

# Climate Change Adaptation

## ISO 14090 – Definitions

### **Adaptation to climate change** (*climate change adaptation*)

process of adjustment to actual or expected climate and its effects

Note 1: In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities.

Note 2: In some natural systems, human intervention can facilitate adjustment to expected climate and its effects.

### **climate**

statistical description of weather in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years

Note 1 to entry: The classical period for averaging these variables is 30 years, as defined by the World Meteorological Organization.

Note 2 to entry: The relevant quantities are most often near-surface variables such as temperature, precipitation and wind.

[SOURCE:Adapted from IPCC, 2014]

# Climate Change Adaptation

## [Consequences of climate change \(europa.eu\)](http://europa.eu)

Region	Territorial threats
The Arctic	Higher-than-average temperature increase / Decrease in summer sea ice cover / Thawing of permafrost
Nothern Europe	Less snow and lake and river ice cover / Increased winter and spring river flows in some parts and decreases in other parts / Greater damage by winter storms / More frequent and intense extreme weather events
North-western Europe	Coastal flooding / Storm surges Higher winter precipitation -> increase spring river flooding
Central and Eastern Europe	Temperature extremes + Reduced summer precipitation = increased risk of droughts Increased intensity and frequency of river floods
Mediterranean región	Decreased precipitation + Increased temperature Increasing risk of droughts
Cities & Urban areas	Heatwaves, flooding, and droughts. Floodings
Mountain Areas	Increase in temperature / loss of glacier mass / reduced snow cover / thawing of permafrost and changin precipitation patterns Increase of the frequency of floods

## Climate change: **a threat** to infrastructure & buildings

The impacts of climate change are particularly pertinent because of their:

- long lifespan
- high initial cost
- essential role in the functioning of our societies and economies.

Can be vulnerable because of **location** (e.g. in flood-prone areas, landslides, avalanches) and/or design **design** ( e.g low resistance to storms)

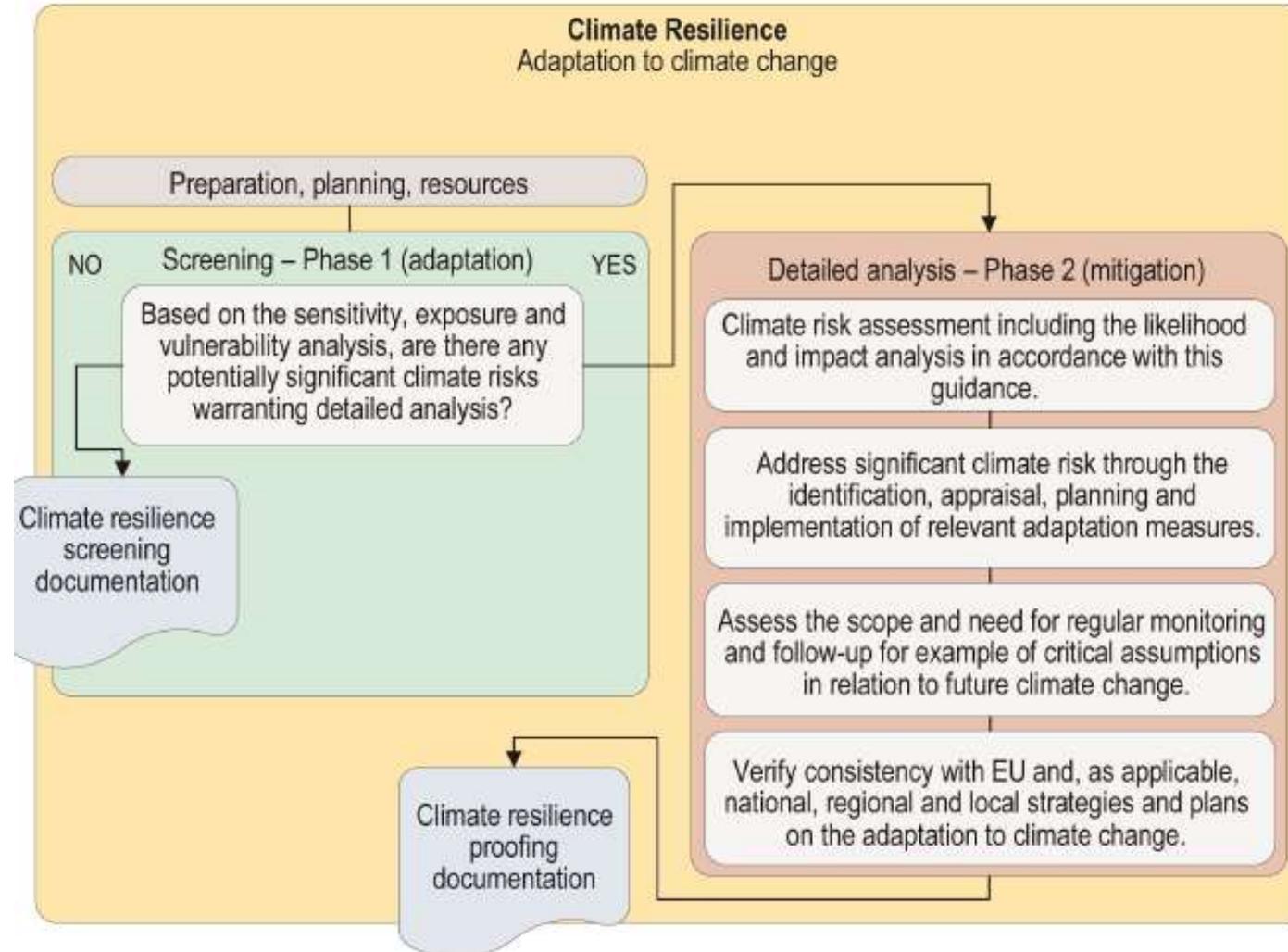
Can be damaged or rendered unfit for use by any changing climatic condition or extreme weather event (e.g rising sea level, extreme precipitation and floods, ...)

