



# An Approach to Climate Risk

Discussion Document  
June 2021

ALVAREZ & MARSAL



Leadership. Action. Results.

# Climate Risk Approach in 4 Steps

1

## 2022 ECB's Climate Risk Stress Test

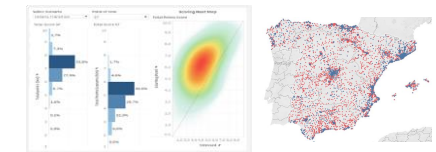
- ✓ ECB will launch its first Bottom up Climate Stress Test in 2022 that will be challenge for Banks.
- ✓ Banks will need to prove their level of climate related data and how advanced are they in terms of Climate Risk Methodology.



2

## Climate Risk Methodology & Tools

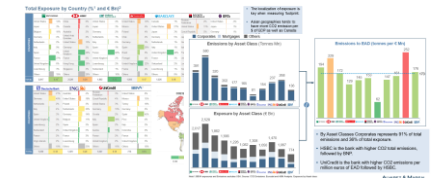
- ✓ Banks will need to approve methodologies and tools that will allow them to analyse their corporate and retail portfolios for transition and physical risks for stress test processes
- ✓ These tools will be used for the first time in the 2022 Climate Risk ST exercise



3

## Portfolio Alignment & Footprint

- ✓ Additionally, they will need methodology to be deployed in their strategic planning efforts to transition loan portfolios to carbon neutral emissions
- ✓ Existing Tools will need to be evolved to include sensitivity analysis and results including different management actions regarding Footprint and Carbon Pledges



4

## Integration into Management

- ✓ Banks are starting to run bottom-up analysis to better understand impacts at exposure level, to assess exposures and risk levels under different scenarios
- ✓ Results will have to feed asset allocation, credit policies, pricing, limits, etc.








## 2022 ECB's Climate Risk Stress Test



# ECB's Climate Risk ST2022 requires major bank preparation

## CR ST 2022 will test bank capabilities to evaluate climate risk in three modules

Three Modules		Key Elements
ECB CR ST 2022	<b>Questionnaire</b> 	<ul style="list-style-type: none"> <li>Goal: qualitative assessment of climate risk stress testing framework with 77 questions</li> <li>11 areas including general use, governance and RAF, integration with strategy, methodology, scenarios, data, ICAAP, future plans, internal audit, parent company and bottom-up projections</li> </ul>
	<b>Climate Metrics Benchmarking</b> 	<ul style="list-style-type: none"> <li>Goal: benchmark banks' income reliance to transition risk sectors and financed GHG emissions</li> <li>Metric 1: Gross Interest and Fee Income from NFCs to cover 80% of income / max 5 countries</li> <li>Metric 2: Scope 1, 2 &amp; 3 Emissions, Revenue and Loans for top 20 per sector non-SME corporates</li> </ul>
	<b>Bottom up Stress Test</b> 	<ul style="list-style-type: none"> <li>Bottom-up stress test projections for subset of banks under transition and physical risk scenarios</li> <li>5 individual tests with different scope, metrics and horizons: 2 transition risk tests (one short term covering credit and market and one long term covering credit) 2 physical risk tests (one Drought &amp; heat and one flood) and 1 operational &amp; reputation risk test</li> </ul>

## Climate risk is here to stay and should be taken as a strategic priority

		Priority	Actions
Areas for response	<b>Data</b>	<b>HIGH</b>	<ul style="list-style-type: none"> <li>Big challenge to capture GHG scope 3 data for Corporates and EPC / NUTS 3 data for Mortgages &amp; CRE. Some data gaps for NACE 2 breakdowns.</li> </ul>
	<b>Models</b>	<b>HIGH</b>	<ul style="list-style-type: none"> <li>Development of Transition Risk, Physical Risk and Operational Risk Models.</li> <li>Introduce dynamic projections over 30 year horizon for Transition Risk</li> </ul>
	<b>Scenario</b>	<b>LOW</b>	<ul style="list-style-type: none"> <li>Scenario guidance provided with some needs for scenario extension</li> </ul>
	<b>Other</b>		<ul style="list-style-type: none"> <li><b>Climate Risk Framework</b> Need to develop and formalize climate risk framework, policy and procedures</li> </ul>
			<ul style="list-style-type: none"> <li><b>Documentation</b> Need to develop comprehensive explanatory note for modules 1, 2 and 3</li> <li><b>Industry Collaboration</b> Explore industry collaboration for sharing of methods and data (e.g., Scope 3)</li> </ul>

# Getting it Done – Climate Stress Testing 2022

Risk Teams Involved / Units Involved



Climate Risk Modeling & Stress Testing New Tools



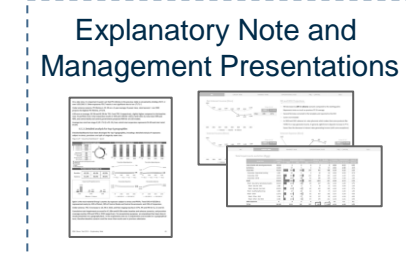
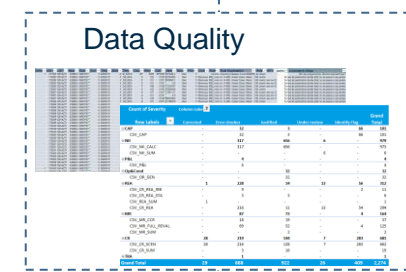
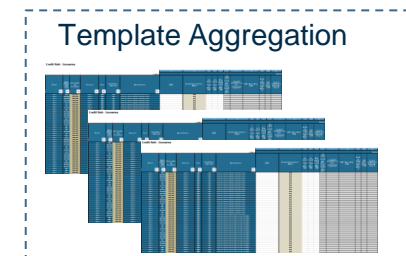
Data Processing, Calculation Template Filling

ECB Climate Risk Stress Test 2022 Aggregation

-  Risk Data & Analytics
-  Credit Risk
-  Market Risk
-  Operational Risk
-  Enterprise Risk Mgmt.
-  ESG Risk Management



Modules		Template
Module 1: Questionnaire		M1 Questionnaire
Module 2: Climate Metrics Benchmarking	Metric 1	M2 Metric 1
	Metric 2	M2 Metric 2
Module 3: Bottom up Stress Test	Test 1	M3 TR ST CR
		M3 TR ST MR
	Test 2	M3 TR LT OD CR
		M3 TR LT DO CR
	Test 3	M3 TR LT HH CR
M3 PR DH CR		
Test 4	M3 PR FL CR	
	M3 OR	
Test 5		M3 RR



 Submission

Others...



