ECB Climate Stress Test 2022

July 2022

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A & M

Summary of Results



EXECUTIVE SUMMARY

First ECB Climate Stress Test delivered manageable results for the banking sector but also highlighted many climate risk management challenges going forward.

1	Stress test overall scorecard ¹ displays considerable gaps	 > Of the 104 banks, 1 scored green, 36 yellow, 53 amber and 14 red. Of the 41 banks that did module 3, 70% amber and 25% red A 51% R 13% > Main issues include data availability and modeling techniques and lack of integration of climate risk into ICAAP and strategy.
2	Quantitative loss impact is manageable	 €70Bn aggregate short term transition losses for top 41 banks compare to €308Bn credit losses on Capital Stress Test 2021. Delta driven by smaller bank sample, exposure coverage (1/3 of total), more benign scenarios and data/modeling limitations
3	Wide range of outcomes leads to high modeling uncertainty	 > Variety of data and modeling techniques drives high dispersion of stress test results (x10 low to high impairment rate range) > This dispersion is also observed when comparing scope emissions data for the same corporate counterparty.
4	Learning nature of exercise will limit capital impact	 Main goals include contribution to the overall SREP, joint learning exercise, foster data/modeling improvements from banks and support upcoming thematic reviews. Exercise will not have a direct quantitative on capital, but instead an indirect impact through qualitative assessment during the SREP process.
5	Banks will now focus on climate as a business opportunity	 > Bank sustainability strategies will evolve from regulatory compliance (stress tests and climate risk expectations) and net zero target setting to a wide array of initiatives to capitalize on the climate transition business opportunity. > Plans for next stress test remain unclear but ECB pressure on climate to increase

ECB Climate Stress Test 2022 Results

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¹The colored scoring combines qualitative and quantitative assessments of banks' submissions across the three modules of the exercise.

Highlights across three stress test modules are presented below with A&M perspectives of bank response priorities going forward.

Module	Highlights		Bank Response Priorities
1	Most material gaps are found under strategy, governance and risk appetite. 59% of banks have not integrated climate risk into their ST framework. Only 22% of sample apply or consider applying dynamic balance sheet and only 24% include liability and reputational risks in their climate framework.	•	Focus on integration of climate risk into 3 year plan and 2023 ICAAP . We expect 50-100bps of climate P2R capital add-ons in the future. Implement independent validation for climate risk modeling Banks will continue to improve integration of climate risk into the end-to-end credit risk management process
2	 Banks have heavily used proxies: 80% of scope 3 emission data and 65% of the EPC rating information. More than 60% of the banks' interest income was derived from business belonging to the 22 carbon-intensive sectors (54% of the EU GVA). G-SIBs and universal banks hold the largest share of exposures to the seven most carbon-intensive sectors. 	•	Improve data quality issues (income, scope 1, 2 and 3 emissions data and EPC information) and introduce data quality scorecards and controls Include Metric 1 and Metric 2 into bank's risks appetite and net zero target KPI setting Develop/access credible client transition plans to improve emission data, visibility of client net zero targets and incentive pricing strategies
3	 €70Bn losses from short-term exercises (3-y disorderly transition + 2 physical risk scenarios) underestimate risk due to bank sample, exposure coverage, scenario, data/modeling limitations and no supervisory overlays. Modest long term losses due to benign scenario and brown sector reduction Flood losses not vey material due to low exposure to high-risk areas, but only 25% included insurance coverage in projections. Mining, construction and agricultural sectors are much most by the drought and heat shock. 	•	Improve short term transition risk modeling including direct and indirect transmission channels of climate variables; and review outliers in climate risk parameters Align long term balance sheet strategies to net zero targets by sector and scenario Improve physical risk modeling and supporting data infrastructure including range and time horizon of scenarios

Overall Climate Stress Test Scorecard¹ displays considerable gaps bank climate risk and stress test capabilities



Bank Response Priorities

- Overall, despite notable progress and banks' ability to provide meaningful input to the exercise, and even considering the "learning" nature of the exercise, the large majority of banks revealed considerable deficiencies.
 - Gaps are greater for 41 banks that executed all 3 modules of the exercise
 - Comparison of quantitative results needs to be taken with caution given disparity of portfolios and business models covered coupled with emerging nature of climate risk data and modeling techniques
- Going forward, banks need to improve their climate stress-testing frameworks and be mindful of the overall associated impacts.
 Integration in business strategy, target setting, risk management and performance will be critical.

