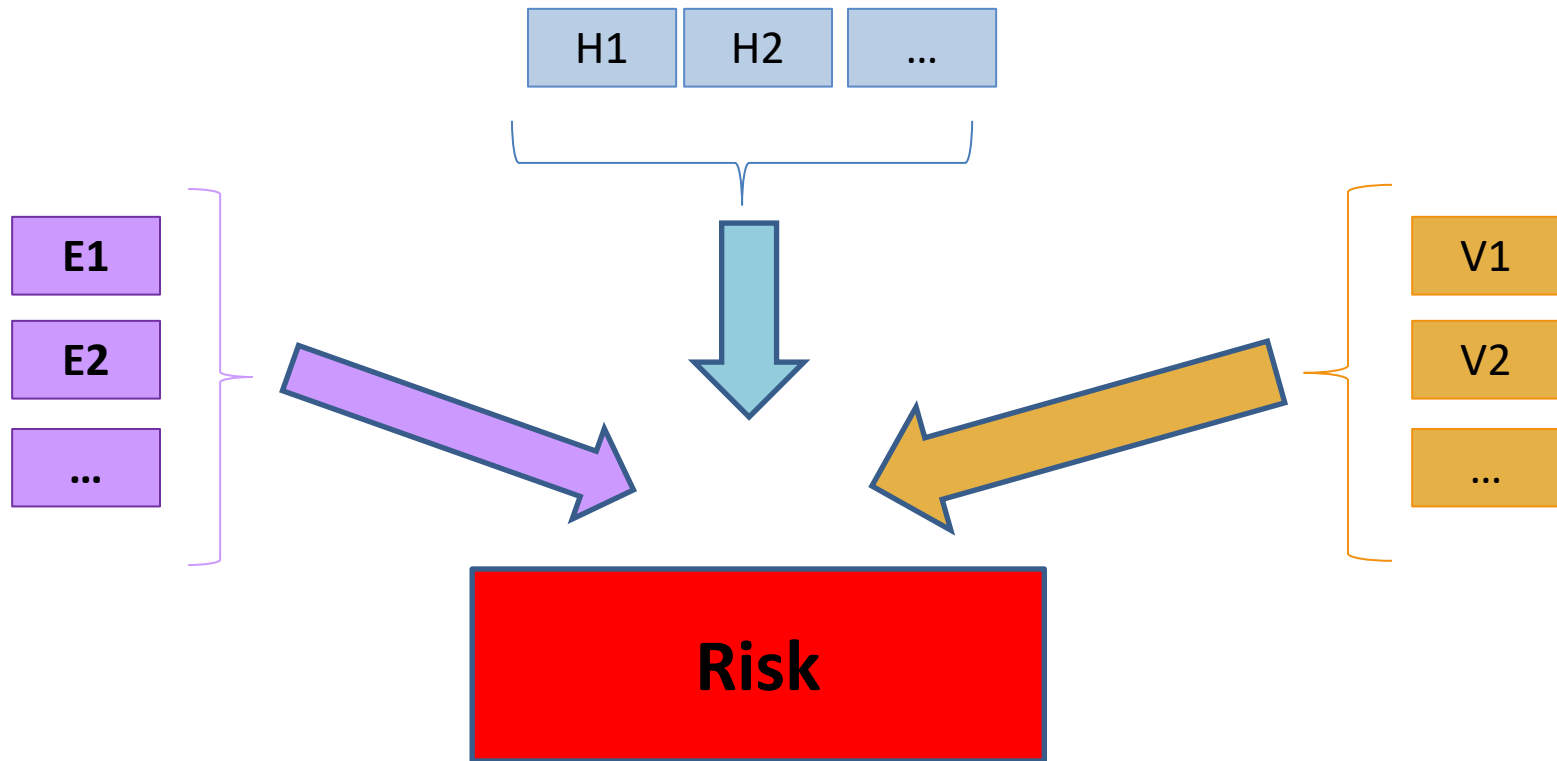
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Risk estimate: Introducing uncertainties