Consequences of climate change for buildings and infrastructure will differ from region to region

# Climate Change Adaptation

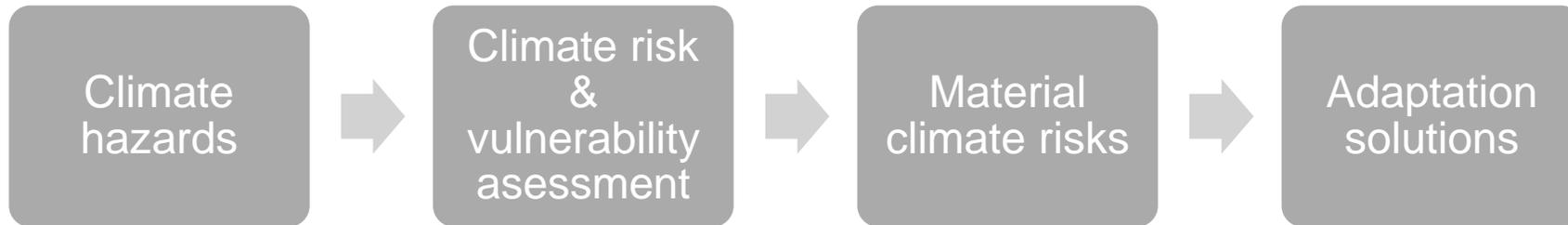
## Technical guidance on the climate proofing of infrastructure in the period 2021-2027

COMMISSION NOTICE (2021/C 373/01)



# Climate Change Adaptation

Climate resilience / adaptation to climate change **evaluation process**



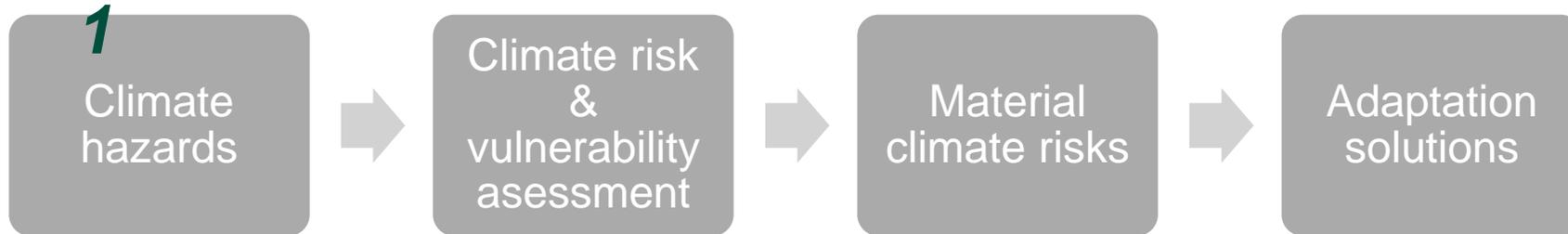
GENERIC CRITERIA FOR DNSH TO CLIMATE CHANGE ADAPTATION  
(Climate Delegated Act - Taxonomy)

[Microsoft Word - 1 EN annexe acte autonome part1 v16 \(europa.eu\)](#)

# Climate Change Adaptation

Climate resilience / adaptation to climate change **evaluation process**

## **Screening – Phase**



## **Detailed analysis – Phase 2**

GENERIC CRITERIA FOR DNSH TO CLIMATE CHANGE ADAPTATION (Taxonomy)  
**vs *Technical guidance on the climate proofing of infrastructure***

# Climate Change Adaptation

Climate resilience / adaptation to climate change **evaluation process**

## ***Screening – Phase 1***

### **Vulnerability analysis**

- to identify the relevant climate hazards for the given specific project type at the planned location.
- is a combination of two aspects:
  - **Sensitivity:** how sensitive the project's components are to climate hazards in general, and
  - **Exposure:** the probability of these hazards occurring at the project location now and in the future