# Climate Risk Methodology & Tools



# Climate Risk Methodology & Tools



✓ Aligned with EBA's Risk Framework Method

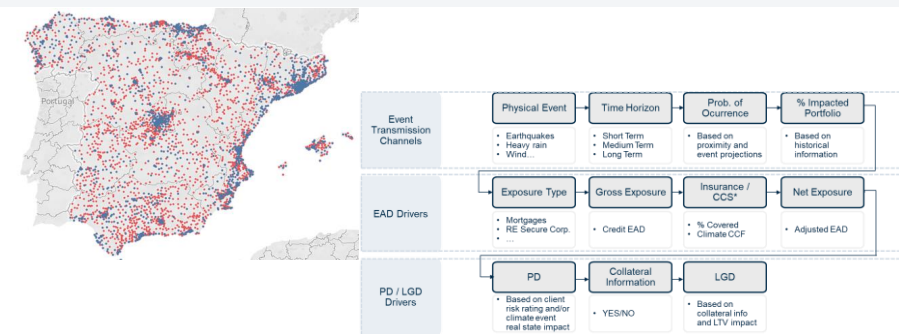
Banks will need methodologies and tools that allows them to analyse corporate and retail portfolios for transition and physical risks for stress test processes

<b>Overview</b>	<ul style="list-style-type: none"> <li>2 set of tools that allows banks analyse corporate and retail portfolios for stress test and sensitivity analysis:             <ol style="list-style-type: none"> <li><b>Transition Risk Tools:</b> focus on Corporates and transition risk</li> <li><b>Physical Risk Tools:</b> focus on real estate assets portfolio under physical risks</li> </ol> </li> </ul>
<b>Approach</b>	<ul style="list-style-type: none"> <li>Tools to be developed should include the following capabilities:             <ul style="list-style-type: none"> <li><b>Environmental Scoring</b> based on physical and transition risks</li> <li><b>Several time horizons and scenarios</b></li> <li><b>Climate Risks and Financial Impacts</b></li> <li><b>Management actions</b></li> </ul> </li> </ul>
<b>Output</b>	<ul style="list-style-type: none"> <li><b>Corporate Climate Risk Tools Results</b></li> <li><b>Physical Risk Tools Results</b></li> <li><b>Summary results and key takeaways for actions</b></li> </ul>

## Transition Risk Tools



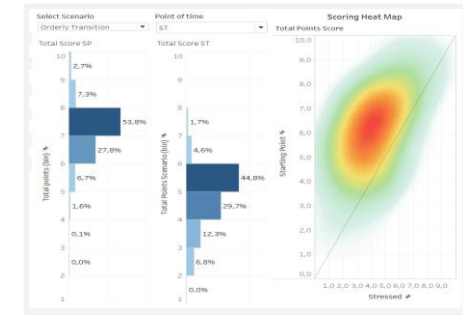
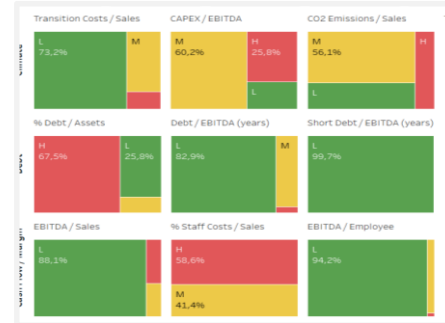
## Physical Risk Tools



# Transition Risk Tools (1/3) : Risk Framework

## Risk Framework Method

Climate risk rating is stressed at a sector level, for different **scenarios** and **time horizons**, allowing for **stress**, **sensitivity** and **what-if analysis**.



- 1

### Define Physical and Transition Risk Levels

Risk levels based on as-of-today financial information and expected evolution per sector
- 2

### Analyze Time Horizon & Scenarios

Different time windows: 2022; 2030; 2040 and 2050  
Multi-scenarios: Orderly, Disorderly, Hot House Word and Stress
- 3

### Transmission Channels

Financial impacts are stressed based on scenario evolution and climate scenario to macro and micro impacts.
- 4

### Climate Risk Ratios & Climate Score

Ratios and scores of: climate related, debt solvency and business model ratios
- 5

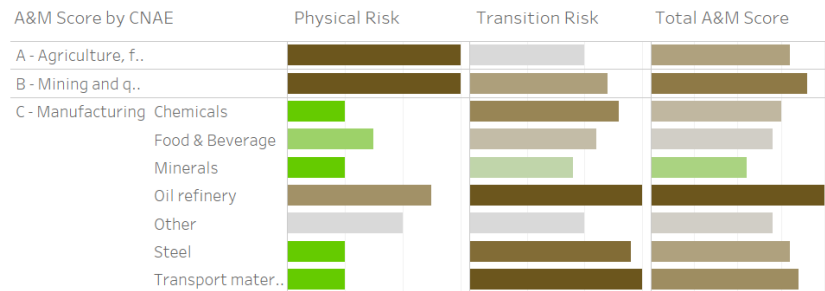
### Risk Impact & Management Actions

Impacts in credit Risk drivers to managed by asset allocation, pricing, risk policies

# Transition Risk Tools (2/3): Modelling approaches

## 1 Define Physical and Transition Risk Levels

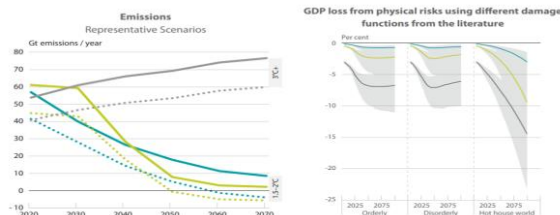
Risk levels based on as-of-today public information and expected evolution per sector



## 2 Define scenarios

Network for Greening the Financial System (NGFS) provides 4 scenarios, with information on **Climate, Macro and Financial-related variables**:

- **Orderly**: Early action to a net zero CO2 emissions economy
- **Disorderly**: Late, sudden and / or unanticipated actions
- **Hot House Word**: Limited actions, increase in temperature
- **Stress**: to be used for 2022 physical risk – drought & heat



## 3 Define Time Horizon

4 different scenarios, in line with ECB climate stress test and NGFS:

- 2022
- 2030
- 2040
- 2050

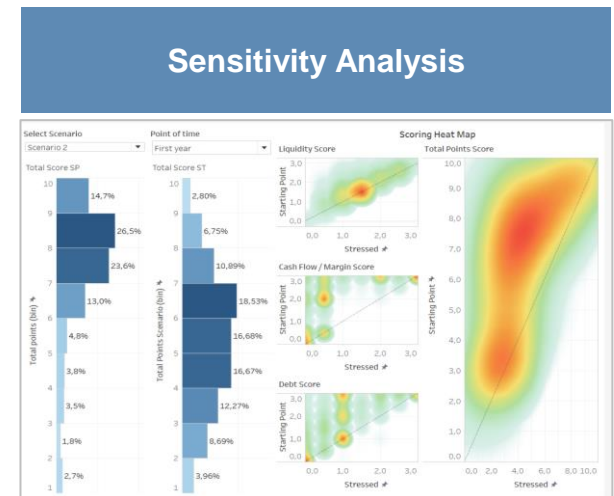
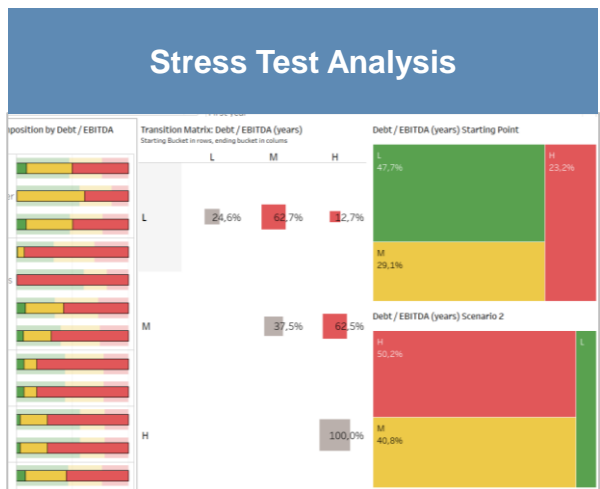
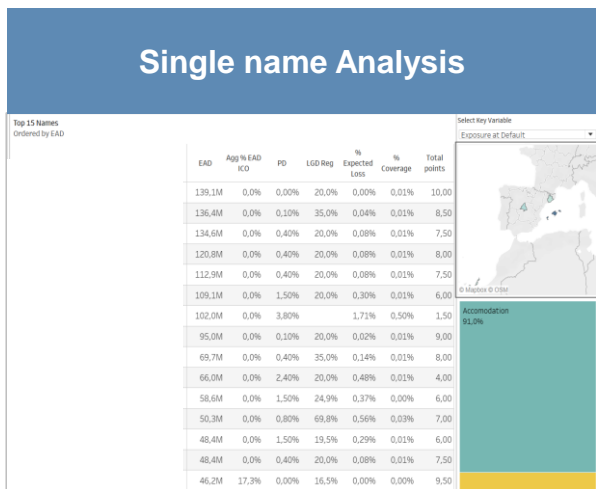
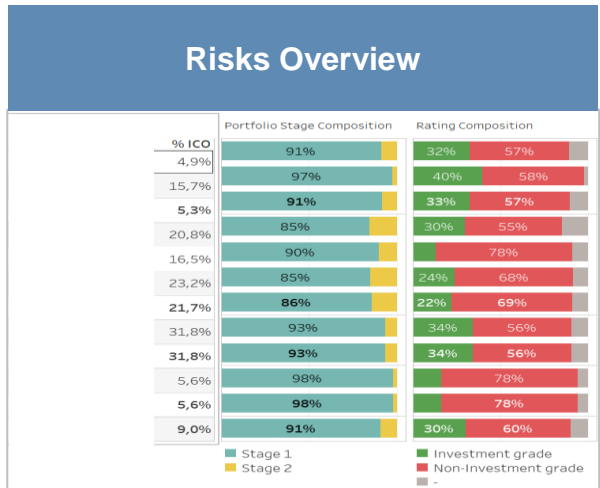
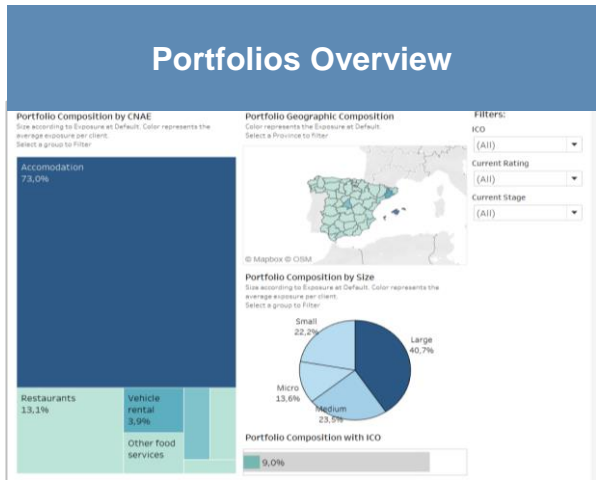