ECB Climate Stress Test 2022 Results

Module 1: Main gaps under Governance & Risk Appetite, Methodology and Data



- 59% of banks have not integrated climate risk into their ST framework. From those with a ST framework in place, (a) governance remains an issue, with lack of independence between development and validation (b) 40% do not consider ST outcomes when defining their business strategy, (c) 60% do not disclose or intent to disclose any climate-related result under Pillar III, and (d) 40% do not include Internal Audit in their climate framework.
- Only 22% of sample apply or consider applying dynamic balance sheet and only 24% include liability and reputational risks in their climate framework.

Bank Response Priorities

- Continue to improve climate stress test (CST) framework
 - Supplement **data sources** for counterparty information (emission, climate strategy/targets, asset location, etc.)
 - Sensitivity and scenario analysis including several transmission channels by asset class
 - Dynamic balance sheet approach for both transition and physical risks
 - Inclusion of **all relevant risks** (e.g., liability and reputational)
- Implement independent validation for climate risk modeling
- Integrate climate risk framework
 - Integrated CST framework into ICAAP
 - · Integrated results into business strategy
 - Integrated results into loan granting process and end-to-end credit risk management process

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 Rethink bank's long-term strategy by sector and net zero strategy based on the CST results

Module 2: Widespread use of proxy data for Scope 1, 2 and 3 emissions and EPCs, with major dispersion per counterparty and per sector

Highlights

- Banks have heavily use proxies to complete key data points for Scope 1, 2 and 3 emissions and EPCs. Proxies accounted for more than 80% of scope 3 data.
- Material dispersion of reported GHG intensity, even for the same counterparty.
- On EPC, 17% of collateral was not allocated to any EPC label, and 65% of banks used proxies to calculate EPC rating, approach not enough robust in most cases given the nature and number of assumptions made.
- 65% of the banks' income was derived from business belonging to the 22 carbon-intensive sectors (54% of the EU GVA). Custodians and asset managers, along with G-SIBs), were rather less reliant on income from GHGemitting sectors.
- Top GHG-emitting sectors are mining and quarrying, manufacture of coke and refined petroleum products, manufacture of non-metallic products, electricity, gas and steam. The largest share of income correspond to low-intensive sectors such as construction, wholesale, retail trade and real estate activities.
- G-SIBs and universal banks hold the largest share of exposures to the seven most carbon-intensive sectors.

Bank Response Priorities

- Improve data quality issues (income, scope 1, 2 and 3 emissions data and EPC information) and introduce data quality scorecards and controls
- Include Metric 1 and Metric 2 into bank's risks appetite and net zero target KPI setting
- Develop/access transition plans with clients to improve emission data and visibility of client net zero targets and
 > strategies



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Income per sector (% of total income from 22 NACE sectors in scope) (left-hand scale)
 Median Scope 1, 2, 3 GHG intensity (tCO2 per EUR million) (right-hand scale)

Module 3 – Transition Risk: Manageable projected loan losses due to benign macro scenarios, limited exposure coverage and limitations in data/modeling capabilities

Highlights

- €70Bn losses from short-term exercises (3-y disorderly transition + 2 physical risk scenarios) underestimate risk due to bank sample, exposure coverage, scenario, data/modeling limitations and no supervisory overlays. Credit risk losses on Capital ST'21 accounted for €308Bn. ST disorderly scenario projects losses 73bps higher than baseline.
- Main impacted sectors are refined petroleum products, mining, minerals and land transportation, which experience cumulative oan losses of more than 200 basis points, largely affected by the carbon price short-term shock.
- Long term results show lower loan losses in the orderly scenario than in disorderly or hot house world. Modest losses are a result of mild scenarios and projected reduction in exposures to brown sectors. Weaknesses in bank's data and modeling capabilities affect the accuracy of these results