# Climate change adaptation – Climate hazards

	Temperature	Wind	Water	Solid-mass
Chronic	Changing temperature (air, freshwater, marine water)	Changing wind patterns	Changing precipitation patterns and types (rain, hail, snow/ice)	Coastal erosion
	Heat stress		Precipitation or hydrological variability	Soil degradation
	Temperature variability		Ocean acidification	Soil erosion
	Permafrost thawing		Saline intrusion	Solifluction
			Sea level rise	
			Water stress	
Accute		Cyclone, hurricane, typhoon	Drought	Avalanche
	Cold wave / Frost	Storm (including blizzards, dust and sandstorms)	Heavy precipitation (rain, hail, snow/ice)	Landslide
	Willdfire	Tornado	Flood (coastal, fluvial, pluvial, ground water)	Subsidence
			Glacial lake outburst	

# Climate Change Adaptation

## Climate resilience / adaptation to climate change **evaluation process**

### **Detailed analysis – Phase 2**

#### **Risk assessment:**

- **Likelihood** : how likely the identified climate hazards are to occur within a given timescale, e.g. the lifetime of the project.
- **Impact**: the consequences if the climate hazard identified occurs. This should be assessed on a scale of impact per hazard. This is also referred to as severity or magnitude.

RISK ASSESSMENT							
Indicative risk table: (example)		Overall impact of the essential climate variables and hazards (example)				Legend:	
		Insignificant	Minor	Moderate	Major	Catastrophic	Risk level
Likelihood	Rare						Low
	Unlikely		Drought				Medium
	Moderate		Heat	Flood			High
	Likely						Extreme
	Almost certain						Extreme

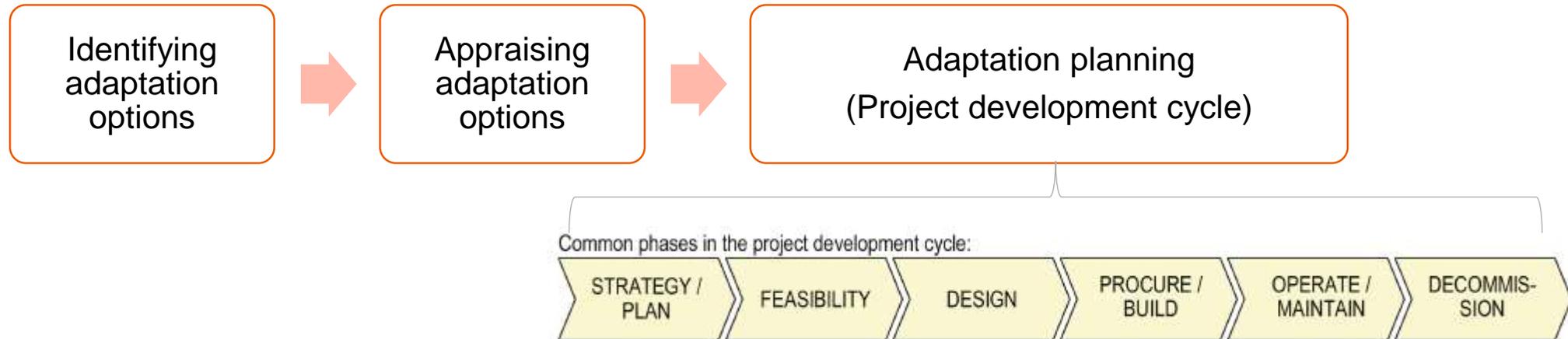
# Climate Change Adaptation

## Climate resilience / adaptation to climate change process

### *Detailed analysis – Phase 2*

#### Adaptation measures

- For each significant risk identified, targeted **adaptation measures** should be assessed.
- The preferred measures should then be integrated into the project design and/or its operation to improve climate resilience



# Climate Change Adaptation

Climate resilience / adaptation to climate change **evaluation process**

Indicative overview of the climate vulnerability and risk assessment, and the identification, appraisal and planning/integration of relevant adaptation measures

## Phase 1 (screening)

### SENSITIVITY ANALYSIS

Indicative sensitivity table: (example)

Themes	Climate variables and hazards			
	Flood	Heat	...	Drought
On-site assets, ...	High	Low	...	Low
Inputs (water, ...)	Medium	Medium	...	Low
Outputs (products, ...)	High	Low	...	Low
Transport links	Medium	Low	...	Low
Highest score 4 themes	High	Medium	...	Low

The output of the sensitivity analysis may be summarised in a table with the sensitivity ranking of the relevant climate variables and hazards for a given project type, irrespective of the location, including critical parameters, and divided in e.g. the four themes.

### EXPOSURE ANALYSIS

Indicative exposure table: (example)

Themes	Climate variables and hazards			
	Flood	Heat	...	Drought
Current climate	Medium	Low	...	Low
Future climate	High	Medium	...	Low
Highest score, current/future	High	Medium	...	Low

The output of the exposure analysis may be summarised in a table with the exposure ranking of the relevant climate variables and hazards for the selected location, irrespective of the project type, and divided in current and future climate. For both the sensitivity and exposure analysis, the scoring system should be carefully defined and explained, and the given scores should be justified.