## 4 Translate scenarios to financial impacts and ratios by sector

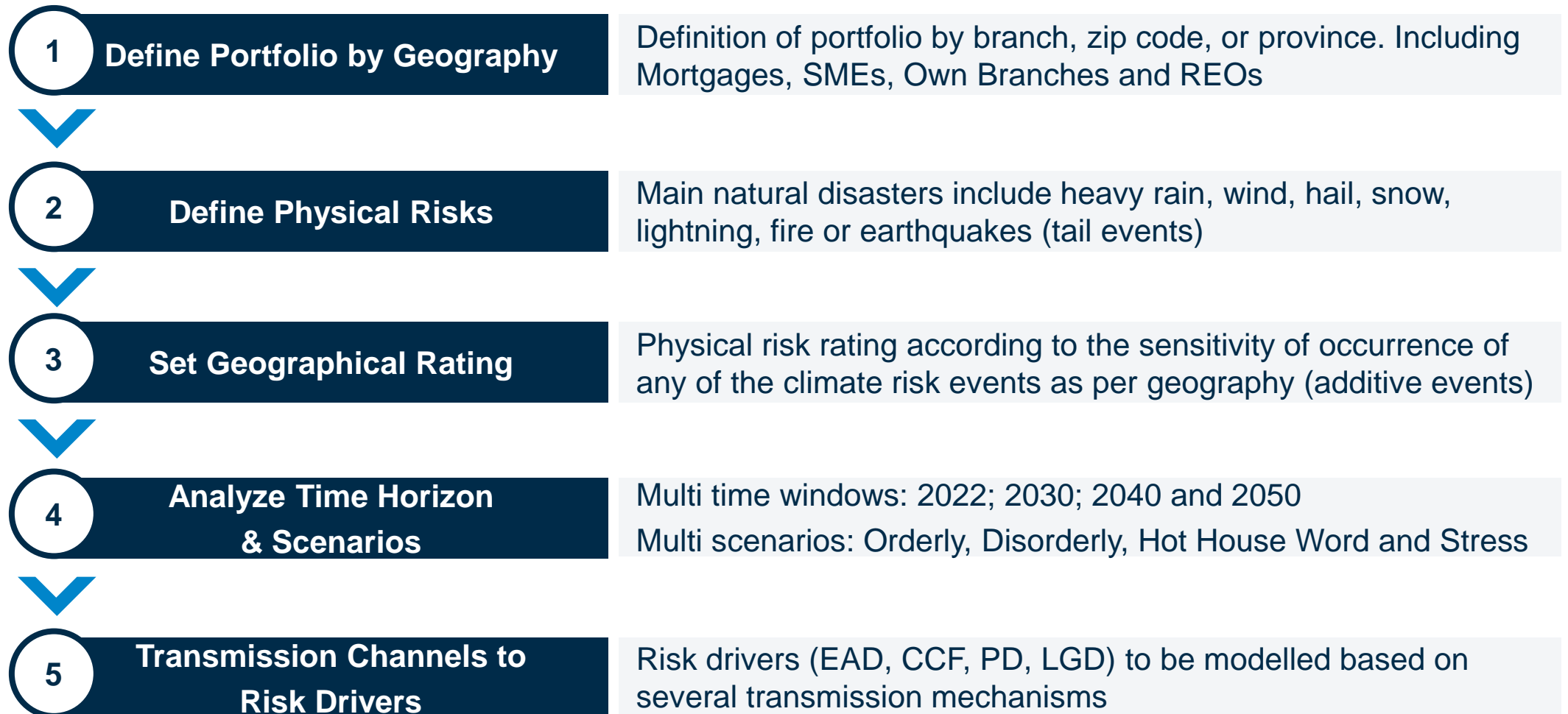
Financial impacts are stressed based on scenario evolution and transmission channels to macro and micro

Risk Level II	Impact	FINANCIAL IMPACTS							
		DEMAND		SUPPLY					
		SALES		OPEX		CAPEX	ONE OFFS	ASSETS	DEBT
		P	Q	P	Q	Amount	Amount	Value	Amount
1.1	Natural Disasters	Neutral	ST Decrease	Neutral	ST Increase	ST Increase	Shock Increase	ST Decrease	ST Increase
2.1	Raising Temperature	Neutral	Neutral	MT Increase	MT Increase	Neutral	Neutral	MT Decrease	Neutral
2.2	Pollution Levels	MT Increase	MT Decrease	MT Increase	MT Increase	Neutral	Neutral	MT Decrease	Neutral
2.3	Raising Sea Level	MT Increase	MT Decrease	MT Increase	MT Increase	Neutral	Neutral	MT Decrease	Neutral
2.4	Longevity	MT Increase	MT Increase	MT Increase	MT Increase	MT Increase	Neutral	Neutral	MT Increase
3.1	Energy Efficiency / Renewable Energy	Neutral	Neutral	ST Increase	ST Increase	ST Increase	Neutral	ST Decrease	ST Increase
3.2	Carbon-neutral transportation	Neutral	Neutral	ST Increase	ST Increase	ST Increase	Neutral	ST Decrease	ST Increase
4.1	Air Emissions Levels	Neutral	Neutral	ST Increase	ST Increase	ST Increase	Neutral	ST Decrease	ST Increase
4.2	Residuals Management	Neutral	Neutral	ST Increase	ST Increase	ST Increase	Neutral	ST Decrease	ST Increase
5.1	Policies to reduce greenhouse gas emissions	ST Increase	ST Decrease	ST Increase	Neutral	ST Increase	ST Increase	ST Decrease	ST Increase
6.1	Production & waste technological change	Neutral	Neutral	ST Increase	ST Increase	ST Increase	Neutral	ST Increase	ST Increase
7.1	Consumer preferences	ST Increase	ST Decrease	Neutral	Neutral	Neutral	Neutral	ST Decrease	Neutral

# Transition Risk Tools (3/3): Components required



# Physical Risk Tools (1/3): Risk Framework

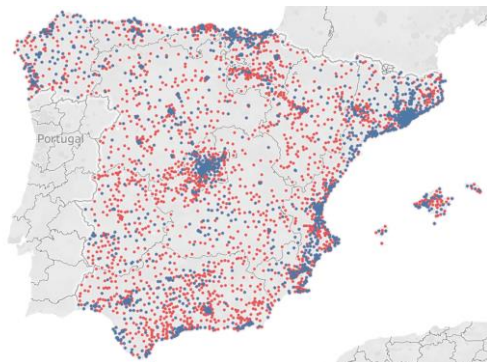


# Physical Risk Tools (2/3): Modelling Approaches

## ① Define Portfolio by Geography

- ✓ Impacted portfolios mostly include mortgages (retail and corporate), branches and REOs
- ✓ Portfolio location is done by branch and postal code

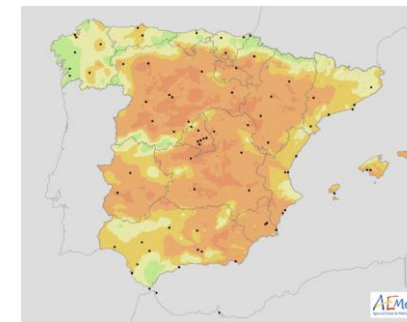
Example of Portfolio Distribution



## ② Define Physical Risks

- ✓ **Main physical risks may** include heavy rain, wind, hail, snow, lightning, fire or earthquakes
- ✓ **Historical physical risk information** are obtained from public sources (AEMET, IGN, MITECO...)

