

D1.2 ATLAS OF EUROPEAN COASTAL HERITAGE LANDSCAPE TYPOLOGIES AND CLIMATE CHANGE IMPACTS



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TABLE OF CONTENTS

Summary	4
1 Introduction	7
2 Description of the Activities	8
3 Methods of analysis	9
3.1 Typology of coastal cultural landscapes	9
3.2 Risk assessment for coastal cultural landscapes	16
4 Results	27
4.1 Landing Page	27
4.2 Typology of coastal cultural landscapes	29
4.3 Risk assessment for coastal cultural landscapes	33
5 Partners	38
Contact us	39

Summary

This deliverable describes the ATLAS of European coastal heritage landscape typologies and climate change impacts, a visualization tool aimed at displaying the different typologies created and risk assessment performed. The developments and scientific outputs represented in the ATLAS are detailed in RescueME Deliverable D1.3. (Policy Paper).

RescueME ATLAS aims to be an entry point of decision making by showing the territorial typologies for cultural landscapes and also the risk assessment, that has been carried out independently for seven climatic hazards (pluvial floods, river floods, coastal floods, landslides, droughts, wildfires, and heatwaves), under several climate change scenarios, and for one non-climatic threat (poor air quality).

The ATLAS will be visualized in the Incremental Spatial Decision Support System (ISDSS) as an entry point for decision making. The interactive tool presents the knowledge generated in the first phase of RescueME project in a user-friendly interface that establishes the ground for the coming outputs of the project.

The RescueME Atlas can be accessed through the following link:

<https://appwerescuemep01.azurewebsites.net/>

List of figures

Figure 1: Landing page of the RescueME ATLAS	27
Figure 2: Layers available for visualisation	28
Figure 3: Selection of the layers to be visualised	29
Figure 4: Build Capital legend	29
Figure 5: Built Capital	30
Figure 6: Human Capital	30
Figure 7: Financial Capital	31
Figure 8: Natural Capital.....	31
Figure 9: Social Capital.....	32
Figure 10: Financial Capital legend of clusters and indicator values shown for a NUTS3 area.....	33
Figure 11: Risk related to Poor Air Quality on coastal cultural landscapes	33
Figure 12: Risk of Coastal Floods on coastal cultural landscapes	34
Figure 13: Risk of Droughts on coastal cultural landscapes	34
Figure 14: Risk of Heatwaves on coastal cultural landscapes	35
Figure 15: Risk of Landslides on coastal cultural landscapes	35
Figure 16 Risk of Pluvial Floods on coastal cultural landscapes	36
Figure 17: Risk of River Floods on coastal cultural landscapes	36
Figure 18: Risk of Wildfires on coastal cultural landscapes	37
Figure 19: Landslide Risk legend for a certain scenario and composite risk indices shown for a NUTS3 area.	37

List of tables

Table 1: List of indicators used to create cultural landscapes typologies	11
Table 2: List of indicators used for the risk assessment	17

List of acronyms

ACRONYM / ABBREVIATION	DESCRIPTION
CAMS	Copernicus Atmospheric Monitoring Service
CC	Climate Change
CDS	Copernicus Climate Data Store
CLC	Corine Land Cover
CLMS	Copernicus Land Monitoring Service
EEA	European Environment Agency
EU	European Union
GUF	Global Urban Footprint
ISDSS	Incremental Spatial Decision Support System
JRC	Joint Research Centre
NUTS	Nomenclature of territorial units for statistics
RCP	Representative Concentration Pathway
SETS	Socio-economic-technical systems
UK	United Kingdom

1 Introduction

The [RescueME ATLAS](#) aims to consolidate and synthesize the knowledge developed in T1.2, presenting a user-friendly depiction of the typologies and risks threatening European coastal cultural landscapes in form of maps.

Built upon the conceptual framework from preceding tasks, this development also integrates the indicators, data sources and methodologies from previous project's activities. Using the indicators suitable for European scale identified in D1.1, a risk assessment of the coastal landscapes has been conducted across the EU, aligning it with climate scenarios. The developments and scientific outputs represented in the ATLAS are detailed in RescueME Deliverable D1.3. (Policy Paper).

The ATLAS represents the visualization of main outputs of the activities and has two main purposes. Firstly, to provide a comprehensive overview of the typologies of European coastal cultural landscapes, categorized based on their similarities in various dimensions of the socio-ecological-technical system. This facilitates the clustering of landscapes for adaptive governance, utilizing the lowest level at which regularly updated socio-economic indicators are available (NUTS3).

Secondly, to display the risk assessment that has been performed for seven climatic hazards (pluvial floods, river floods, coastal floods, landslides, droughts, wildfires, and heatwaves), under several climate change scenarios, and for one non-climatic threat (poor air quality). This assessment provides a holistic view of the diverse challenges cultural landscapes face, aiding in the development of mitigation and adaptation strategies.

The ATLAS serves as the gateway to the Incremental Spatial Decision Support System (ISDSS), aiming to connect cultural landscapes typologies with the meta-repository of solutions to provide early-stage decision-making capabilities.

2 Description of the Activities

The ATLAS has been conceived as an easy-to-use tool aiming to visualise the characterisation of European coastal cultural landscapes and the risks they are exposed to at the spatial level of NUTS3 regions. The maps displayed in the ATLAS represent on the one hand a typology of European cultural landscapes according to the five capitals defined by the RescueME approach and, on the other hand, the level of risk regions currently face, or will face in the future, in relation to climatic and non-climatic hazards. Both the typologies of cultural landscapes and the risk assessment are based on subsets of indicators defined earlier in the project (RescueME D1.1, Gandini and Egusquiza, 2023) and are fully described in D1.3.

The general architecture and the main components of the RescueME ATLAS were therefore defined to represent and allow the comparison of different European regions among them. NUTS3 regions can be visualised according to two main components:

- The cultural landscape typologies which enable to compare regions with common characteristics.
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- The risk assessment, which result in a final risk composite index for different hazards and scenarios. NUTS3 regions can be compared for the reference year, while a risk evolution map can be visualized in each NUTS3 for reference year and future scenarios considered.

3 Methods of analysis

The ATLAS represents coastal heritage landscapes typologies and their related climate change impacts on a NUTS3 level, with European coverage of coastal regions. Based on the nomenclature of territorial units for statistics, these are the ones having a border with a coastline or having more than half their population within 50 km of the coastline. In total 513 coastal NUTS3 regions are analysed, considering the NUTS 2021 classification, for EU27 (including outermost regions) and UK.

3.1 Typology of coastal cultural landscapes

Typologies of European coastal cultural landscape were created aiming at the identification of European coastal NUTS3 regions with similar (or distinct) characteristics. These typologies can help to identify regions with similar challenges, attributes, strengths and weaknesses in resilience building of cultural landscapes. Thus, they can either call attention to regions that might need support on their resilience journey or to identify good practice examples that might serve as lighthouses for other regions and policymakers.

Method: Earlier in RescueME a framework was defined, that describes cultural landscapes as socio-economic-technical systems (SETS) based on five capitals (natural, built, social, human and financial capital; RescueME D1.1, Gandini and Egusquiza, 2023). In this context, indicators were identified and allocated to the five capitals. For creating the typologies, these indicators were in a first step evaluated for correlation within each capital. If indicators show a clear and explainable correlation, only one of these indicators is kept for the subsequent analysis step. This is done in order to avoid double-counting of the same aspects of a capital.

In the next step, the remaining indicators per capital are fed into a k-means clustering algorithm to identify clusters of NUTS3 regions. It is important to further note that the applied k-means cluster algorithm associates centroids to each cluster and subsequently assigns the NUTS3 regions to the cluster. For each NUTS3 region, the algorithm finds the cluster, for which the sum of the distances to the cluster centroid for all used indicators is minimal. In other words, the algorithm looks at all indicators at the same time. This approach does lead to overlapping class boundaries for each indicator, e.g. cluster 1 can be made up of NUTS regions with indicator A values between 5 and 10, while cluster 2 contains NUTS

regions with indicator A values between 8 and 13. Therefore, the indicators in the clusters are diagrammed in boxplots and visually interpreted for quality of separation. Indicators were subsequently removed or replaced, depending on the outcome.

Finally, the k-means clustering algorithm requires the number of resulting clusters to be defined a priori. In order to obtain the most meaningful result, the number of clusters was varied and again with the help of the visual interpretation of the boxplots, the number of clusters in which the best separation was achieved, was chosen.