Bank Response Priorities

- Improve short term transition risk modeling
 - Direct and indirect transmission channels of climate variables
 - Assess outliers in climate risk parameters
 - Develop **bottom-up analysis for large counterparties** based on specific company's strategies and transition paths, combining results with the **top-down** approach
- Align long term balance sheet strategies to net zero targets by sector and scenario
 - Analyze cost/benefit of applying different balance sheet strategies by sector and geography
 - Improve asset location risk of clients under hot house world scenario



Module 3 – Physical Risk: Impacts of drought & heat and flood scenarios are very idiosyncratic depending on industry concentrations and location of real estate collateral.

Highlights

- Banks with material footprint in mining, construction or agricultural activities, are highly impacted by the drought and heat scenario. This shock is especially relevant in regions more vulnerable to high temperatures. Most banks did not incorporate insurance coverage or public natural disaster relief schemes into their projections, which may lead to an overestimation of the total losses.
- Most banks report low allocation of exposures to high flood-risks areas (exposures to high or medium only accounted for 31%). Those high or medium risk exposures represented 31% of the exposure but 50% of total losses. Like in drought and heat shock, less than 25% included insurance coverage or public natural disaster relief schemes into their projections.



Bank Response Priorities

- Improve physical risk modeling and supporting data infrastructure
 - Loss rates and assumptions per scenario type
 - Location data of corporate assets to permit physical risk
 assessment
 - Expand range physical risk scenarios to other events such as fire
 - Extend **time horizon** of physical risk scenarios
 - Automate calculations using granular exposure location data



ECB CST vs. UK CBES – Main Differences (1 of 2)

		UK – CBES 2021		ECB – CST 2022
Scope	•	7 UK Banks and building societies (covering 70% of UK banking lending to UK households and businesses), as well as large insurers	•	104 significant institutions. 41 of them including bottom-up projections
Objectives		Assist participants in enhancing their management of climate-related financial risks; size the financial exposures and the financial system to climate-related risks; understand the challenges in business models; gauge the implications for the provision of financial services	•	Contribute to overall SREP process; joint learning exercise from banks and supervisors; make more information available; prepare banks for upcoming regulatory changes; leverage on ECB's stress testing approach; support other banking supervision initiatives
Scenarios & Exercise		 Scenarios: Early Action and Late Action linked to a net-zero 2050 target, and No Additional Action exploring physical risks from climate change Exercise: (1) 30 year loss projections under the three scenarios for transition risk and physical risk (2) responses to a qualitative questionnaire and (3) management actions by scenario 	•	Scenarios: Orderly and Disorderly linked to a net-zero 2050 target, and Hot House World exploring physical risks from climate change Exercise : (1) questionnaire with 78 questions covering 11 areas; (2) climate metrics benchmarking and (3) bottom-up stress test including 3-year and 30-year transition risk, market risk and 1-year physical risks
Main Impacts	:	Qualitative findings for climate risk management Loss rates in the LA scenario were >2X as a result of climate risks – equivalent to an extra c.£110 billion of transition risk losses during 30 year horizon		Qualitative findings with focus on Governance and Risk Appetite, Data & Methodology. €70Bn from short-term exercises (3-y disorderly transition + 2 physical risk scenarios)
Next Steps	•	Will not be used to set capital requirements related to climate risk. PRA/ BoE undertaking further analysis to determine possible changes on design, use, or calibration of the regulatory capital frameworks Findings will feed into the FPC's thinking around financial stability policy issues related to climate risk	•	Exercise will not have a direct quantitative on capital, but instead an indirect impact through qualitative assessment during the SREP process together with the ECB thematic review Focus will be on business model, internal governance and risk management

ECB CST vs. UK CBES – Main Differences (2 of 2)