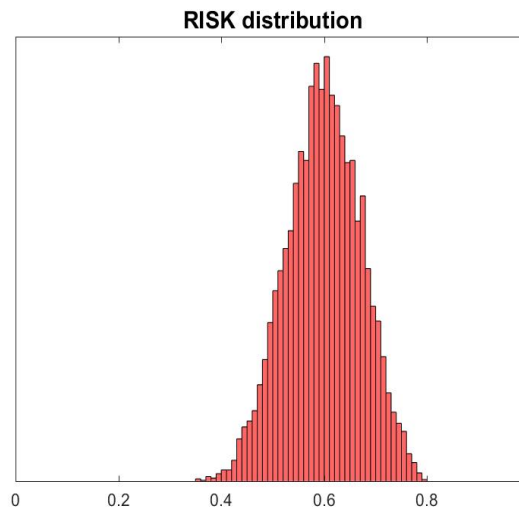
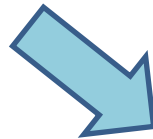
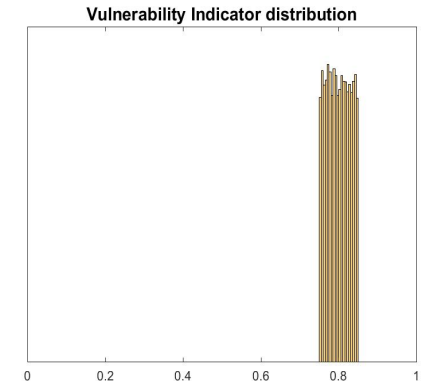
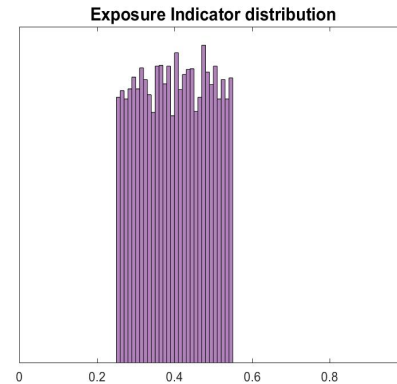
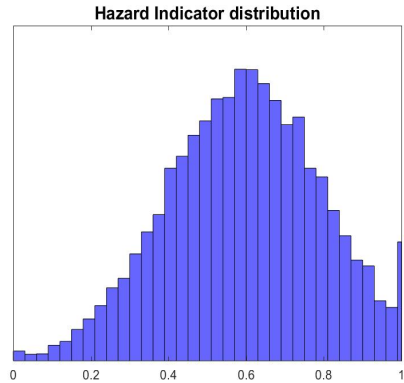


$$R = W_{H \rightarrow R} \sum w_k H_k + W_{E \rightarrow R} \sum w_j E_j + W_{V \rightarrow R} \sum w_l V_l$$