Interpretation: Having created a typology for each capital, the resulting clusters are described with the help of the values of the underlying indicators. Thereby the values stated refer either to the 25th (lower limit) or 75th (upper limit) percentiles over all NUTS3 regions in the cluster. For example, if the text in brackets says “> 41% of NUTS area is forest”, this depicts the 25th percentile of all NUTS regions, meaning that only 25% of the NUTS regions in the cluster are made up of less than 41% forests. The reverse conclusion is that 75% of the NUTS regions in the cluster are made up of more than 41% forest area.

It is important to mention that the clusters can only be interpreted relative to each other. For example, looking at the social capital and therein at the gender employment gap: a region might be characterised as having a male dominated workforce, as the gender employment gap is above 18% in the NUTS regions in the cluster. The 18% is high compared to the other coastal NUTS3 regions. However, it is possible that inland NUTS3 regions feature an even higher gender employment gap. As the present analysis focusses solely on the European coastal NUTS3 regions, descriptive terms always have to be interpreted as relative to the other regions in the analysis.

Table 1 shows the list of indicators used to create the typologies and the data sources used to generate them. The  symbol indicates that the original data was further processed in the RescueME project.

Table 1: List of indicators used to create cultural landscapes typologies

CAPITAL	GROUP	DESCRIPTION	UNIT	SOURCE OF ORIGINAL DATA	
Natural capital	Land use	Share of urban land	% of NUTS area	Copernicus Land Monitoring Service (CLMS): CORINE Land Cover (CLC) data	
		Share of agricultural land	% of NUTS area		
		Share of forest land	% of NUTS area		
		Share of natural land and water	% of NUTS area		
		Degree of urbanisation - Share of urban-rural areas	% of NUTS area	European Environment Agency (EEA): Refined degree of urbanisation in Europe (DEGURBA level 2) - version 1, Jul. 2018	
	Agriculture	Agricultural holdings with mixed crops – livestock farming	% of agricultural area	EUROSTAT Farm Structure data	-
		Share of arable land	% of agricultural area	Copernicus Land Monitoring Service (CLMS): CORINE Land Cover (CLC) data	
		Share of vineyards and olive groves	% of agricultural area		
	Protected areas	Protected natural and agricultural areas with international designation	m ²	The World Database on Protected Areas (WDPA) European Environment Agency	
		Protected areas under national laws	m ²	European Environment Agency (EEA): Nationally designated areas for public access (vector data) - version 21, Jun. 2023	
	Ecological quality	Dispersion of urban areas	Index (0 – 1)	Copernicus Land Monitoring Service (CLMS): CORINE Land Cover (CLC) data	
		Shannon Evenness Index	Index (0 – 1)		
		Share of area with outdoor recreation potential	% of NUTS area		

CAPITAL	GROUP	DESCRIPTION	UNIT	SOURCE OF ORIGINAL DATA	
	Ecosystem services	Willingness to pay of households for maintaining current habitat and species maintenance service areas	€/ 100 km ² species/ habitat area, mean value in NUTS region	EU Joint Research Centre (JRC): Integrated Natural Capital Accounting (INCA) Project	
		Flood control service providing area (river floods)	% of area		
		Value of ecosystem contribution to carbon sequestration	€/ km ² , mean value in NUTS region		
	Topography	Elevation breakdown - low coast	% of NUTS area	European Environment Agency (EEA): Elevation breakdown based on EU-DEM	
		Elevation breakdown - high coast	% of NUTS area		
		Elevation breakdown - inland	% of NUTS area		
		Elevation breakdown - upland	% of NUTS area		
		Elevation breakdown - mountains	% of NUTS area		
		Share of NUTS region with high or very high landslide susceptibility	% of NUTS area	EU Joint Research Centre (JRC): European Landslide Susceptibility Map version 2 (ELSUS v2)	
Built capital	Settlements	Share of build-up area (built-up area is defined as a region featuring man-made building structures with a vertical component)	% of NUTS area	German Aerospace Center (DLR): Global Urban Footprint (GUF) data	
	Connectivity to the internet	Households with access to the internet at home	% of households	EUROSTAT Information society indicator	-
		Individuals who never use the internet	% of individuals		
	Health and strategic infrastructure	Available beds in hospitals	beds per 100 000 population	EUROSTAT Healthcare data	-
		Physicians	number per 100 000 population		
		Strategic buildings	number per 1000 population	OpenStreetMap data	

CAPITAL	GROUP	DESCRIPTION	UNIT	SOURCE OF ORIGINAL DATA	
	Built heritage	Cultural sites with international designation	number per NUTS region	Cultural gems (europa.eu)	
		Share of buildings built before 1919	% of all buildings	European Statistical System – CensusHub: Housing Census 2011	
	Energy consumption	Energy consumption per land area in the agriculture sector	MWh/ km ²	ESPON project package: 'LOCATE - Territories and Low-Carbon Economy'	-
		Residential energy consumption (for space heating, cooling and water heating in residential, public and private service sector buildings)	MWh / capita		
		Share of renewable energy carriers in residential buildings (used for space heating, cooling and water heating in private and public service sector buildings)	% of all energy carriers		
Social capital	Population structure	Population density	persons/ km ²	EUROSTAT Regional Demographic Data	-
		Population change	number/ 1000 inhabitants	EUROSTAT Population Change Data	-
		Proportion of population aged 20-39 years	%	EUROSTAT Regional Demographic Data	-
		Proportion of population aged 65 years and more	%	EUROSTAT Regional Demographic Data	-
		Young-age dependency ratio (population 0 to 14 years to population 15 to 64 years)	%	EUROSTAT Regional Demographic Data	-
	Gender equality	Gender employment GAP	%	EUROSTAT Regional Labour Market Statistics	
	Structure of agriculture	Share of agricultural holdings with manager > 65 years old	% of all holdings	EUROSTAT Farm Structure data	-
		Share of tenant agricultural area	% of agricultural area		

CAPITAL	GROUP	DESCRIPTION	UNIT	SOURCE OF ORIGINAL DATA	
		Share of agricultural holdings with female farm managers	% of all holdings	EUROSTAT Farm Indicators	-
		Share of agricultural holdings with young farmers (< 36 years old)	% of all holdings		
		Number of PDO products allowed to be produced in this NUTS3 region	number	Flinzberger et al (2022)	-
	Cultural vibrancy	Cultural vibrancy	number of cultural sites per 100 000 population	OpenStreetMap data	
Human capital	General workforce skills	Share of employed persons with tertiary education	% of working age population (15-64 years)	EUROSTAT Education and Training Data	-
		Early leavers from education and training	% of 18 to 24 year old population		
		Participation rate in education and training	% of 25 to 64 year old population		
		Number of educational facilities	number/ 100 000 population	OpenStreetMap data	
	Agricultural workforce skills	Share of holdings with farm manager with full or basic agricultural training	% of holdings	EUROSTAT Farm Indicators	-
		Share of holdings with a full-time farm manager	% of holdings	EUROSTAT Farm Structure data	
Financial capital	Economic status	Employment rate	% of working age population (15-64 years)	EUROSTAT Regional Economic Accounts	

CAPITAL	GROUP	DESCRIPTION	UNIT	SOURCE OF ORIGINAL DATA	
	Tourism sector	Household income per inhabitant	€/inhabitant		-
		Tourism turnover	€	EUROSTAT	
		Bed places	number	EUROSTAT Tourism Data	-
		Arrivals	number		
		Seasonality in tourism	Index (0 – 1)	ESPON Indicator ‘Tour_cap’	-
	Agricultural sector	Number of holdings	holdings/ 100 ha	EUROSTAT Farm Structure data	
		Share of employed persons in agriculture, forestry and fishing	% of working age population (15-64 years)	EUROSTAT Regional Economic Accounts	
	Arts & culture sector	Share of Gross Domestic Product attributable to private and formal cultural production	% of Gross Domestic Product	EUROSTAT Regional Economic Accounts	
		Share of employed persons in Arts, entertainment, and recreation	% of working age population (15-64 years)	EUROSTAT Regional Economic Accounts	
	Environmental investments	Share of environmental protection investments of total economy	% of Gross Domestic Product	EUROSTAT Environment and Energy Data	-

3.2 Risk assessment for coastal cultural landscapes

European coastal cultural landscapes are facing various climate-related risks and present different degrees of vulnerability according to their characteristics. Identifying these risks is therefore a crucial step for planning and implementing appropriate adaptive measures. The RescueME Atlas is conceived as an easy-to-use tool illustrating information, in forms of maps and associated semantic information, on the composite indices of risk assessment. It represents risks for each hazard during the reference period (1981-2010) and the future period (2071-2100), considering different greenhouse gas emission scenarios.