	UK CBES 2021	ECB CST 2022					
Most impacted scenario	Late action scenario with loss rates more than doubling the contrafactual scenario as result of climate risk.	Disorderly scenario with delayed but abrupt phasing-in of climate- related transition policies tends to produce the highest cumulated losses.					
Main drivers	Carbon prices are the main driver of the transition - in both transition scenarios (Late Action and Early Action)	Carbon prices are the main driver of the transition					
Corporates, affected sectors	 The more impacted industries in the transition scenarios were: Mining (including extraction of petroleum and natural gas) Manufacturing Transport and wholesale Retail trade These sectors represent 14% of the banks' total corporate exposures. Under the NAA scenario a quarter of the provisions are registered by the sectors more exposed to physical risk 	The most GHG emitting sectors were:1. Mining5. Electricity and energy2. Refined petroleum6. Water transportation3. Chemical7. Air transportation4. MineralThese sectors represent 29% of non-financial corporate exposuresrelated to 22 NACE sectors of the exercise.Under the hot house world scenario banks tend to show a reduction inthe exposure to the most polluting sectors, which for the seven mostGHG-emitting sectors results in lower cumulated loan losses thanunder the disorderly scenario					
Mortgages impacts	Mortgages losses are highest in the NAA scenario , they seem to relate with those areas heavily impacted by flooding. Losses are higher in Late action scenario than in the Early Action scenario, impairment rates are high for properties whose energy efficiency (EPC) ratings are in the lowest two brackets	Mortgages portfolios are not discussed under the Long-term transition risk projections results. In the short term transition risk test they display lower loss rates than corporate exposures. Least energy efficient EPC labels display higher loss rates.					

Examples of Best Practices observed in UK and ECB Climate Stress Tests. ECB will follow up with further guidance on "best practices"

CORPORATES HOUSEHOLDS	
 Modelling sectors in a differentiated way to reflect sector-specific features, for example relating to particular climate-risk vulnerabilities, as in the oil & gas sector. Considering wider market dynamics, including price elasticities of demand and so the extent to which increases in production costs (e.g., from increases in a carbon prices) could be passed on to consumers. This informed analysis of the consequences for revenues. Calculating potential damages by counterparty arising from the wider market. Engaging in thorough outreach with counterparties to assess their climate vulnerability and the feasibility of their adaptation plans – e.g., through pre-populated surveys sent to key counterparty esclere approaches, based on individual counterparty assessments, and top-down ones, based on sector-country assessments. Asseessing potential counterparty vulnerabilities using both bottom-up approaches, based on individual counterparty assessments. 	 Climate risk stress-testing framework: Some banks established robust stress-testing frameworks by the cut-off date, some of which were also included in the ICAAP. They also integrated various transmission channels and asset classes. Sectoral Income: Some banks used counterparty/transaction-level internal data sources for at least 90% of their reported income (both for interest income and fees and commission income). Greenhouse gas (GHG) proxies (Scope 1-2): Some banks incorporated actual emissions data (i.e. reported by firms) in at least 50% of the cases, based on internal collection efforts and purchase of datasets. Also reported using waterfall approaches to proxy the rest of the data. GHG proxies (Scope 3): A few banks reported 1/3 of scope 3 emissions based on actual data; controlling whether obtained S3 emissions include all relevant GHG protocol categories. Credit risk modelling: A few banks considered both direct and indirect transmission channels in line with the scenarios. Also acknowledged the long-term scenario narratives in projections and business strategies. Integrated both physical and transition risks. Performed counterparty level analysis using actual data for a single portfolio; adequate extrapolation techniques using proxies.

ALVAREZ & MARSAL LEADERSHIP. ACTION. RESULTS." Post climate stress tests, bank strategies will evolve from regulatory compliance and net zero target setting to multiple initiatives to capitalize on the ESG business opportunity.

Building Block

Key Elements

Launch of Sustainability programme and unit created to advance capabilities, data, toolsets and disclosures Sustainability Meeting regulatory compliance requirements (e.g. ECB risk management and stress test expectations) Programme Portfolio ESG risk assessment and evaluation

 2 Net Zero Portfolio Targets
 Articulation of net zero targets for financed emissions
 Sustainability strategy, metrics and targets are integrated in the Company's strategic plan with clear ownership and accountability
 Sustainability targets, plans and practices cascaded down to business units / portfolios

> Client management programme linking portfolio alignment targets with client solutions, pricing and tools to support client transition / transformation

> > Focus on ESG big bets, ESG client teams and capabilities

Create vertical transition marketplaces to facilitate client transition

Innovative Business Generation Ideas

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A&M Views

Sustainability

as a Business

Opportunity

The development of net zero portfolio alignment targets have generated bank efforts during 2022 to adequately balance sustainability, risk, profitability and business opportunity.