### VULNERABILITY ANALYSIS

Indicative vulnerability table: (example)	Exposure (current + future climate)			Legend: Vulnerability level
	High	Medium	Low	
Sensitivity (highest across the four themes)	High	Heat	Drought	
High	Medium	Low		
Medium	Low			

The vulnerability analysis may be summarised in a table for the given specific project type at the selected location. It combines the sensitivity and the exposure analysis. The most relevant climate variables and hazards are those with a high or medium vulnerability level, which are then taken forward to the steps below. The vulnerability levels should be carefully defined and explained, and the given scores justified.

## Phase 2 (subject to the outcome of phase 1)

### LIKELIHOOD ANALYSIS

Indicative scale for assessing the likelihood of a climate hazard (example):

Term	Qualitative	Quantitative (%)
Rare	Highly unlikely to occur	5%
Unlikely	Unlikely to occur	20%
Moderate	As likely to occur as not	50%
Likely	Likely to occur	80%
Almost certain	Very likely to occur	95%

The output of the likelihood analysis may be summarised in a qualitative or quantitative estimation of the likelihood for each of the essential climate variables and hazards. [7] Defining the scales requires careful analysis for various reasons including e.g. that the likelihood and impacts of the essential climate hazards may change significantly during the lifespan of the infrastructure project among other due to climate change. Various scales are referred to in the literature.

### IMPACT ANALYSIS

Indicative scale for assessing the potential impact of a climate hazard (example):

Aspects	Impact level				
	Insignificant	Minor	Moderate	Major	Catastrophic
Risk areas:					
Asset damage, engineering, operational					
Safety and health					
Environment, cultural heritage					
Social					
Financial					
Reputation					
Any other relevant risk area(s)					
Overall for the above-listed risk areas					

The impact analysis provides an expert assessment of the potential impact for each of the essential climate variables and hazards.

### RISK ASSESSMENT

Indicative risk table: (example)	Overall impact of the essential climate variables and hazards (example)					Legend: Risk level
	Insignificant	Minor	Moderate	Major	Catastrophic	
Rare						
Unlikely		Drought				
Moderate		Heat	Flood			
Likely						
Almost certain						

The output of the risk analysis may be summarised in a table combining likelihood and impact of the essential climate variables and hazards. Detailed explanations are required to qualify and substantiate the assessment conclusions. The risk levels should be explained and justified.

### IDENTIFYING ADAPTATION OPTIONS

Option identification process:

- Identify options responding to the risks (use e.g. expert workshops, meetings, evaluations, ...)
- Adaptation may involve a mix of responses, e.g.:
  - training, capacity building, monitoring, ...
  - use of best practices, standards, ...
  - nature-based solutions, ...
  - engineering solutions, technical design, ...
  - risk management, insurance, ...

### APPRAISING ADAPTATION OPTIONS

The appraisal of adaptation options should give due regard to the specific circumstances and availability of data. In some cases a quick expert judgement may suffice whereas other cases may warrant a detailed cost-benefit analysis. It may be relevant to consider the robustness of various adaptation options vis-à-vis climate change uncertainties.

### ADAPTATION PLANNING

Integrate relevant climate resilience measures into the technical project design and management options. Develop implementation plan, finance plan, plan for monitoring and response, plan for regular review of the assumptions and the climate vulnerability and risk assessment, and so on. The vulnerability and risk assessment and adaptation planning is aiming to reduce the remaining climate risks to an acceptable level.

# Climate Change Adaptation

Climate projections and assessment of impacts based on **best practice**  
**and available guidance**



[IPCC — Intergovernmental Panel on Climate Change](#)



[Home — Climate-ADAPT \(europa.eu\)](#)

# Climate Change Adaptation

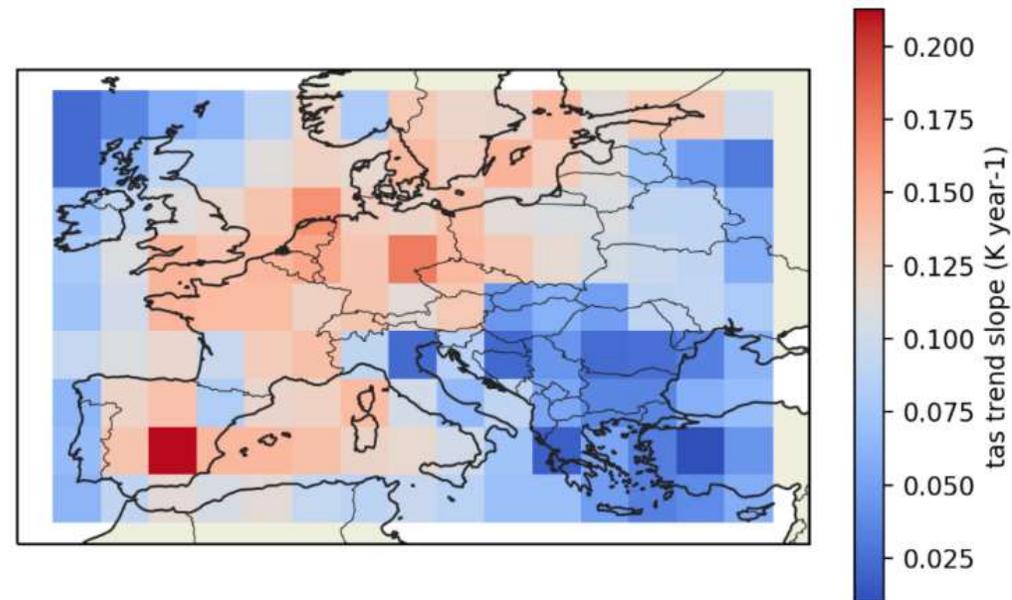
Climate projections and assessment of impacts based on **best practice and available guidance**