Method: The cultural landscape risk assessment employed a semi-quantitative approach, utilizing spatialized indicators corresponding to NUTS3 territorial units. This resulted in composite indices, ranging from 1 ("very low") to 2 ("very high"), representing the relative risk of each NUTS3 unit within the sample. Eight specific hazards—pluvial floods, river floods, coastal floods, landslides, droughts, wildfires, heatwaves, and poor air quality—were independently evaluated. Starting from the list of indicators provided in D1.1, the method identified and acquired relevant territorialized indicators for each hazard, assigning them to risk components (hazard and exposure) and sub-components (vulnerability, sensitivity, and adaptive capacity) in line with the IPCC AR5 and AR6 reports' risk concept. The indicators were normalized, rescaled, and aggregated to create composite indices. The risk assessment considered climate change scenarios for all hazards, except poor air quality, incorporating a reference period (1981-2010), a low emissions scenario (RCP 2.6), a medium emissions scenario (RCP 4.5), and a high emissions scenario (RCP 8.5) for the period 2071-2100. For poor air quality, data from the Copernicus Atmospheric Monitoring Service (CAMS) and Climate Data Store (CDS) for 2016-2020 were used.

Interpretation: The assessment facilitates comparing the risk levels of NUTS3 units within the same scenario and tracking the risk level evolution across different scenarios. Relative risk maps for specific hazards and scenarios are represented. For the reference period NUTS3 comparison can be visualized in an intuitive manner through a color ramp in which the intensity of the color represents the level of risk (the darkest the higher). A risk evolution map for each hazard and scenario is provided for every NUTS3 and shows green for regions with lower risk than the reference period in at least one future scenario; grey for no appreciable change; and orange for regions with higher risk than the reference period in at least one future scenario.

Table 2: List of indicators used for the risk assessment

RISK COMPONENT	DESCRIPTION	UNIT	SOURCE OF ORIGINAL DATA		POOR AIR QUALITY	HEATWAVES	RIVER FLOOD	COASTAL FLOOD	PLUVIAL FLOOD	LANDSLIDES	WILDFIRES	DROUGHTS
Hazard	Ratio of hours with Air Quality Index (AQI) higher than 2	Adimensional	CAMS		X							
	Building surface recession per year	µm/year	CAMS and CDS		X							
	AOT40: Accumulated vegetation exposure to O3 respect the 80 µg/m3 threshold	µg/m3 · h	CAMS		X							
	Annual mean of NOx (NO+NO2)	µg/m3	CAMS		X							
	Annual mean of SO2	µg/m3	CAMS		X							
	Annual mean temperature	°C	CDS			X						
	Summer days	days/year	CDS			X						
	Tropical nights	days/year	CDS			X						
	River flooding frequency	Return period in years	PESETA IV River floods				X					
	Coastal flooding frequency	Return period in years	PESETA IV Coastal floods					X				
	Very heavy rainfall days	days/year	CDS						X	X		
	Days with fire danger	days/year	CDS								X	
	Consecutive dry days	days/year	CDS									X

RISK COMPONENT	DESCRIPTION	UNIT	SOURCE OF ORIGINAL DATA		POOR AIR QUALITY	HEATWAVES	RIVER FLOOD	COASTAL FLOOD	PLUVIAL FLOOD	LANDSLIDES	WILDFIRES	DROUGHTS
	European Landslide Susceptibility	Level (0-5)	JRC - EUROPEAN SOIL DATA CENTRE (ESDAC)							X		
Exposure	Population number	number	EUROSTAT Regional Demographic Data	-	X	X	X	X	X	X		
	Cultural vibrancy - number of cultural sites	number	OpenStreetMap data		X	X			X		X	X
	Cultural vibrancy - number of cultural sites exposed to coastal floods							X				
	Cultural vibrancy - number of cultural sites exposed to fluvial floods						X					
	Cultural vibrancy - number of cultural sites exposed to landslides									X		
	Number of educational facilities	number	OpenStreetMap data			X	X	X	X	X	X	
	Number of Agricultural holdings	number	EUROSTAT Farm Structure data	-	X	X	X	X	X	X	X	X

RISK COMPONENT	DESCRIPTION	UNIT	SOURCE OF ORIGINAL DATA		POOR AIR QUALITY	HEATWAVES	RIVER FLOOD	COASTAL FLOOD	PLUVIAL FLOOD	LANDSLIDES	WILDFIRES	DROUGHTS
	Tourism turnover	€	EUROSTAT Annual data on trips of EU residents and Tourism industries - annual data			X	X	X	X	X	X	
	Tourist accommodation establishments	number					X	X	X	X	X	X
	Protected natural and agricultural areas with international designation	m²	The World Database on Protected Areas (WDPA) European Environment Agency		X	X			X		X	X
	Protected natural and agricultural areas with international designation exposed to coastal floods							X				
	Protected natural and agricultural areas with international designation exposed to fluvial floods						X					
	Protected natural and agricultural areas with international designation exposed to landslides									X		

RISK COMPONENT	DESCRIPTION	UNIT	SOURCE OF ORIGINAL DATA		POOR AIR QUALITY	HEATWAVES	RIVER FLOOD	COASTAL FLOOD	PLUVIAL FLOOD	LANDSLIDES	WILDFIRES	DROUGHTS
	Protected areas under national laws	m ²	European Environment Agency (EEA): Nationally designated areas for public access (vector data) - version 21, Jun. 2023		X	X	X	X	X	X	X	X
	Size of build-up area	m ²	German Aerospace Center (DLR): Global Urban Footprint (GUF) data			X	X	X	X	X	X	
	Cultural sites with international designation	Number	UNESCO (WHS) and European Commission (Capitals of Culture)		X	X			X		X	
	Cultural sites with international designation exposed to coastal floods							X				
	Cultural sites with international designation exposed to Fluvial floods						X					

RISK COMPONENT	DESCRIPTION	UNIT	SOURCE OF ORIGINAL DATA		POOR AIR QUALITY	HEATWAVES	RIVER FLOOD	COASTAL FLOOD	PLUVIAL FLOOD	LANDSLIDES	WILDFIRES	DROUGHTS
	Cultural sites with international designation exposed to Landslides									X		
	Share of buildings built before 1919	% of all buildings	European Statistical System – CensusHub: Housing Census 2011	-	X		X	X	X	X	X	
Sensitivity	Population change	number/ 1000 inhabitants	EUROSTAT Population Change Data	-	X	X	X	X	X	X		X
	Proportion of population aged 65 years and more	%	EUROSTAT Regional Demographic Data	-	X	X	X	X	X	X	X	X
	Young-age dependency ratio (population 0 to 14 years to population 15 to 64 years)	%	EUROSTAT Regional Demographic Data	-		X	X	X	X	X	X	X
	Gender employment GAP	%	EUROSTAT Regional Labour Market Statistics	-		X	X	X	X	X	X	X

RISK COMPONENT	DESCRIPTION	UNIT	SOURCE OF ORIGINAL DATA		POOR AIR QUALITY	HEATWAVES	RIVER FLOOD	COASTAL FLOOD	PLUVIAL FLOOD	LANDSLIDES	WILDFIRES	DROUGHTS
	Area that encountered a land use change between 2012 and 2018	m ²	Copernicus Land Monitoring Service	-	X	X	X	X	X	X	X	X
	Employment in agriculture, forestry and fishing	thousand persons	EUROSTAT Farm structure	-	X							
	Unemployed persons	% of Working Age Population (15 and older)	EUROSTAT Employment and unemployment (LFS)	-	X	X	X	X	X	X	X	X
	Economic Damage (Natural hazard types considered: flood, windstorm, drought, earthquake)	% of Gross Value Added	European Environment Agency (EEA)	-	X	X	X	X	X	X	X	X
	Arrivals at tourist accommodation establishments	number	EUROSTAT Tourism industries - annual data >	-		X	X	X	X	X	X	X
	Seasonality in tourism	Index (0 – 1)	ESPON Indicator 'Tour_cap'	-	X	X	X	X	X	X	X	X
	Employed persons in Arts, entertainment and recreation	thousand persons	EUROSTAT Culture statistics	-		X	X	X	X	X	X	X
	Bed places	Number	EUROSTAT Tourism Data	-		X	X	X	X	X	X	X