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Overall Scorecard		Energy		Indu	stry	Real	Estate		Transportation	
1	Coal	Oil and Gas	Power	Cement	Steel	Residential	CRE	Auto	Aviation	Shipping
	氯		緀		•				¥	1

	Total Goal	% coverage										
📾 🔮 BARCLAYS			\checkmark	\checkmark				2023-24		2023-24		
👪 LLOYDS BANK 💏	-50% by 2030		\checkmark	\checkmark								
😹 🔥 NatWest Group		53%	\checkmark			\checkmark	\checkmark	\checkmark	\checkmark			\checkmark
📾 🚺 HSBC												
standard chartered		48%										
🛤 COMMERZBANK 스						\checkmark						
르 Deutsche Bank 🔽			\checkmark									
CREDIT SUISSE			ĺ	<								
🛚 🛣 UBS		43%										
🚺 🛃 BNP PARIBAS			\checkmark									
🛤 BBVA						$\overline{\checkmark}$	\checkmark					
💶 武 CaixaBank												
📼 S antander					\checkmark							
🚺 INTESA 🚾 SNND4OLO		60%	\checkmark	V	\checkmark							
💶 💋 UniCredit												
🚍 🔽 ABN·AMRO			\checkmark									
= ING 🍌								$\overline{\checkmark}$			\checkmark	
Nordeo												

A&M has developed a comprehensive benchmarking tool to compare bank net zero targets across high emitting portfolios.

Bank Overall Net Zero Targets Approach

	Scope	Methods & Benchmarks	Metrics	Targets	Leading Practices
ING 脸	Power, Mortgages, Cement, Steel, Autos, Aviation, Shipping	Meth.: PACTA & SBTi IEA OECD and B2DS	 Emission intensity Absolute emissions 	Cut financing to upstream oil & gas by -19% by 2040. Targeting C or better label on Dutch and German mortgages by 2022	Extensive coverage of retail and corporate sectors Sector views and pathways Business link to client decarbonisation solutions
BBVA	 Power, Autos, Steel, Cement and Coal 	Meth: PACTA IEA Net Zero 2050	Emission intensityAbsolute emissions	 Power cut by -52% 2030 (vs 2020), Autos by - 46%, Steel - 23% and Cement -17% 	Baseline and distance to benchmark of starting point
standard chartered	Oil & Gas, Power, Coal and Steel	Meth.: PCAF & SBTi IEA OECD and CPS	Carbon intensity	 Power cut by -63% 2030 (vs 2020), Coal by - 85%, Steel and mining by -33% (scope 1 &2) and Oil & Gas by -30% 	Methodology overview
BARCLAYS	Energy & Power	Meth.: Own model (BlueTrack) IEA OECD SDS	Emission intensity Absolute Emissions	Absolute energy portfolio emissions -15% by 2025. Power portfolio emission intensity - 30% by 2025	Sector views and pathways and energy mix Methodology overview
JPMorgan Chase & Co.	Oil & Gas, Power, Autos	Meth.: Own model (Carbon Compass) IEA SDS and B2DS	Emission intensity	 Power cut by -69% 2030 (vs 2019), Autos by - 41%, Oil & gas by -35% (scope 1 & 2) and - 15% (scope 3) 	Methodology overview
\lambda NatWest Group	 Oil & Gas, Autos, Agriculture and Mortgages 	Meth.: SBTi and PACTA CCC BNZ and IEA B2DS	Emission intensity	Cut climate impact of all financed emissions by -50% 2019-2030	Use data quality scorecards Sector views and pathways Detailed targets for all portfolios