[Home | Copernicus](#)

The C3S mission is to support adaptation and mitigation policies of the European Union by providing consistent and authoritative information about climate change

Offers free and open access to climate data and tools based on the best available science.



# Climate Change Adaptation

Climate projections and assessment of impacts based on best practice and available guidance -> **Examples of local tools, databases, etc..**

[Proyecciones climáticas para el siglo XXI - Agencia Estatal de Meteorología - AEMET. Gobierno de España](#)

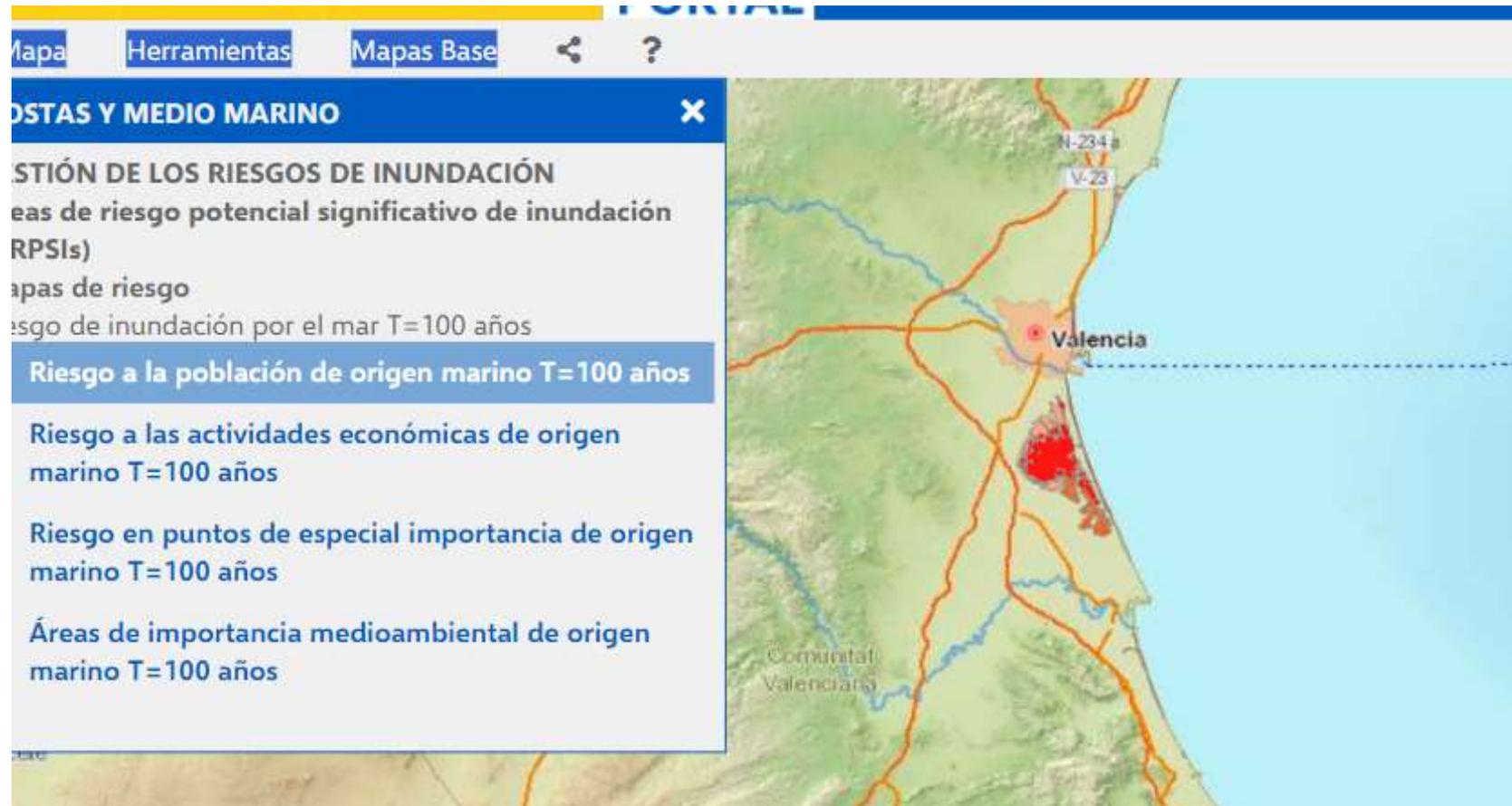


[Competence center KomPass | Umweltbundesamt](#)