RISK COMPONENT	DESCRIPTION	UNIT	SOURCE OF ORIGINAL DATA		POOR AIR QUALITY	HEATWAVES	RIVER FLOOD	COASTAL FLOOD	PLUVIAL FLOOD	LANDSLIDES	WILDFIRES	DROUGHTS
	Arable land	m ²	Copernicus Land Monitoring Service (CLMS): CORINE Land Cover (CLC) data		X	X	X	X	X	X	X	X
	Area of vineyards and olive groves	m ²	Copernicus Land Monitoring Service (CLMS): CORINE Land Cover (CLC) data		X	X	X	X	X	X	X	X
	Final energy consumption per capita in the agriculture sector	MWh / capita	ESPON project package: 'LOCATE - Territories and Low-Carbon Economy'	-	X	X	X	X	X	X	X	X
	Number of endangered heritage sites	Number	UNESCO (WHS) Europanostra		X	X	X	X	X	X	X	X
Adaptive capacity	Household income per inhabitant	€/inhabitant	EUROSTAT Regional Economic Accounts			X	X	X	X	X	X	X
	Share of female farm managers	%of total farm managers	EUROSTAT Farm Indicators	-		X	X	X	X	X	X	X

RISK COMPONENT	DESCRIPTION	UNIT	SOURCE OF ORIGINAL DATA		POOR AIR QUALITY	HEATWAVES	RIVER FLOOD	COASTAL FLOOD	PLUVIAL FLOOD	LANDSLIDES	WILDFIRES	DROUGHTS
	Share of young farmers	% of holdings	EUROSTAT Farm Indicators	-		X	X	X	X	X	X	X
	NUTS0 - availability of national action plan (NAP) or national adaptation strategy (NAS)	class (0=has neither nor, 1=has one of them, 2=has both)	ClimateAdapt	-	X	X	X	X	X	X	X	X
	Number of PDO products allowed to be produced in this NUTS3 region	number	Flinzberger et al (2022)	-	X	X	X	X	X	X	X	X
	Agricultural area under tenant farming	ha	EUROSTAT Farm Structure data	-		X					X	X
	Share of holdings with a full-time manager	% of all holdings	EUROSTAT Farm Structure data			X	X	X	X	X	X	X
	Participation rate in education and training	% of 25 to 64 year old population	EUROSTAT Education and Training Data	-		X	X	X	X	X	X	X
	Share of farmers with full or basic agricultural training	% of holdings	EUROSTAT Farm Indicators	-	X	X	X	X	X	X	X	X
	Employed persons with tertiary education (15-64 years)	number	EUROSTAT Education and Training Data	-	X	X	X	X	X	X	X	X

RISK COMPONENT	DESCRIPTION	UNIT	SOURCE OF ORIGINAL DATA		POOR AIR QUALITY	HEATWAVES	RIVER FLOOD	COASTAL FLOOD	PLUVIAL FLOOD	LANDSLIDES	WILDFIRES	DROUGHTS
	NUTS0 - Environmental protection investments of total economy	million euro	EUROSTAT Environmental protection expenditure	-	X	X	X	X	X	X	X	X
	Agricultural area of holdings with Mixed crops - livestock	ha	EUROSTAT Farm Structure data	-	X	X	X	X	X	X	X	X
	Green areas of high ecological quality	m²	Corine Land Cover		X	X	X	X	X	X	X	X
	Shannon Evenness Index	index (0-1); 0=no diversity, 1=maximum diversity	Copernicus Land Monitoring Service (CLMS): CORINE Land Cover (CLC) data		X	X	X	X	X	X	X	X
	Area with outdoor recreation potential	m²	EU Joint Research Centre (JRC):		X	X	X	X	X	X	X	X
	Willingness to pay of households for maintaining current habitat and species maintenance service areas 2018	€/100 km² Species/Habitat area, mean value in NUTS region	Integrated Natural Capital Accounting (INCA) Project		X	X	X	X	X	X	X	X

RISK COMPONENT	DESCRIPTION	UNIT	SOURCE OF ORIGINAL DATA		POOR AIR QUALITY	HEATWAVES	RIVER FLOOD	COASTAL FLOOD	PLUVIAL FLOOD	LANDSLIDES	WILDFIRES	DROUGHTS
	Value of ecosystem contribution to carbon sequestration 2018	€/km2, mean value in NUTS region			X	X	X	X	X	X	X	X
	Available beds in hospitals	beds per 100 000 population	EUROSTAT Healthcare data	-		X	X	X	X	X	X	X
	Natura2000 area	m²	European Environment Agency		X	X	X	X	X	X	X	X

4 Results

The visualization of the RescueME Atlas is displayed on an online web:

<https://appwerescuemep01.azurewebsites.net/>

Given that the scientific developments that lead to the ATLAS are presented in RescueME Deliverable D1.3. (Policy Paper), the following describes the outputs that are visible and available for ATLAS users.

4.1 Landing Page

The landing page shows a description of the project (upper left side), including funding and main objectives towards protecting European common heritage, as well as a general map of the European coastal cultural landscapes. In the lower left side diverse information will appear in function of the selections made.

There are four icons in the upper right side to modify users' preferences over the maps: modify the scale, representation mode (3D or 2D) and change the background map type. Finally, in the question mark the use of the mouse or touching screen modes are explained. There is an icon in the upper middle part (upper left side of the shown map) in which, when selecting, the layers' selection screen appears.