Deep Dive Net Zero Targets by Bank



Deep Dive Net Zero Targets by Portfolio

	Overall Scorecard		Energy		Indu	stry	Real	state	т	ransportation									
	1		Oil and Gas	Power		Steel	Residential	CRE	Auto	Aviation	Shipping			\mathbf{O}	il e	an	d I	C:	26
			m	套	2 .	•	命		~	¥	<u></u>			U			u	90	13
		Methodology			Emissio	n Metric	Expo	sure	Starting	Point			Targets				% Red	uction	
_	Sector Scope Emission Scope	Standard	Scenario	Target Setting	Absolute	Relative	EAD	Outstanding	MtCO2	C02/EAD	Current	2025	2030	2040	2050	2025	2030	2040	2050
BARCLAYS	Energy S1, S2 and S3		IEA NZE2050		MTCO2				75.8		75,8		45,5				-40%		
LLOYDS BANK	Extraction, trans; S1, S2 and S3		IEA NZE2050	2019 baseline	MTCO2						7,8		3,9				-50%		
NatWest Group	SDA	S1&2 ACA S3 / E	BNZ S1&2 / IE	A NZ S3		tCO2e/TJ is tonn	es of carbon dio	£1,6bn	0,9	531	2,5		1,6				-36%		
HSBC u	lpstream & Integrat S1, S2 and S3		IEA NZE2050	2019 Baseline	MTCO2	Mt CO2e/EJ		\$12,3bn	35,8	2911	68,4						-34%		
standard chartered	S1, S2 and S3	Aug	mented NZE 20	2020 baseline	kgCO2	e/ dollar client rev	venue	\$3,36bn	13,7	4077	3,0		2,1				-30%		
COMMERZBANK																			
Deutsche Bank																			
CREDIT SUISSE	Coal / Oil & Gas S1, S2 and S3			2020 baseline	MTCO2			\$2,6bn	21,9	8423	37,1		18,9		1,11		-49%		-97%
🗱 UBS	\$1, \$2 and \$3		IEA NZE2050	2020 baseline				\$0,7	0,3781	540	0,3781		0,1				-71%		
BNP PARIBAS	pstream and Refining		IEA NZE2050	2020 baseline		gCO2e/MJ					68	<61				-10%			
	Oil extraction				Exposure											-20%			
SOCIETE CENERALE	Oil extraction		IEA SDS 2020		Exposure											-10%		-27%	
BBVA																			
CaixaBank																			
🔌 Santander																			
INTESA 🔟 SANDIOLO) S1, S2 and S3		IEA NZE2050	2019 baseline		gCO2e/MJ					64		52 to 58						
🖉 UniCredit																			
ABN-AMRO																			
ING			IEA (WEO) SDS	2020	Exposure			€3,6bn								-12%	-19%	-53%	-69%
Nordea	S1, S2 and S3				MTCO2				4										
	Overall Scorecard	Coal	Energy Oil and C	ias Power	Cement	ndustry Steel	Residentia	al Estate d CRE	Auto	Transportation Aviation	n Shipping			Ρ	ow	/ei	r		
		Methodolo	gy		Emi	sion Metric	E	xposure	Start	ing Point			Targets				% Re	duction	
	Sector Scope Emission S	cope Standard	d Scenari	o Target Settir	Absolute	Relative	EAD	Outstanding	MtCO2	C02/EAD	Current	2025	2030	2040	2050	2025	2030	2040	2050