# Climate Change Adaptation

Climate projections and assessment of impacts based on best practice and available guidance -> **Use of GIS**



[Geoportal \(mapama.gob.es\)](http://mapama.gob.es)

## Commission explanatory note – Application of the ‘do no significant harm’ principle under cohesion policy – ERDF, ESF+, Cohesion Fund, JTF

[EGESIF October 2021](#)

## Technical guidance on the application of ‘do no significant harm’ under the Recovery and Resilience Facility (RRF) Regulation

[eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021XC0218\(01\)](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021XC0218(01))

*Please note that this guidance does not apply **directly** to Interreg programmes but it includes interesting methodological takeaways*

The principle of **‘do no significant harm’** ->Regulation (EU) 2020/852 (Taxonomy)

**Environmental objectives (art. 9)**

Climate change mitigation

Climate change adaptation

Sustainable use and protection of water and marine resources

Circular economy, including waste prevention and recycling

Pollution prevention and control

Protection and restoration of biodiversity and ecosystems

## Significant harm to environmental objectives (Art 17 . Taxonomy)

Objectives	An activity shall be considered to <b>significantly harm</b> when it:
Climate change mitigation	leads to significant greenhouse gas emissions
Climate change adaptation	leads to an increased adverse impact of the current climate and the expected future climate, on the activity itself or on people, nature or assets
Sustainable use and protection of water and marine resources	is detrimental: (i) to the good status or the good ecological potential of bodies of water, including surface water and groundwater; or (ii) to the good environmental status of marine waters;
Circular economy, including waste prevention and recycling	(i) leads to significant inefficiencies in the use of materials or in the direct or indirect use of natural resources such as non-renewable energy sources, raw materials, water and land at one or more stages of the life cycle of products, including in terms of durability, reparability, upgradability, reusability or recyclability of products; (ii) leads to a significant increase in the generation, incineration or disposal of waste, with the exception of the incineration of non-recyclable hazardous waste; or (iii) the long-term disposal of waste may cause significant and long-term harm to the environment;
Pollution prevention and control	leads to a significant increase in the emissions of pollutants into air, water or land, as compared with the situation before the activity started
Protection and restoration of biodiversity and ecosystems	is: (i) significantly detrimental to the good condition and resilience of ecosystems; or (ii) detrimental to the conservation status of habitats and species, including those of Union interest.

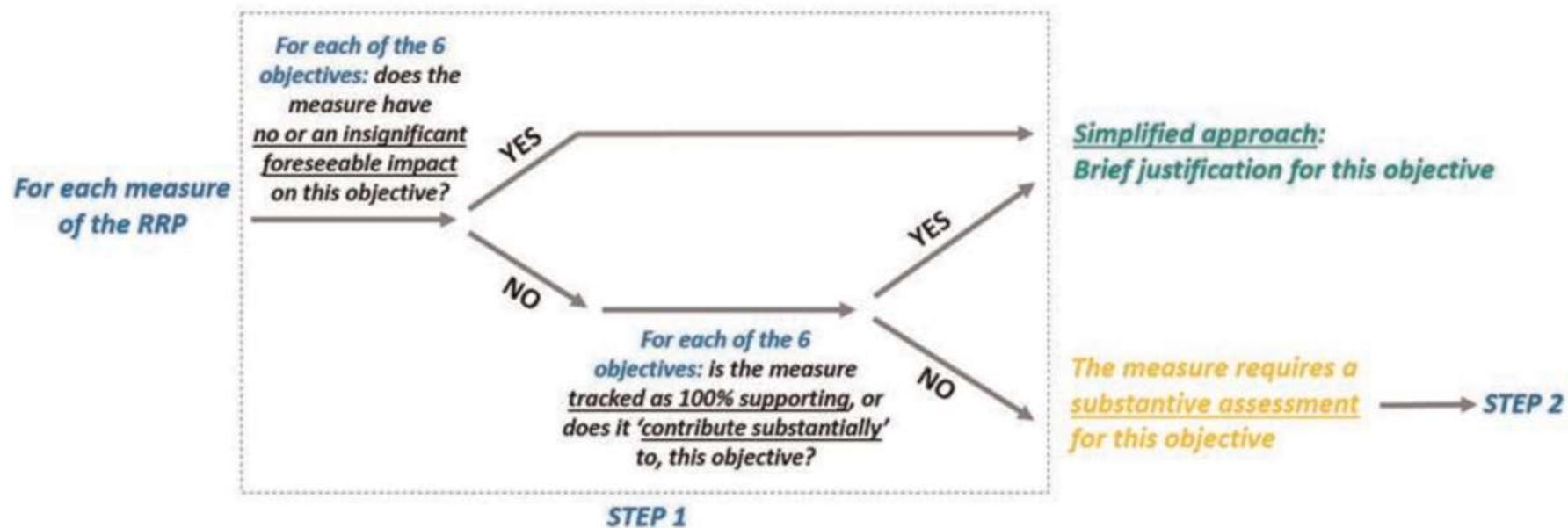
## **Guiding principles for the DNSH assessment**