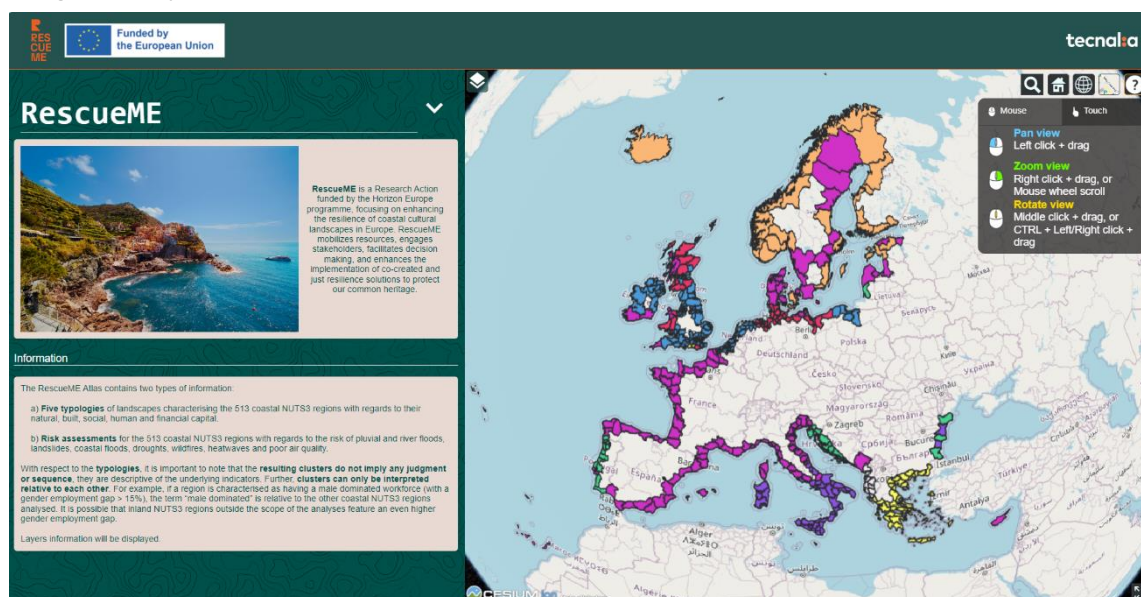


Figure 1: Landing page of the RescueME ATLAS

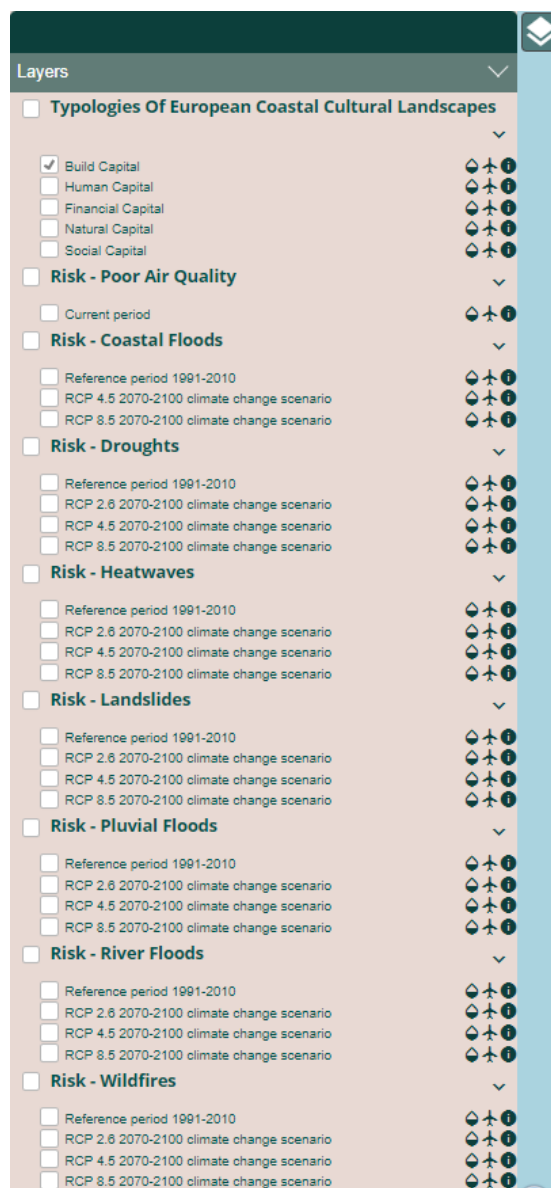


Figure 2: Layers available for visualisation

It is possible to open the layer panel just by clicking on the  icon, located at the top – left corner of the map section. It will show the layer list available to be visualized. In this case there are nine groups. One for the typologies of the European coastal cultural landscapes, and the rest for the different risk assessment maps.

To show the maps, the user needs to first open the Layers window, and, then select one of the capitals or risks.

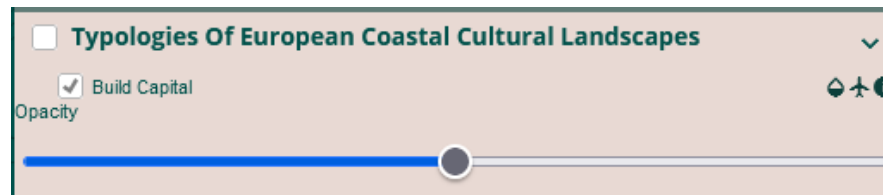


Figure 3: Selection of the layers to be visualised

Each map has tree icons at the right side :

- The drop corresponds to layer transparency, so it is possible to change the opacity of each layer using a slider for that
- The plane icon “flies to” the total extension of the layer, centering it on the map
- The Info icon loads the legend:

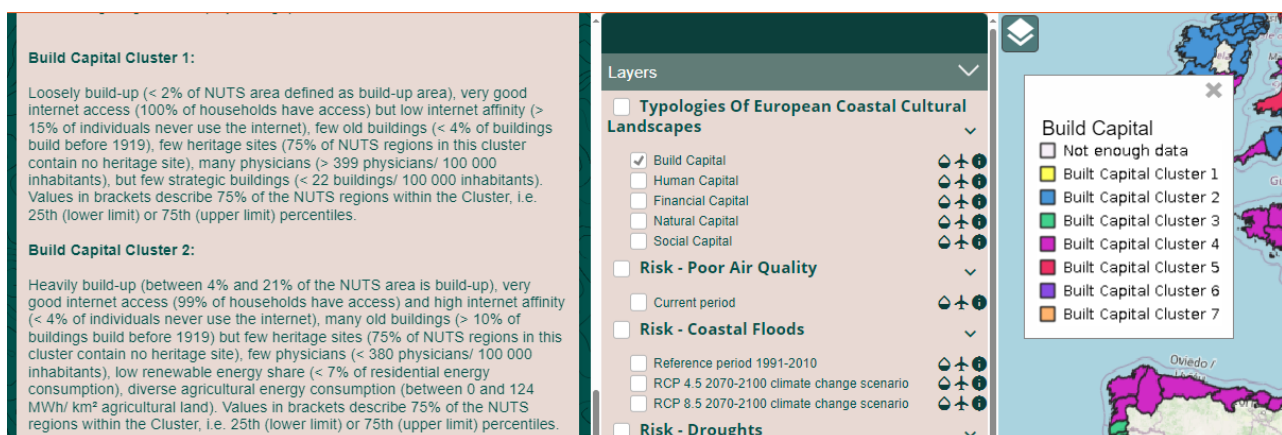


Figure 4: Build Capital legend

4.2 Typology of coastal cultural landscapes

The first output that can be visualized in the ATLAS are the typologies of coastal cultural landscapes.

The following maps, extracted from RescueME ATLAS, show the five typologies of coastal cultural landscapes present in Europe. The ATLAS permits selecting between the five different typologies defined in the project (Built Capital, Human Capital, Financial Capital, Natural Capital and Social Capital) and, for each of them it shows the clusters that have been defined (see D1.3 Policy Paper for further detail on the clusters).

For each cluster, a more detailed description of its meaning and the value range of selected underlying indicators is described on the left-hand side of the ATLAS window underneath the project description section.

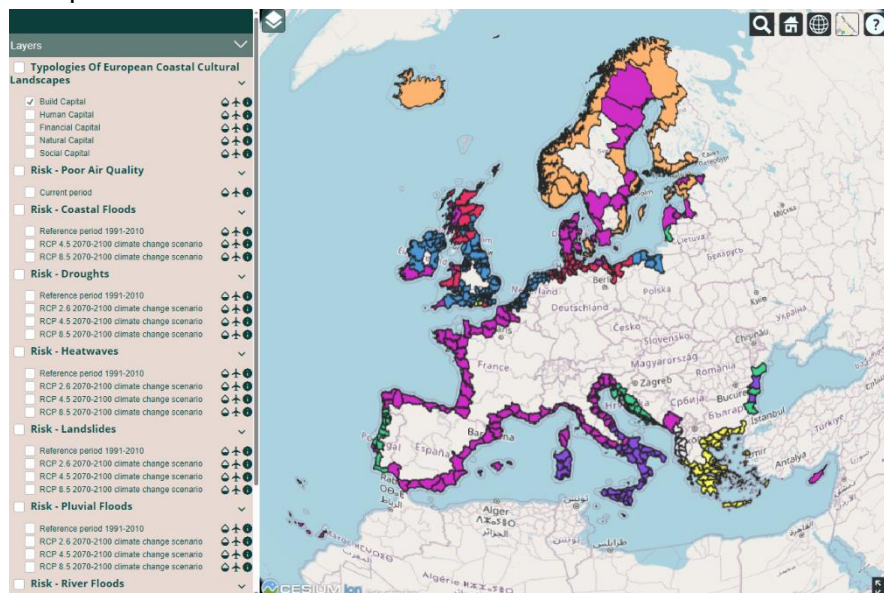


Figure 5: Built Capital

Built Capital refers in RescueMe to human-made infrastructure, as a tangible representation of culture and history, and includes monuments, traditional buildings, industrial heritage, roads and connections as well as energy and water provision systems. Together with the natural capital, it contributes to shape the landscape unique character. (RescueME D1.1, Gandini and Egusquiza, 2023, page 40).

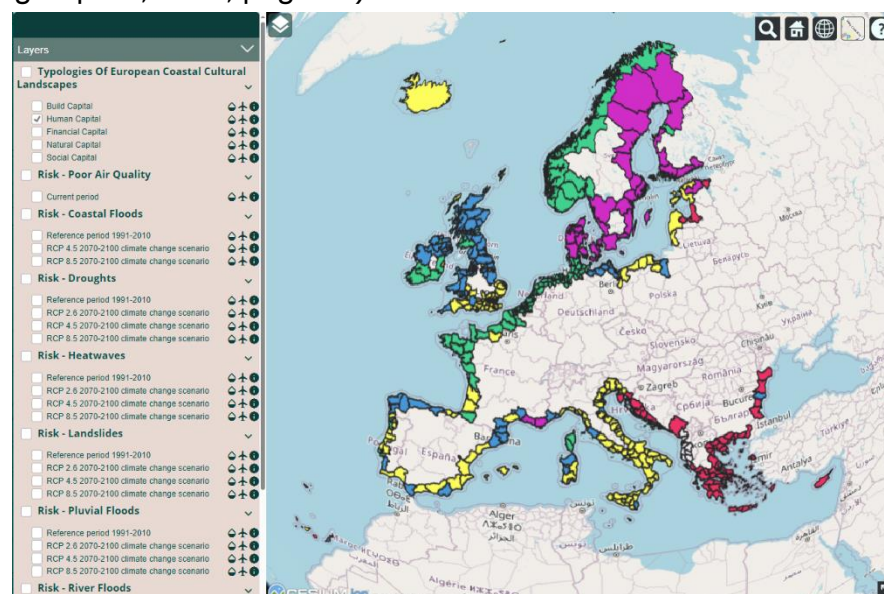


Figure 6: Human Capital

Human Capital is, in RescueME, that related to the skills and abilities of local communities and how these could be enhanced and fostered through continuous learning, education and training (RescueME D1.1, Gandini and Egusquiza, 2023, page 40).