	Methodology			Emission Metric Exposure Starting Point			ng Point	Targets					% Reduction							
	Sector Scope	Emission Scope	Standard	Scenario	Target Setting	Absolute	Relative	EAD	Outstanding	MtCO2	C02/EAD	Current	2025	2030	2040	2050	2025	2030	2040	2050
BARCLAYS		Scope 1		IEA NZE2050			KgCO2/MWh			320							-	50% to -69%		
LLOYDS BANK				Govt Policies			gCO2/KWh							75						
🛱 👌 NatWest Group			SDA / PCAR	F UK CCC BNZ			KgCO2/MWh		£3.5bn	1,7	546	258,5		53				-79%		
HSBC	Upstream	Scope 1 and 2		IEA NZE2050			Mt CO2e/TWh		\$11,2bn	10	813	0,55		0,14				-75%		
		Scope 1 and 2		Augmented NZE 2	0 2020 baseline	kgCC	12e/ dollar client re	venue	\$3,9bn	7,7	1974	3,67		1,4				-63%		
COMMERZBANK																				
Deutsche Bank																				
CREDIT SUISSE																				
UBS Upstream	, Operat and D	Iov S1, S2 and S3		IEA NZE2050			KgCO2/MWh		\$1,2			238		121,4				-49%		
BNP PARIBAS			1	IEA net-zero scena	ar 2020 baseline		gCO2/kWh					208	<146				-30%			
SOCIETE GENERALE				IEA SDS 2020	2019 Baseline		gCO2/kWh					260	212		67		-18%		-75%	
				IEA NZE2050	2020 baseline		KgCO2/MWh					249		120,0				-52%		
🗖 ズ CaixaBank																				
🗖 🌢 Santander					2019 Baseline		t CO2e/MWh					0,29		0,11				-62%		
INTESA 🔽 SANDAOLO				IEA NZE2050	2019 baseline		kgCO2e/MWh					214		110				-49%		
🛚 💋 UniCredit																				
a 🚺 ABN-AMRO																				
	ower generati	on		IEA (WEO) SDS 2	0: 2020		KaCO2/MWb		€7.3bn			210		200	120	80		-5%		

Banks are now focusing on Sustainability as a Business Opportunity with multiple waves of complexity and innovation underway.



Sustainability as a Business Opportunity - Some leading industry practice examples

Busi	ness Opportunity	,	Bank	Practice
		Green Products		Extensive green product offering across retail, SME and Corporate
	Financing the Transition	ESG Linked Pricing	BARCLAYS	 £100bn target of green financing of which £62bn already provided across multiple green financing solutions for clients
		Portfolio Alignment Tool		 Developed BlueTrack Proprietary Portfolio Alignment tool
		Carbon Footprint Tool		 Client access to green Building Tool in collaboration with CFP Green Building which offers C02 footprint data and identify/optimize retrofit plans
	Transition Analytics	Transition Playbook	LLOYDS BAINK (
		Transition Planning Tool	HSBC	 Sustainability assessment tool provides to help clients design sustainability plan and identify efficiency recommendations and transition actions
	ESG Teams and	ESG Advisors	INTESA 🕅 SANPAOLO	 100 dedicated ESG experts with 15 ESG regional hubs across country
	Thought	Training	💫 NatWest Group	 Trained more than 500 leaders in Cambridge's Sustainability Program
	Leadership	Research C	redit Suisse 🔌 🟂 UBS	Dedicated ESG research teams, research institute, ESG risk radar, etc.
		Climate Tech Investments	BARCLAYS MARIBA	 Direct equity investments in climate tech and sustainable venture capital
- <u>`</u> Q́-	Innovative Solutions	Marketplace	SaveMoney CutCarbon	 Digital end-to-end platform for SME real estate asset greening & retrofit
-		JV and Circular Economy	📣 Santander	 JV with Enel for solar panels and buys WayCarbon ESG consulting

A&M has developed a proprietary tool ET^2 Value to quantify financial cost-benefit analysis of transition plans that can be used by bank clients.

How does it work?

ET² Value assessment process consists of four steps (see Annex 1 for further details).

Emission Intensity



We start with the evaluation of the company business model and its reliance to CO2 intensive income sources. We calculate CO2 emission intensity per unit of EBITDA created

Green / Stranded Value We compare CO2 emission intensity metrics

against pre-defined country and sector benchmarks. We then calculate ESG stranded or green value based on the intensity distance between the company and the benchmark. If the company's intensity is above benchmark, the excess is considered stranded value. if it is below, the deficit is defined as green value.



We estimate forward looking transition cost required by each company to become net zero by 2050. We use CO2 emission pathway targets and calculate the net present value of Opex / Capex required to transition.