1. *Direct and primary indirect* impacts are relevant
2. Consideration of life cycle of the activity : production, use and end-of-life phases
3. Measures promoting greater electrification (e.g. industry, transport and buildings) are considered compatible
4. For economic activities where there is a technologically and economically feasible alternative with low environmental impact, the assessment of the negative environmental impact of each measure should be carried out against a ‘no intervention’ scenario by taking into account the environmental effect of the measure in absolute terms.
5. For economic activities where there is no technologically and economically feasible alternative with low environmental impact, Member States may demonstrate that a measure does no significant harm by adopting the best available levels of environmental performance in the sector.
6. Measures are future-proof and do not lead to harmful lock-in effects

## Technical guidance DNSH - RRF (2021/C 58/01)

**Step 1:** Filter the six environmental objectives to identify those that require a substantive assessment

**Step 2:** Provide a substantive DNSH assessment for those environmental objectives that require it



Decision tree

## Simplified assessment:

provide a brief justification, why the environmental objective does not require a substantive DNSH assessment of the measure, based on one of the following cases

- a) The measure **has no or an insignificant foreseeable impact** on the environmental objective related to the direct and primary indirect effects of the measure across its life cycle, given its nature, and as such is considered compliant with DNSH for the relevant objective;
- b) The measure is tracked as **supporting a climate change or environmental objective** with a **coefficient of 100 %**, and as such is considered compliant with DNSH for the relevant objective;
- c) The measure **‘contributes substantially’** to an environmental objective, pursuant to the Taxonomy Regulation, and as such is considered compliant with DNSH for the relevant objective.

## Simplified: ‘supporting with coefficient 100%’

REGULATION (EU) 2021/241 establishing the Recovery and Resilience Facility

ANNEX VI - Methodology for climate tracking Dimensions and codes for the types of intervention for the Facility

	INTERVENTION FIELD	Coefficient for the calculation of support to climate change objectives	Coefficient for the calculation of support to environmental objectives
024bis	Energy efficiency and demonstration projects in large enterprises and supporting measures	40 %	40 %
024ter	Energy efficiency and demonstration projects in SMEs or large enterprises and supporting measures compliant with energy efficiency criteria <sup>(1)</sup>	100 %	40 %
025	Energy efficiency renovation of existing housing stock, demonstration projects and supporting measures	40 %	40 %
025bis	Energy efficiency renovation of existing housing stock, demonstration		

## Simplified: ‘**contributes substantially**’

### Regulation (EU) 2020/852 – *Taxonomy*

*Art 10* Substantial contribution to climate change mitigation

*Art.11* Substantial contribution to climate change adaptation

*Art .12* Substantial contribution to the sustainable use and protection of water and marine resources

*Art.13* Substantial contribution to the transition to a circular economy

*Art.14* Substantial contribution to pollution prevention and control

*Art.15* Substantial contribution to the protection and restoration of biodiversity and ecosystems

*Art. 16* Enabling activities

## R (EU) 2020/852 – Taxonomy (example of substantial contribution)

### **Article 11 - Substantial contribution to climate change adaptation**

1. *An economic activity shall qualify as contributing substantially to climate change adaptation where that activity:*
  - (a) *includes adaptation solutions that either substantially reduce the risk of the adverse impact of the current climate and the expected future climate on that economic activity or substantially reduce that adverse impact, without increasing the risk of an adverse impact on people, nature or assets; or*
  - (b) *provides adaptation solutions that, in addition to satisfying the conditions set out in Article 16, contribute substantially to preventing or reducing the risk of the adverse impact of the current climate and the expected future climate on people, nature or assets, without increasing the risk of an adverse impact on other people, nature or assets.*
2. *The adaptation solutions referred to in point (a) of paragraph 1 shall be assessed and ranked in order of priority using the best available climate projections and shall, at a minimum, prevent or reduce:*
  - (a) *the location-specific and context-specific adverse impact of climate change on the economic activity; or*
  - (b) *the potential adverse impact of climate change on the environment within which the economic activity takes place.*

# DNSH – technical guidance

## EU Taxonomy Compass

[EU Taxonomy Compass \(europa.eu\)](https://europa.eu)



- All sectors
- All activities
- Forestry
- Environmental protection and restoration activities
- Manufacturing
- Energy
- Water supply, sewerage, waste management and remediation
- Transport
- Construction and real estate
- Information and communication
- Professional, scientific and technical activities
- Financial and insurance activities
- Education
- Human health and social work activities
- Arts, entertainment and recreation



### Construction of new buildings

#### Contributing to climate mitigation ^

##### Description v

#### Substantial contribution criteria ^

Constructions of new buildings for which:

1. The Primary Energy Demand (PED)<sup>(281)</sup>, defining the energy performance of the building resulting from the construction, is at least 10 % lower than the threshold set for the nearly zero-energy building (NZEB) requirements in national measures implementing Directive 2010/31/EU of the European Parliament and of the Council<sup>(282)</sup>. The energy performance is certified using an as built Energy Performance Certificate (EPC).
2. For buildings larger than 5000 m<sup>2</sup> <sup>(283)</sup>, upon completion, the building resulting from the construction undergoes testing for airtightness and thermal integrity<sup>(284)</sup>, and any deviation in the levels of performance set at the design stage or defects in the building envelope are disclosed to investors and clients. As an alternative, where robust and traceable quality control processes are in place during the construction process this is acceptable as an alternative to thermal integrity testing.
3. For buildings larger than 5000 m<sup>2</sup> <sup>(285)</sup>, the life-cycle Global Warming Potential (GWP)<sup>(286)</sup> of the building resulting from the construction has been calculated for each stage in the life cycle and is disclosed to investors and clients on demand.