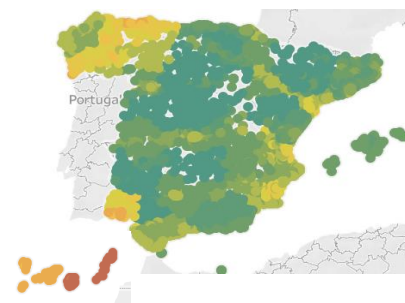
Example of Historical Event Distribution



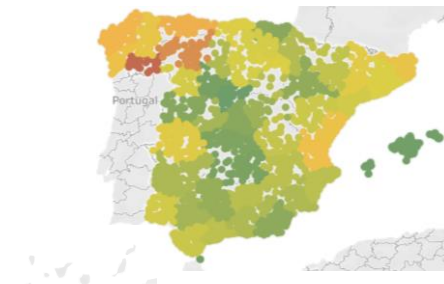
## ③ Set Geographical Rating

- ✓ Physical risk rating according to the **sensitivity of occurrence** of any of the climate risk events as per geography (**additive events**)
- ✓ Based on **proximity to physical events** (longitude and latitude)

Bank Climate Risk Rating



ESPON Environmental Rating



# Physical Risk Tools (3/3): Modelling Approaches

## 4 Analyze Time Horizon & Scenarios

Network for Greening the Financial System (NGFS) provides 4 scenarios, with information on **Climate, Macro and Financial-related variables**:

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4 different scenarios:

- 2022
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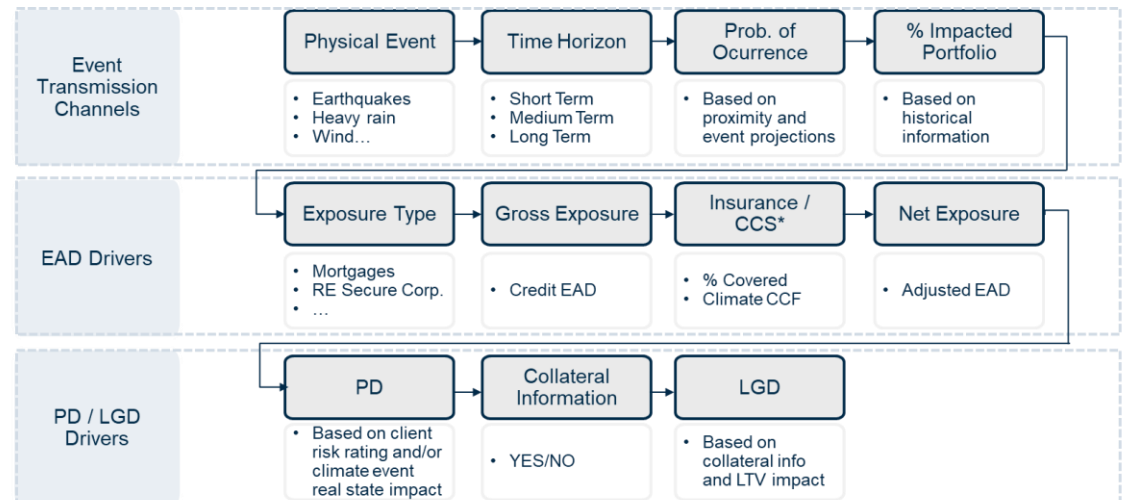
Tabla 5: Cambio en precipitaciones intensas respecto al periodo de control (1991-2020) para tres ventanas temporales (2020-2040, 2040-2070, y 2070-2100) en diversas Demarcaciones Hidrográficas. Datos ANCI procedentes del downscaling del modelo de EUROCORDEX.

CAMBIO RegT (%)	2040	2070	2100
Miño-Sil	33	102	117
Galicia - Costa	38	119	109
Cantábrico Occidental	52	54	83
Cantábrico Oriental	54	66	61
Duero	38	102	16
Ebro	38	85	103
Cuencas Internas de Cataluña	77	113	12
Tago	85	97	145
Guadiana	94	99	125
Júcar	58	11	95
Segura	72	88	126
Guadalquivir	81	83	151
Tinto, Odiel y Piedras	122	134	154
Guadalete-Barbate	85	97	139
Cuencas Mediterráneas Andaluzas	6	94	132

Area	Scenario	Short Term	Mid Term	Info Miteco <sup>1</sup>	Long Term	Info Miteco <sup>1</sup>
		2025	2030	2040	2050	2070
Miño - Sil	Orderly	x1	x1	-	x1	-
	Disorderly	x1.83	x3.65	-	=	-
	Hot House	x1.83	x3.65	x7.30	x8.27	x20.20
Galicia - Coast	Orderly	x1	x1	-	x1	-
	Disorderly	x1.95	x3.90	-	=	-
	Hot House	x1.95	x3.90	x7.80	x9.17	x11.90

## 5 Transmission Channels to Risk Drivers

Risk drivers (EAD, CCF, PD, LGD) to be modelled based on several transmission mechanisms