$$R = \sum a_l, \text{ with } l \in H_k, E_j, V_l$$

Risk estimate: Introducing uncertainties

Propagation of uncertainties through Monte Carlo approach

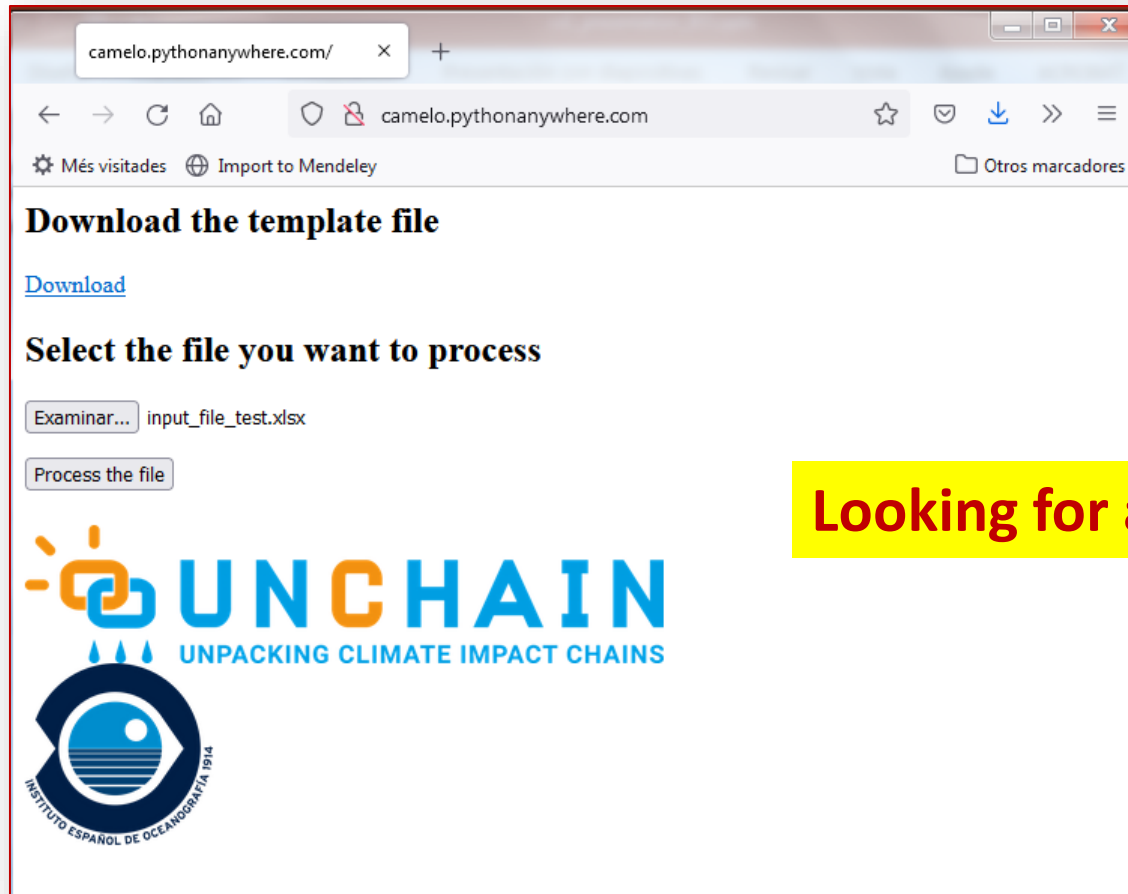


$$R = \sum aI, \text{ with } I \in H, E, V$$

Risk estimate: Introducing uncertainties

- Final risk estimate: On-line Tool

<http://camelo.pythonanywhere.com/> Temporary!!



Looking for a name!

Risk estimate: Introducing uncertainties

<http://camelo.pythonanywhere.com/> Temporary!!

Input file -> Excel file with weights, indicators, and estimated uncertainties for each component (if available)

EXPOSURE	Weight	Uncertainty	Shape
1	0,3	0,2	2
2	0,5	0,3	1
3	0,1	0,05	1

Locations	H1	H2	H3	H4
Mallorca	0,5	0,2	0,4	0,2
Menorca	0,7	0,5	0,4	0,8
Eivissa	0,6	0,6	0,4	0,7
Formentera	0,2	0,7	0,4	0,6
Cabrera	0,4	0,9	0,4	0,5