#### Do no significant harm criteria ^

Climate adaptation v

Water v

Circular economy v

Pollution prevention v

Biodiversity v

# DNSH – technical guidance

## Checklist (simplified)

Please indicate which of the environmental objectives below require a substantive DNSH assessment of the measure	Yes	No	Justification if 'No' has been selected
Climate change mitigation			
Climate change adaptation			
The sustainable use and protection of water and marine resources			
The circular economy, including waste prevention and recycling			
Pollution prevention and control to air, water or land			
The protection and restoration of biodiversity and ecosystems			

# DNSH – technical guidance

## Checklist (Substantive)

Questions	No	Substantive justification
<b>Climate change mitigation:</b> Is the measure expected to lead to significant GHG emissions?	X	
<b>Climate change adaptation:</b> Is the measure expected to lead to an increased adverse impact of the current climate and the expected future climate, on the measure itself or on people, nature or assets?	X	
<b>The sustainable use and protection of water and marine resources:</b> Is the measure expected to be detrimental: (i) to the good status or the good ecological potential of bodies of water, including surface water and groundwater; or (ii) to the good environmental status of marine waters?	X	
<b>The transition to a circular economy, including waste prevention and recycling:</b> Is the measure expected to: (i) lead to a significant increase in the generation, incineration or disposal of waste, with the exception of the incineration of non-recyclable hazardous waste; or (ii) lead to significant inefficiencies in the direct or indirect use of any natural resource at any stage of its life cycle which are not minimised by adequate measures; or (iii) cause significant and long-term harm to the environment in respect to the circular economy?	X	
<b>Pollution prevention and control:</b> Is the measure expected to lead to a significant increase in the emissions of pollutants into air, water or land?	X	
<b>The protection and restoration of biodiversity and ecosystems:</b> Is the measure expected to be: (i) significantly detrimental to the good condition and resilience of ecosystems; or (ii) detrimental to the conservation status of habitats and species, including those of Union interest?	X	

## DNSH Technical guidance - ANNEX II -**Supporting evidence** for the substantive DNSH assessment in the context of Part 2 of the checklist

### ***Cross-cutting supporting evidence***

- The applicable part of the EU environmental legislation has been complied with and relevant permits/authorisations have been granted.
- The measure includes elements requiring companies to implement a recognised environmental management system, such as EMAS (or alternatively ISO 14001 or equivalent), or to use and/or produce goods or services that are awarded an EU Ecolabel or another Type I environmental label.
- The measure concerns the implementation of best environmental practices or the reaching of benchmarks of excellence set out in the Sectoral Reference Documents (EMAS).
- For public investments, the measure respects green public procurement criteria
- For infrastructure investments, the investment has been subject to a climate and environmental proofing.

### ***Climate change adaptation:***

- A proportionate climate risk assessment has been carried out.
- If an investment is above the value of EUR 10 million, a climate vulnerability and risk assessment has been carried out or is planned leading to identification, appraisal and implementation of relevant adaptation measures.

## DNSH Technical guidance - ANNEX IV - Worked out examples of how to implement the DNSH assessment

Questions	Substantive justification
<p><b>Climate change adaptation:</b> Is the measure expected to lead to an increased adverse impact of the current climate and the expected future climate, on the measure itself or on people, nature or assets?</p>	<p>Since the measure relates to the construction of a road and related charging and refuelling infrastructure in an area prone to heat stress and temperature variability and the expected life-span of the assets exceeds 10 years, a climate risk and vulnerability assessment has been performed, using climate projections across a range of future scenarios consistent with the expected lifetime of the facilities. In particular, a flood risk analysis was carried out and two segments where specific adaptation solution need to be implemented have been identified. Special attention has been paid to sensitive elements like bridges and tunnels. The conclusions of the assessment have been incorporated in the design of the measure (see page X in the RRP). Additionally, the measure specifies the obligation for the economic operators to develop a plan to implement adaptation solutions to reduce material physical climate risks to the road and related charging and refuelling infrastructure (see page X in the RRP). The obligation includes that adaptation solutions do not adversely affect the adaptation efforts or the level of resilience to physical climate risks of other people, of nature, of assets and of other economic activities and are consistent with local, sectoral, regional or national adaptation efforts.</p>

***THANK YOU!***

jesus.moya@sgs.com

elena.mansilla@sgs.com