\* CCS: Consorcio de Compensación de Seguros



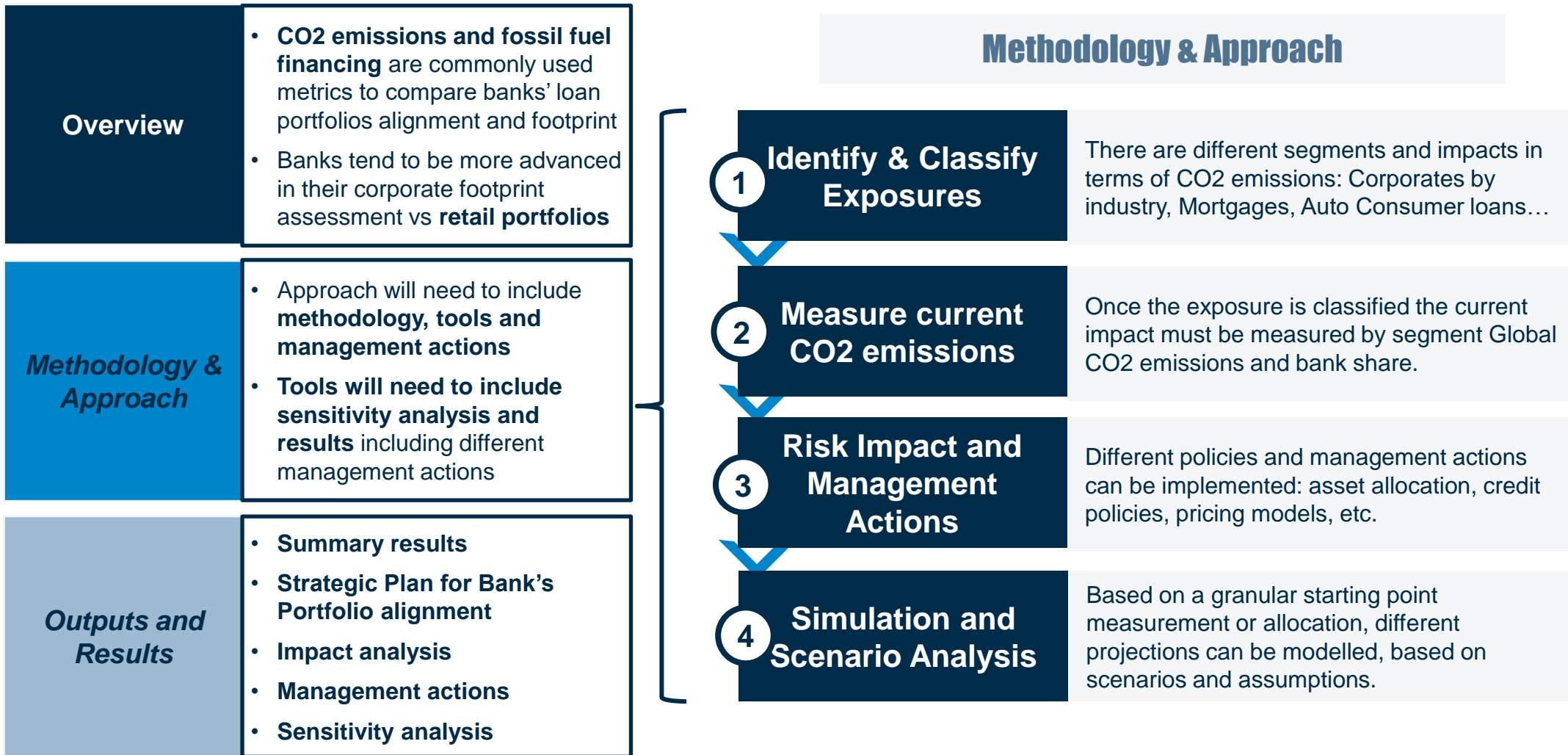
# Portfolio Alignment & Footprint



# Portfolio Alignment & Footprint

✓ Aligned with EBA's Portfolio Alignment Method

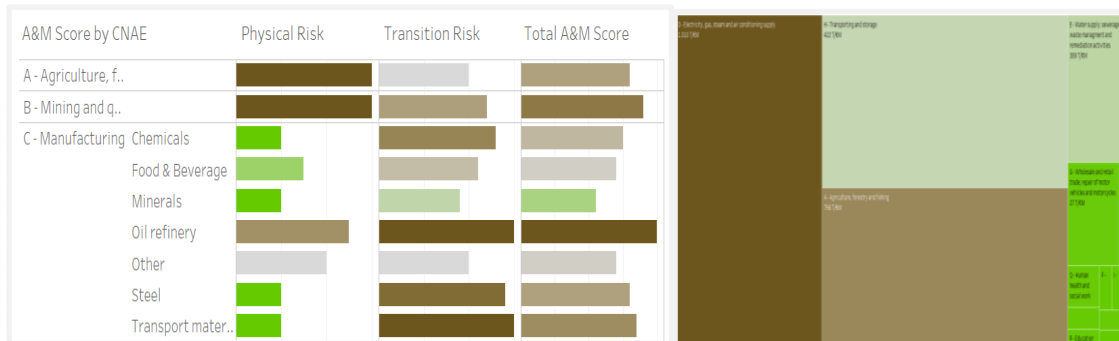
Banks need new methodology for their strategic planning efforts to transition loan portfolios to carbon neutral emissions



# 1 Methodology

## Portfolio Alignment Method

Risk levels based on as-of-today public information and **expected evolution per segment/sector, according to environmental current ratios and goals.**



### 1 Identify & Classify Exposures

There are different segments and impacts in terms of CO2 emissions: Corporates/SMEs by industry, Mortgages, Auto Loans...

### 2 Measure current CO2 emissions

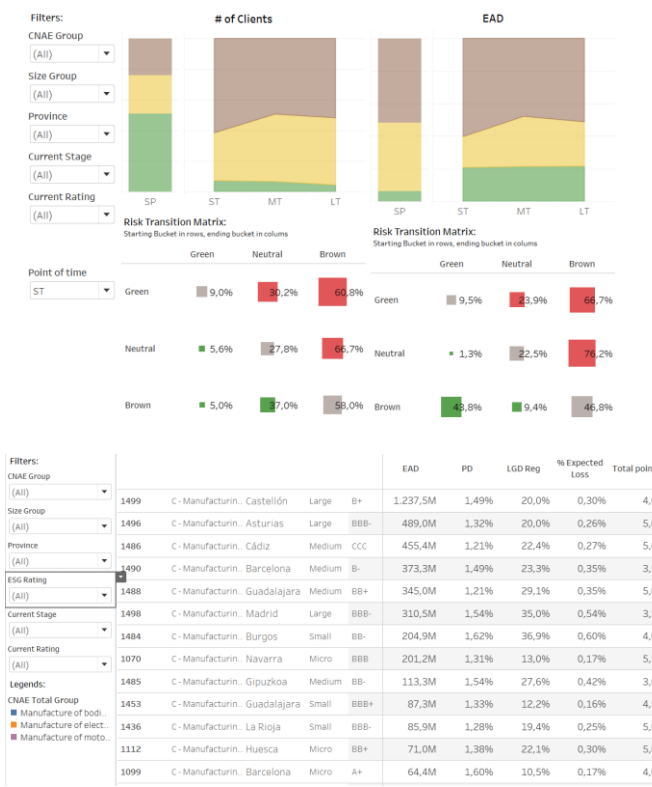
Once the exposure is classified the current impact must be measured by segment Global CO2 emissions and bank share.

### 3 CO2 projections under different assumptions

Based on a granular starting point measurement or allocation, different projections can be modelled, based on scenarios and assumptions.

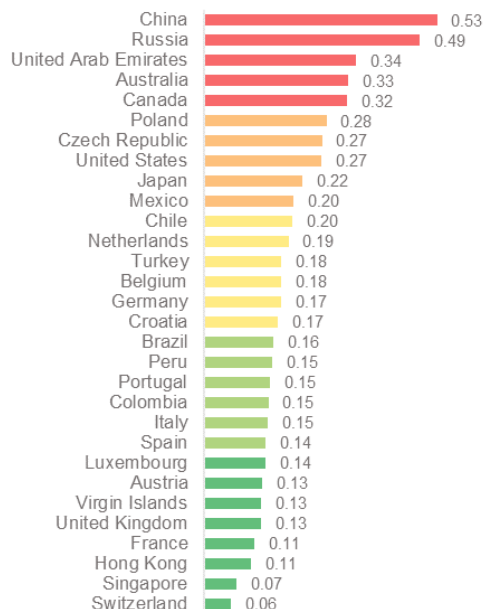
### 4 Risk Impact and Management Actions

Under those scenarios different policies and management actions can be implemented. Asset allocation, credit policies, pricing models