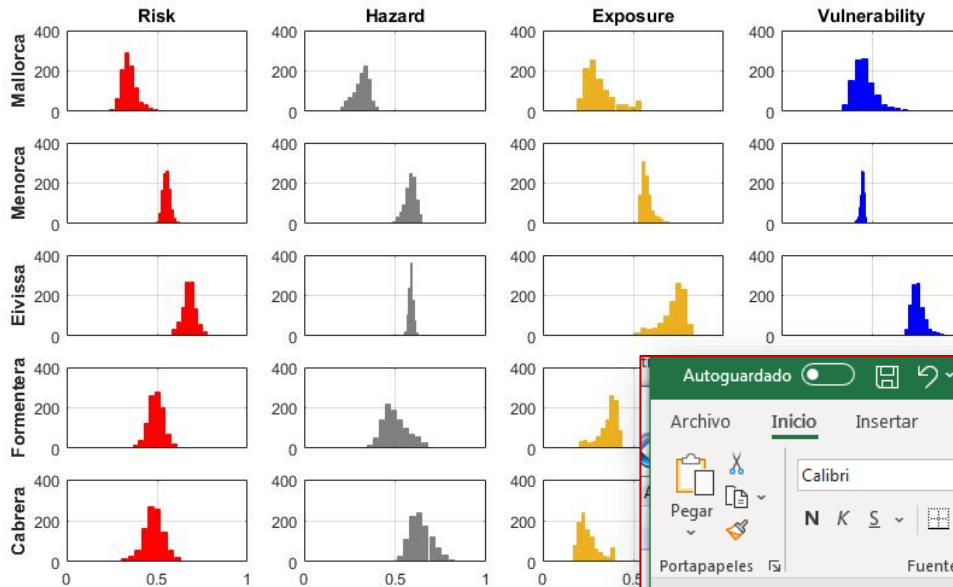
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Climate, ar
with co-fundi

Risk estimate: Introducing uncertainties

<http://camelo.pythonanywhere.com/> Temporary!!

Output file -> Excel file with aggregated indicators and risk + uncertainty



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Archivo Inicio Insertar Disposición de página Fórmulas Datos Revisar Vista Ayuda ACROBAT

Calibri 11

Portapapeles Fuente Alineación Número Estilos Celdas

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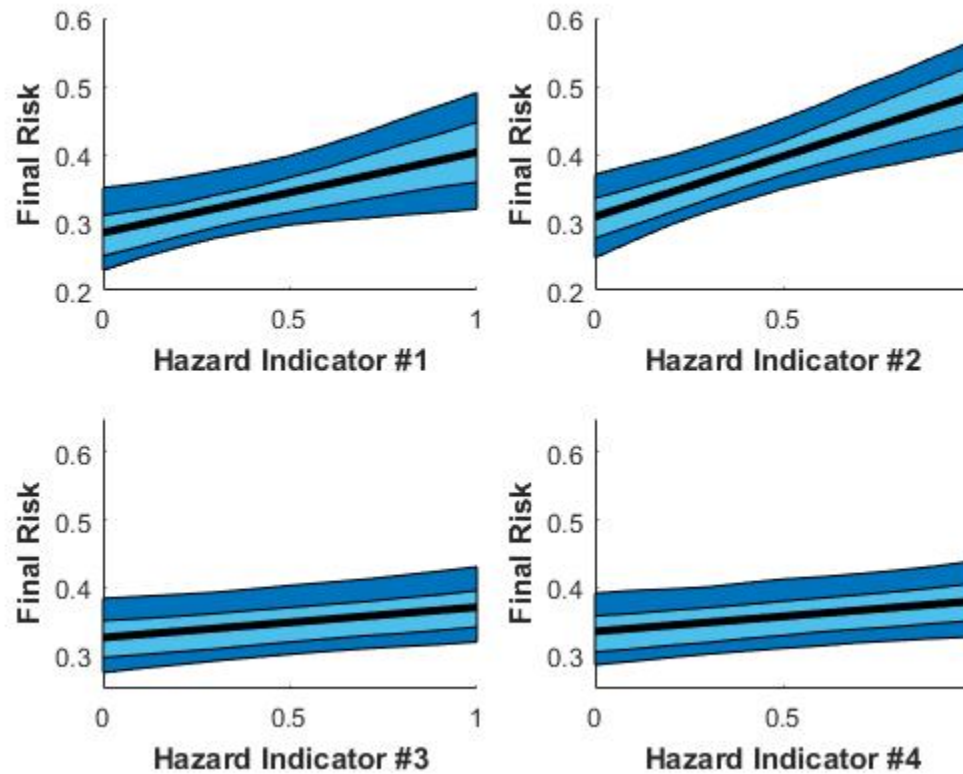
	A	B	C	D	E	F	G	H	I	J
1	Locations	Risk Mean	Risk STD	Hazard Mean	Hazard STD	Exposure Me	Exposure STI	Vulnerability	Vulnerability STD	
2	Mallorca	0,34384112	0,04253572	0,31481346	0,04217139	0,31345646	0,08255235	0,45702027	0,06149013	
3	Menorca	0,55318334	0,02082486	0,58409907	0,03099858	0,5755178	0,03085737	0,44859595	0,01229803	
4	Eivissa	0,67765492	0,03687642	0,58824851	0,01318592	0,72430245	0,0688454	0,75421216	0,03689408	
5	Formentera	0,49427452	0,0423941	0,50093607	0,06806183	0,36175496	0,05340755	0,75140405	0,01229803	
6	Cabrera	0,4818942	0,05599309	0,64278424	0,06117176	0,25072921	0,05806742	0,64297973	0,06149013	
7										
8										
9										