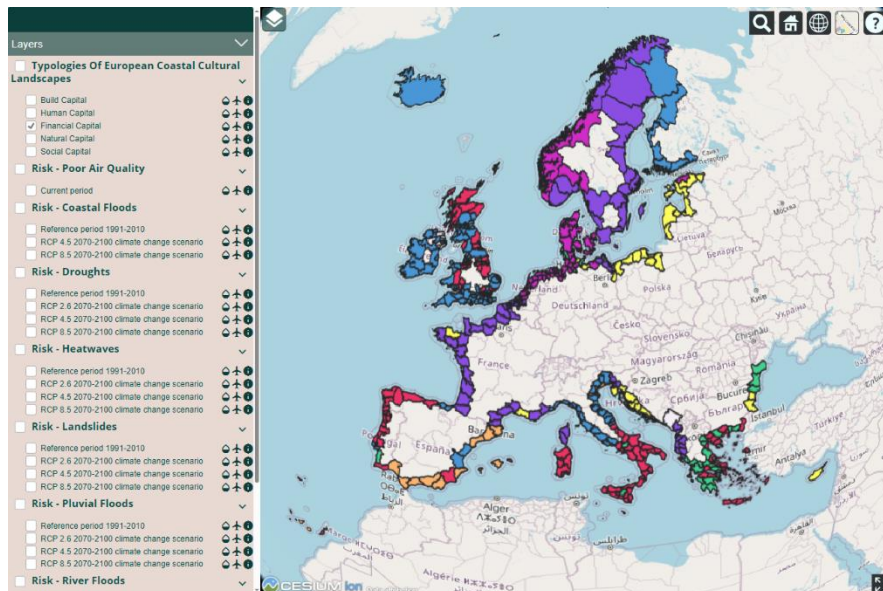


Figure 7: Financial Capital

In RescueME, the Financial Capital refers to the economic contribution of cultural landscapes to local communities as well as the resources and funds available for their maintenance, management and improvement, including revenues from the touristic sector and cultural events (RescueME D1.1, Gandini and Egusquiza, 2023, page 40).

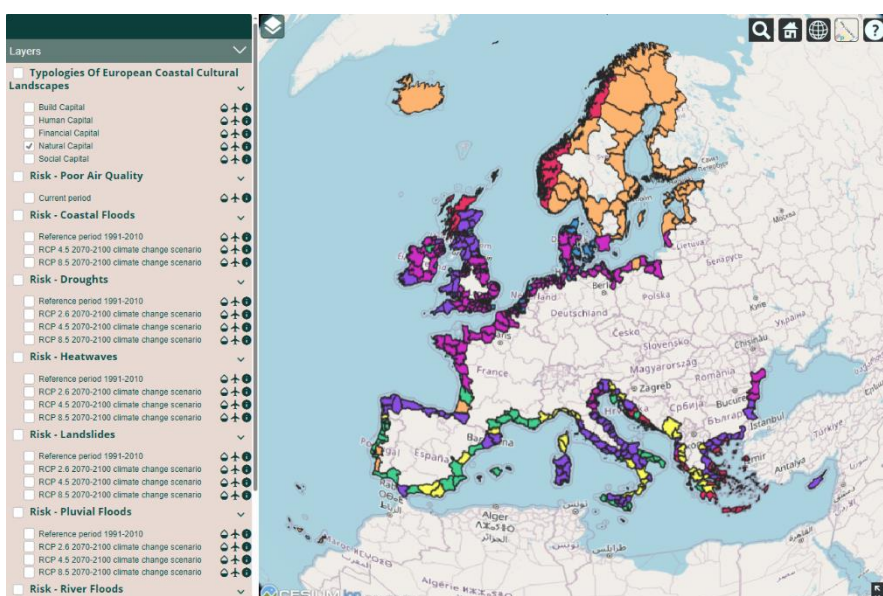


Figure 8: Natural Capital

RescueME defines the Natural Capital as that related to natural resources and ecosystems providing benefits and services to local communities, including agricultural practices and biodiversity as well as recreational, and traditional practices (RescueME D1.1, Gandini and Egusquiza, 2023, page 40).

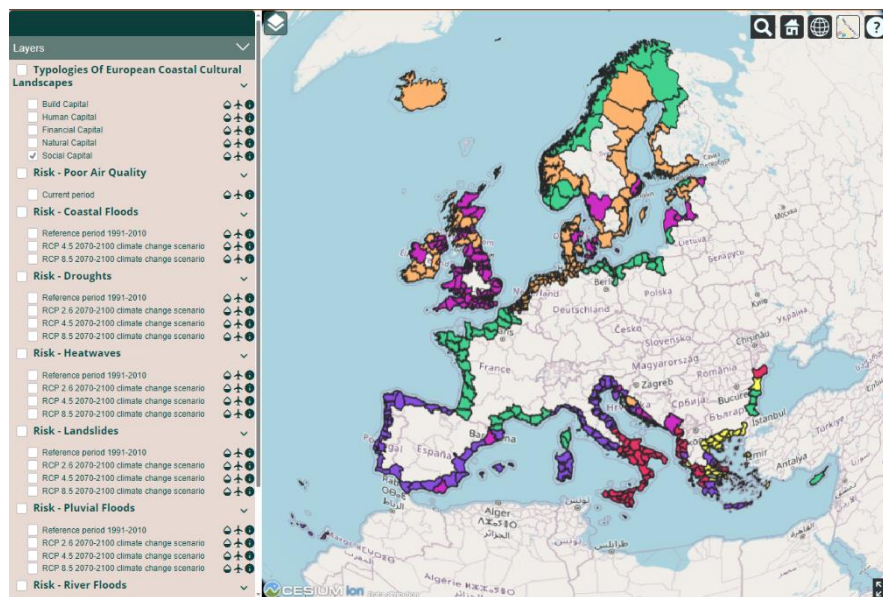


Figure 9: Social Capital

In RescueME, Social Capital is that related to networks, relationships and trust that coexist in a community and influences how people contribute to the preservation and sustainable development of cultural landscapes. It includes community engagement practices, traditional knowledge sharing, advocacy and policy influence and governance mechanisms that include communities to mobilize support and influence decision making (RescueME D1.1, Gandini and Egusquiza, 2023, page 40).

In each of the typologies, users can:

- **In each of the capitals** three small icons appear, to: modify the opacity of the layer, zoom up to the whole EU map and show the legend for the capital clusters (classified in a gradient of colors).
- **When selecting each of the NUTS3 areas:** The indicator values per capital are shown on a table on the right side of the screen. Each indicator on the table has a tooltip when the mouse is over, the tooltip shows the unit in which the indicator has been calculated.

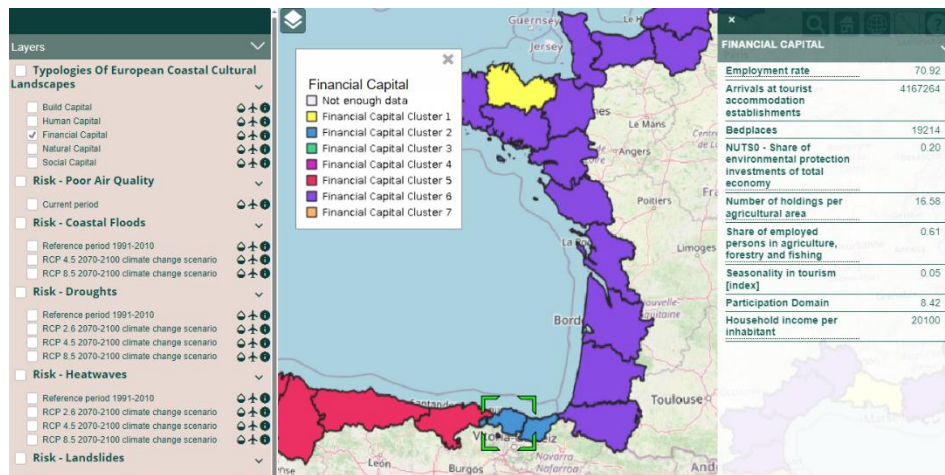


Figure 10: Financial Capital legend of clusters and indicator values shown for a NUTS3 area.