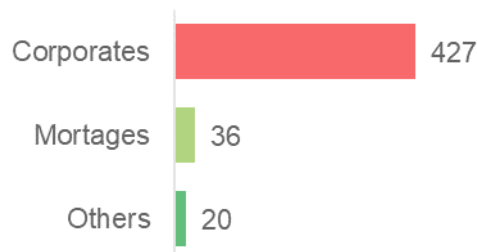
# Case Study: Footprint Assessment for GSIBs by A&M

## 1 Geography CO2 per GDP MM

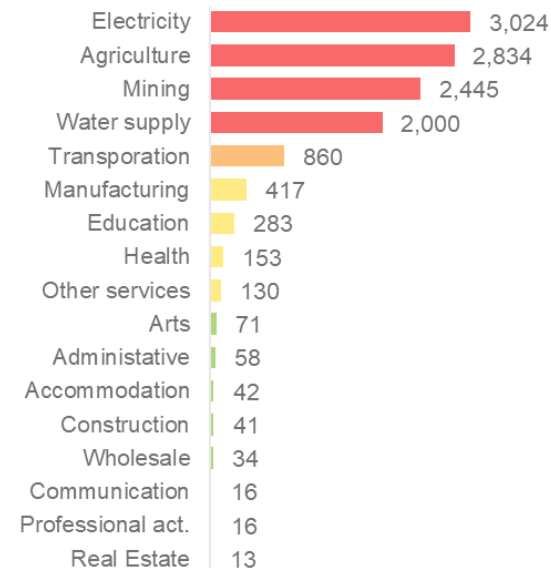


## 2 Asset class CO2 per Gross Exposure MM

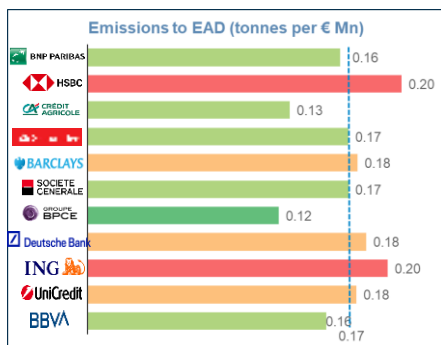
Asset Class	CO2/Gross Exposure
Corporates	427
Mortgages	36
Total	20



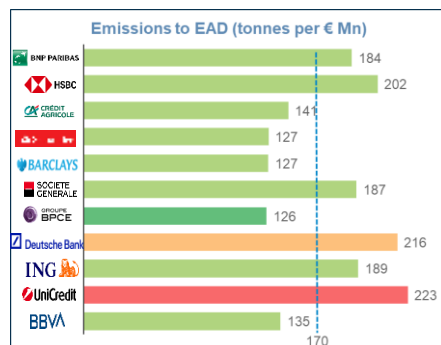
## 3 Industry CO2 per Gross Exposure MM



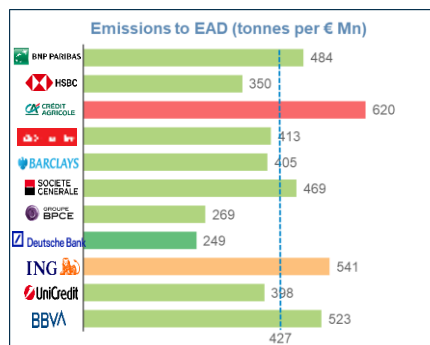
### Geographical ranking Average CO2 geographical weight



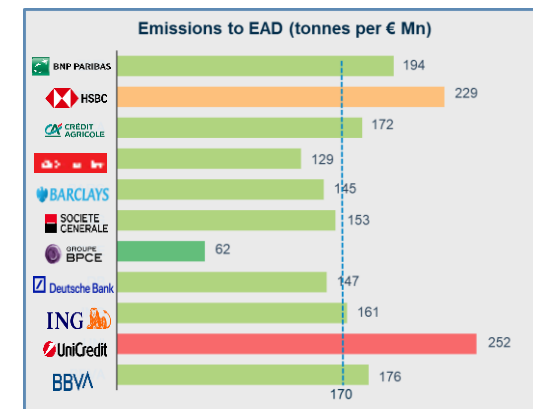
### Asset class ranking Average CO2 asset weight



### Industry ranking Average CO2 industry weight



### Global ranking CO2 per Gross Exposure MM





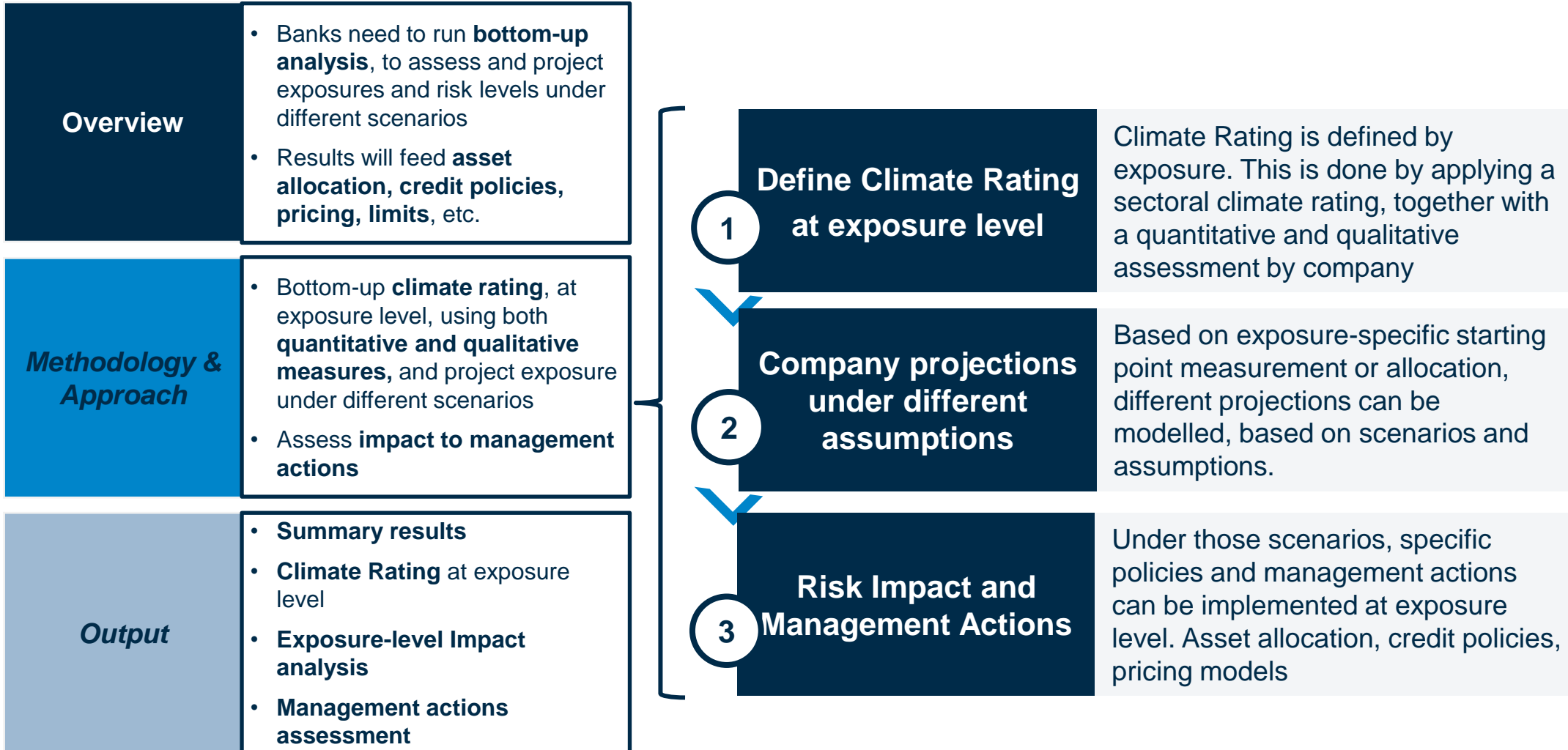
## Integration into Credit Underwriting & Management Processes