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Risk estimate: Introducing uncertainties

<http://camelo.pythonanywhere.com/> Temporary!!

Output file -> Sensitivity to changes in each indicator (*in progress*)



Conclusions

Main Outcomes

- a **new participatory process** about a topic not addressed before in the region
- dealing with **uncertainties** in a systematic way
- development of an **user friendly tool** for the uncertainty propagation

Conclusions

Research innovations:

(2) Co-production - Integrating participatory methods into impact and adaptation modelling (participatory methods of co-design:

Prior meetings with top-level stakeholders , face2face, polls final workshop

(3) Incorporating societal trends into scenario analysis -What impact does socioeconomic scenarios have on risk estimates? How do impact and climate uncertainties compare?

We consider climate scenarios and set different scenarios for the indicators to assess sensitivity to their changes.

(4) Testing the Impact Chains approach

We introduce and test a probabilistic framework to naturally include uncertainties.

Research Questions - IC Model

How to combine a multitude of (sector-specific) information and still present them in a clear and concise manner?

How to identify potentially beneficial vs. potentially problematic interdependencies?

Not clear yet how to be done.

How to better integrate quantitative, semi-quantitative, qualitative and narrative approaches?

Transfer non-quantitative to discrete classes. The key point is the experts cross-validation of relative weights.

How to make assessments and results comparable?

Not clear yet how to be done.

How to address limitations in the availability of reliable data? (heterogeneity, spatial / temporal resolution, mismatch between resolution)

Establishing a mathematical framework that helps to quantify the interlinks between indicators and between indicators and the final risk. In this way, the elements that can't be quantified or that are missed, will appear as a residual variance that can be incorporated as an uncertainty..

How to better address uncertainties and confidence levels for each step in the impact chain assessment?

Keep track of the uncertainties and to quantify them at each step of the procedure. This applies to quantitative estimates (e.g. uncertainty associated to sea level rise projections), to qualitative ones (e.g. discrepancies among experts about the potential impact on attractiveness due to beach reduction).

How to overcome the problems of deep uncertainty about future climatic and socio-economic conditions, as well as the lack of data – even of present conditions – when doing risk assessments?

We deal with the unknowns or missed information as a residual variance treated as uncertainty in the formalism.

Research Questions – User interface and stakeholder involvement

How to critically reflect on and be clear about stakeholder roles in the process as well as expected outcomes when doing impact chain analysis, and how to consider and compensate the potential bias of the participatory elements within the impact chain assessment?

How can knowledge co-production in climate change risk assessments better inform decision-making and adaptation action?

What are the critical factors concerning how knowledge co-production processes may lead to improvements in adaptation action?

We have no expertise to do research on this, but we need to address these issues to be sure the Case Study is robust enough.