4.3 Risk assessment for coastal cultural landscapes

The second output that can be visualized in the ATLAS are the risk assessments maps for coastal cultural landscapes. The options for each map are the same as the previous one. Each of the maps represents the relative risks for each of the coastal cultural landscapes in a certain period. More intense red colors indicate higher levels of risk.

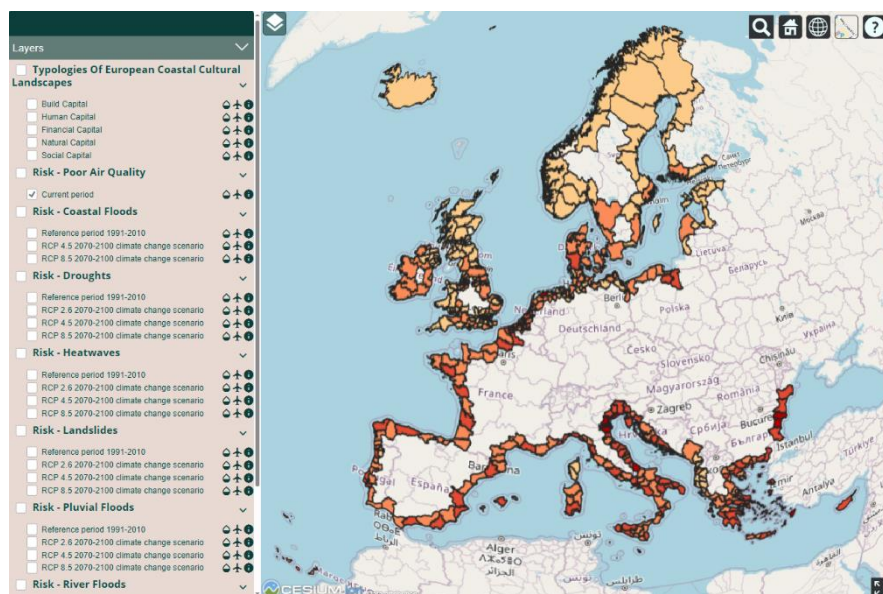


Figure 11: Risk related to Poor Air Quality on coastal cultural landscapes

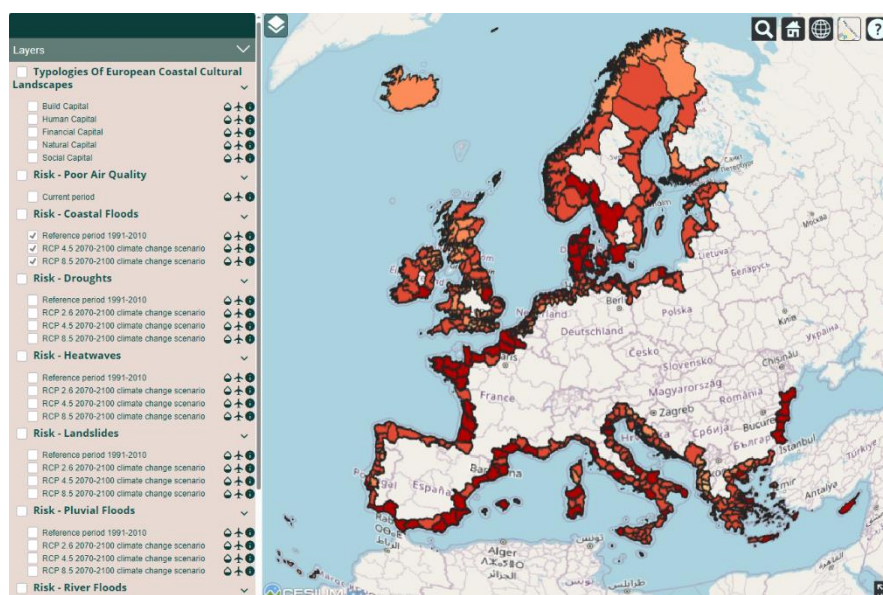


Figure 12: Risk of Coastal Floods on coastal cultural landscapes

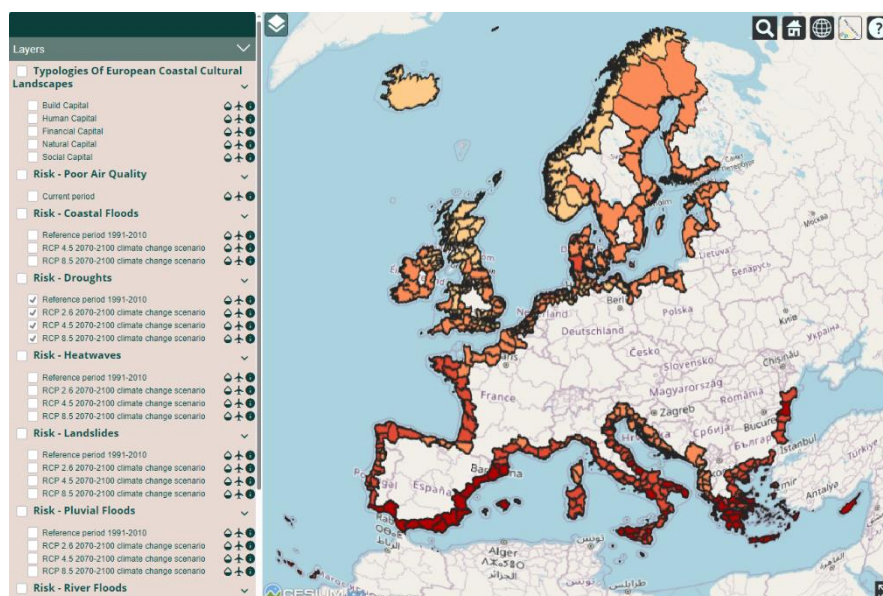


Figure 13: Risk of Droughts on coastal cultural landscapes

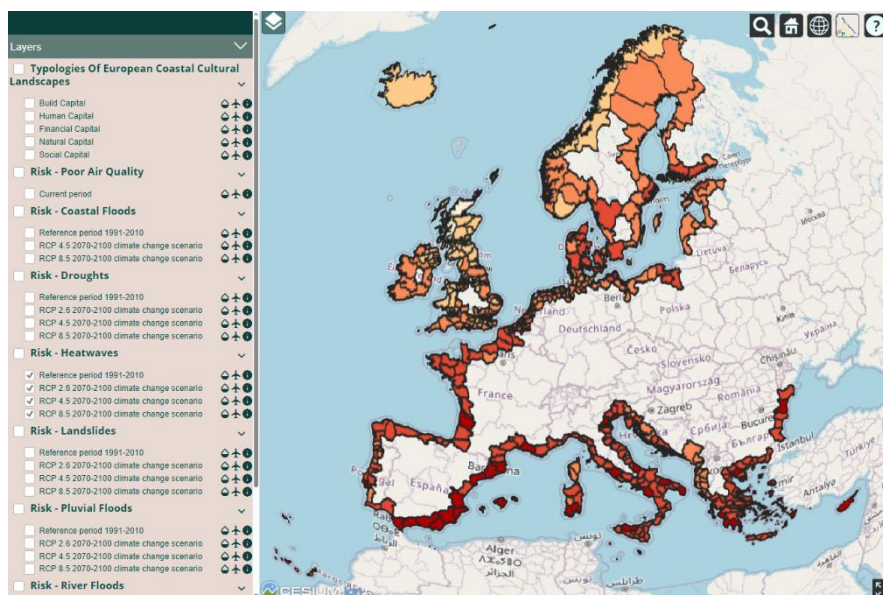


Figure 14: Risk of Heatwaves on coastal cultural landscapes