# Integration into Credit Underwriting & Management Processes



✓ Aligned with EBA's Exposure Method

Bottom-up climate rating, at exposure level, using both quantitative and qualitative measures, and project exposure under different scenarios are capabilities that Banks need to start building





# Methodology (1/2) : Modelling Approaches

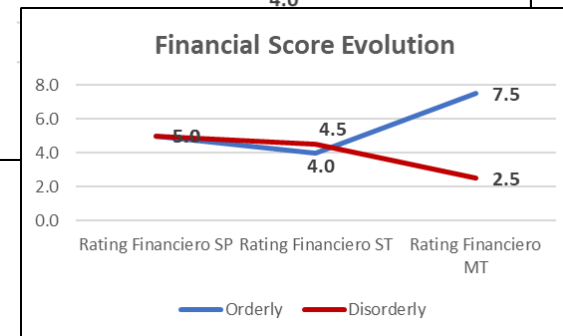
## 1 Define Climate Rating at exposure level



Company specific factor includes a **quantitative assessment** (based on company climate and financial ratios) as well as a **qualitative** one (based on climate governance and management)

## 2 Company projections under different assumptions

SCORE	SP	ST	MT
Transition Cost	M	H	L
Capex/Ebitda	L	M	M
CO2 Emissions	M	H	L
Debt/Assets	L	M	L
Debt/EBITDA	H	L	L
Short Debt/EBITDA	M	M	L
EBITDA/Sales	H	H	M
Staff Cost/Sales	M	M	M
EBITA/Employee	H	H	H
<b>EMPRESA</b>	<b>5.0</b>	<b>4.0</b>	<b>7.5</b>



## 3 Risk Impact and Management Actions

Management Tools	Pricing	Limits	LTV Policies	Green Policies	KRIs Policies
Corporates	✓	✓	✓	✓	
Auto Loans	✓	✓		✓	
Mortgages	✓	✓		✓	✓

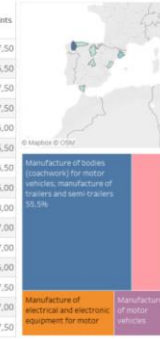


# Methodology (2/2): Integration with Management

## Risk Impact and Management Actions

Analysis can be run at contract (exposure) level. Tailored-climate rating is developed based on company-specific ratios, and project it under different scenarios and time horizons.

				EAD	PD	LOD Req	% Expected Loss	Total points
C-Manufacture	Lugo	Large	A	3,640.1M	1.32%	45.0%	0.59%	7.50
C-Manufacture	Ceuta	Small	BB	1,337.3M	1.61%	41.0%	0.66%	6.50
C-Manufacture	Barcelona	Medium	A	438.2M	1.32%	22.3%	0.29%	7.50
C-Manufacture	Barcelona	Small	BBB	425.7M	1.41%	41.0%	0.58%	7.50
C-Manufacture	Madrid	Large	BBB	244.2M	1.54%	35.0%	0.54%	6.00
C-Manufacture	Castellón	Large	BB+	163.5M	1.49%	20.0%	0.30%	5.50
C-Manufacture	Burgos	Micro	A-	150.8M	1.44%	44.0%	0.63%	6.50
C-Manufacture	Lugo	Micro	BB	114.2M	1.51%	4.6%	0.07%	6.00
C-Manufacture	Barcelona	Micro	BBB+	109.5M	1.34%	33.2%	0.44%	8.00
C-Manufacture	Asturias	Large	BBB	105.1M	1.32%	20.0%	0.26%	7.00
C-Manufacture	Lugo	Micro	BB	103.2M	1.54%	44.0%	0.68%	7.00
C-Manufacture	Barcelona	Micro	A-	99.9M	1.60%	48.7%	0.78%	6.00
C-Manufacture	Cádiz	Micro	A+	97.4M	1.28%	22.8%	0.29%	7.50
C-Manufacture	Gipuzkoa	Small	B	94.1M	1.33%	40.2%	0.53%	7.00
C-Manufacture	Cádiz	Small	BB+	93.1M	1.28%	41.0%	0.52%	7.50



MORTGAGES		CONSUMER LENDING			CORPORATES	
<b>Methodology Proposed:</b>						
Energy Classification	Purpose			ESG Rating		
Risk Classification	Auto	Electronics	Others	Yes	No	
Annual Emissions / Footprint	Car Model	Energy Classification	Risk Classification	Risk Classification	Sector	
Estimations	Risk Classification	Risk Classification		Annual Emissions / Footprint	High Risk / Low Risk	
	Annual Emissions / Footprint	Annual Emissions / Footprint		Estimations	Current Ratios / Risk Classification	
	Estimations	Estimations		Financial Impact	Risk Classification / Annual Emissions / Footprint	
					Annual Emissions / Footprint / Estimations	
					Estimated Ratios / Financial Impact	
					Estimations	
					Financial Impact	
Leverages						
Prices	Prices			Prices	Prices	Prices
Limits	Limits	Limits		Limits	Limits	Limits
LTV policies				KRI policies	KRI policies	KRI policies
Green Products				Green Products	Green Products	Green Products

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