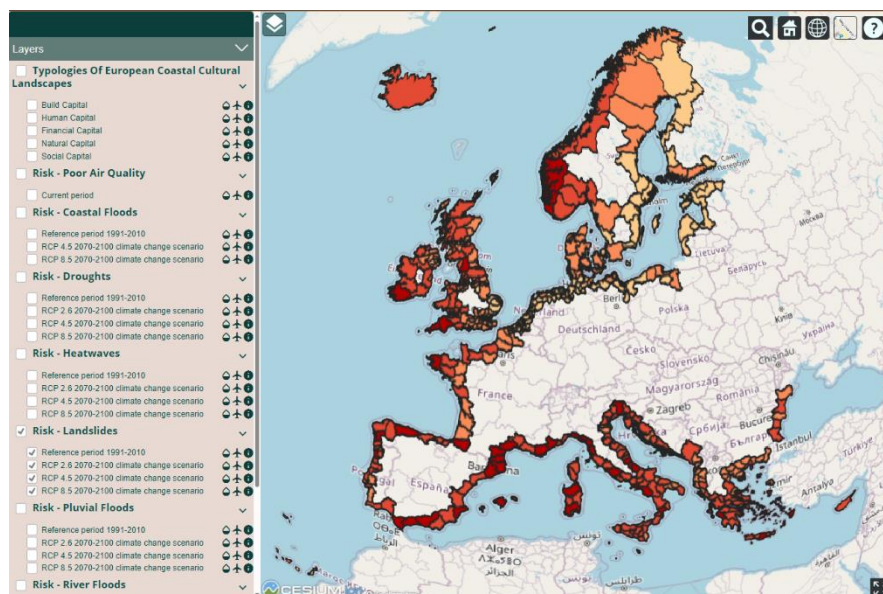


Figure 15: Risk of Landslides on coastal cultural landscapes

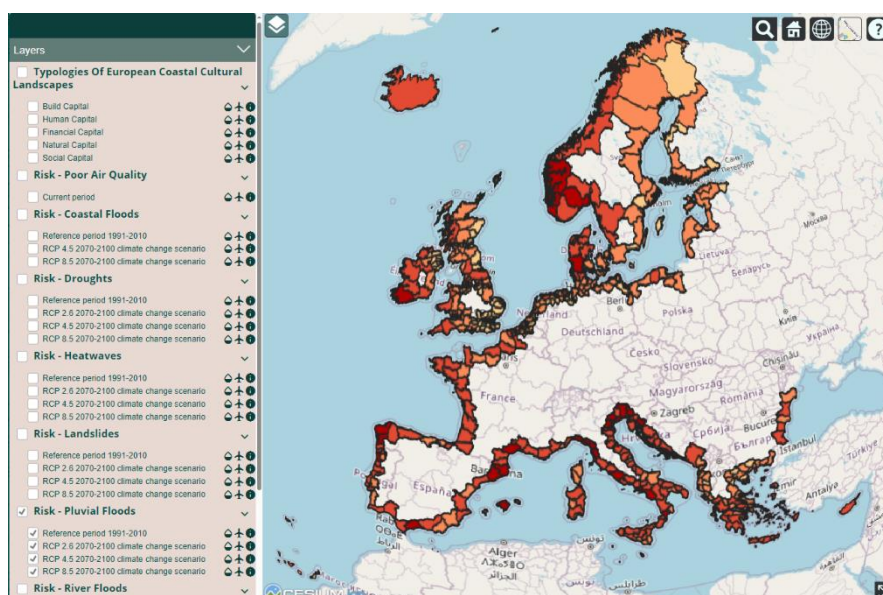


Figure 16 Risk of Pluvial Floods on coastal cultural landscapes

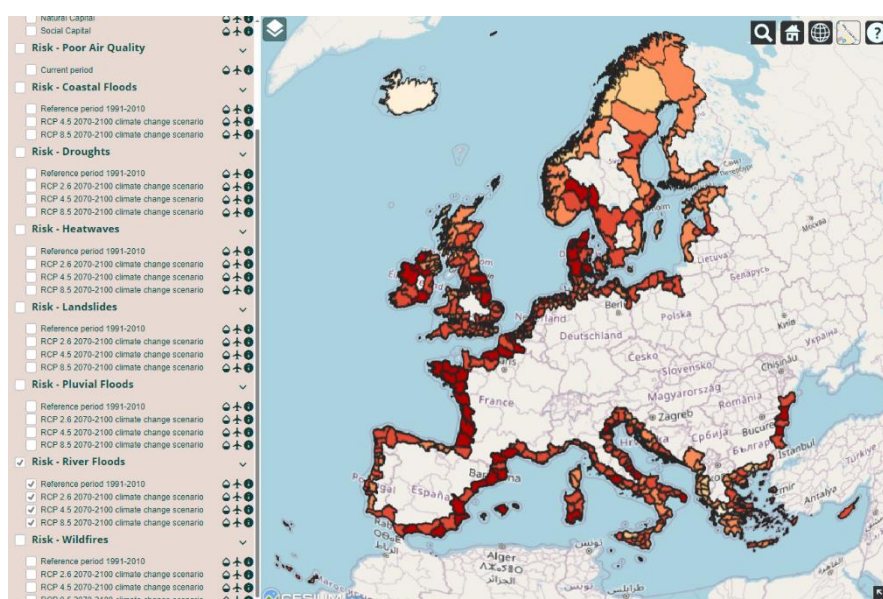


Figure 17: Risk of River Floods on coastal cultural landscapes

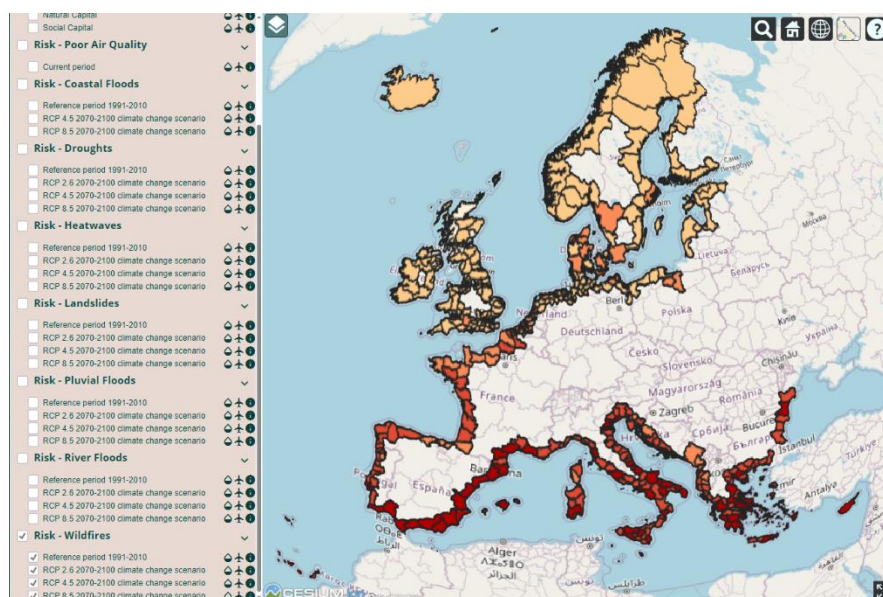


Figure 18: Risk of Wildfires on coastal cultural landscapes

In each of the risks, users can:

- **Select a sub-layer:** Referring to different periods and scenarios.
- **When selecting each of the NUTS3 areas:** composite risk indices are shown.

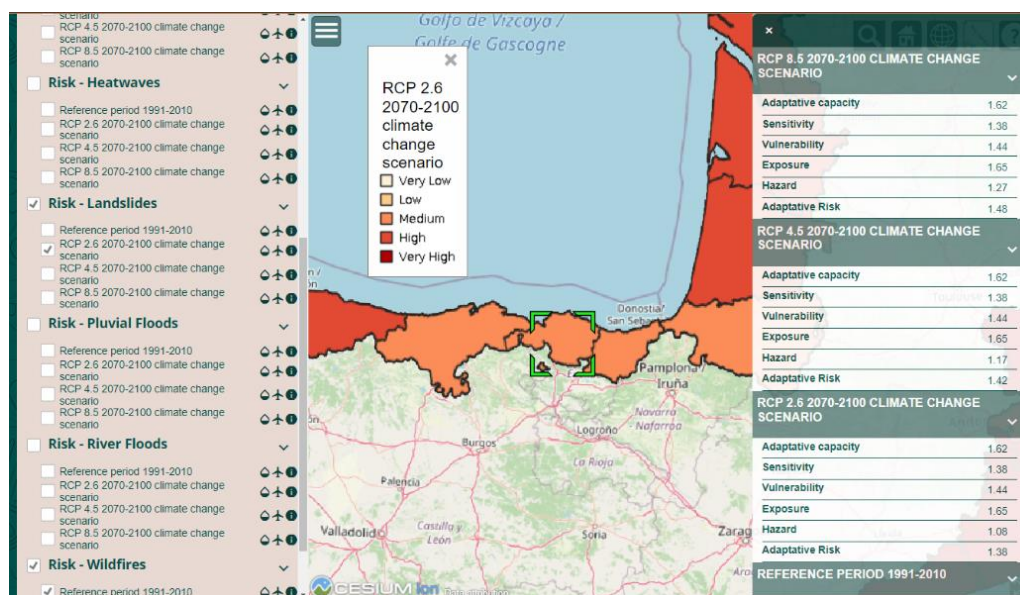


Figure 19: Landslide Risk legend for a certain scenario and composite risk indices shown for a NUTS3 area.

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