Transformation Plan

Transition Cost



Check Video Link https://youtu.be/yTRaZS50678

- Can be used to develop **tailored transition** plans and end to end solutions for corporate clients
- **Client Transition Framework using industry** net zero pathways and best practices to facilitate benchmarking, engagement and communication
- Prioritises **solutions** by bringing together financial and operational business cases
- Can be used to monitor transition plans, track progress and offer solutions over time

ET2 Value has been tested for

- CAC40 Companies
- Global auto supplier industry
- Global Oil and Gas
- Global Steel
- **Commercial Real Estate**
- IBEX 35



A&M is also working on ESG Marketplaces to brings corporates, investors, start-ups and banks together to promote, enable, finance and accelerate transition to net zero.





UK vs. ECB Climate Stress Test

Appendix 1

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Orderly scenario losses are lower than disorderly and hot house scenarios in both tests. Loss amounts are not comparable due to different scope, timing horizon and methodology.



Projected bank credit losses were greatest in the Late Action scenario, with loss rates more than doubling as a result of climate risks. That is equivalent to an extra c.£110 billion of losses over 30 years, of which around 40% is realised during the first five years of transition. These losses compare to 3year credit impairments of £90bn in the 2021 Solvency Stress Test. Projected loan losses per decade in the long-term scenarios

(% of performing exposures in each decade)



ECB CST 2022

- Projected loan losses under the orderly scenario are lower than those both under a disorderly transition scenario and under a scenario with no transition policies
- Banks reported €70bn of aggregate losses under the 3 short-term exercises
 - €53bn losses reported under the short-term disorderly transition scenario
 - €17bn losses reported under the short-term physical risk scenarios (drought & heat risk and flood risk)

Comparison of climate loss rates across asset classes are inconclusive due different time horizons used. Corporate exposures seem the most sensitive to climate shocks.



- Corporate losses increase substantially as a result of the impact of higher carbon prices. By contrast, mortgage losses are relatively muted in the early action scenario but increase substantially in the late action scenario as a result of rising unemployment together and falling house prices.
- The highest impact is observed for corporate exposures not secured by real estate and those secured by real estate but not within the scope of the EPC in the disorderly scenario

Both climate stress test provide insightful benchmarks of climate risk associated to high emitting sectors.



 Unsurprisingly, some of the most carbon-intensive industrial sectors, and those most exposed to physical risks, account for a disproportionate share of projected corporate credit losses.

ECB CST 2022

Losses from 22 GHG-intensive sectors increase significantly in a short-term disorderly transition scenario

Cumulative loan losses in the short-term disorderly vs baseline scenario by 2024



The increase is mainly driven by the most carbon-emitting sectors, such as refined petroleum products, mining, minerals and land transportation, which experience cumulated loan losses of more than 200 basis points, reflecting the steep increase in carbon prices required to reach a net zero economy within a short time horizon They also provide insightful exposure reduction benchmarks by sector indicating the speed at which banks are transitioning to net zero for their financed emissions.

	UK CBES 2021
Chart 5.1: Banks plan to red Indicative net changes in banks' of	luce lending to carbon-intensive industries drawn balances to selected sectors in the CBES scenarios (<u>a</u>)
Early action No action No additional action	
Electricity and gas supply	
Construction	
Water supply	
Trade of vehicles	
Vehicle manufacturing	
Petroleum manufacturing	
Petrol and natural gas extraction	
Mining and quarrying	
-6	0 -40 -20 0 20 40 60 80 Per cent

 In response to the scenarios, banks planned to reduce lending to some of the most carbon-intensive corporate sectors, in line with existing commitments to reach net- zero financed emissions by 2050.

ECB CST 2022

Banks project decreasing exposures to most carbon-emitting sectors, which mitigates to some extent the cumulated loan losses under the disorderly and hothouse world scenarios

Cumulative loan losses in the period 2030-2050 (LHS) and exposure changes (RHS) in the long-term scenarios to 2050

(% of performing exposures)



 The assumed exposure reduction is particularly pronounced under the Hot house world scenario (e.g. a 50% decline compared with the orderly scenario for the electricity and energy sector), which for the seven most GHG-emitting sectors results in lower cumulated loan losses than under the disorderly scenario.

Both climate stress test provide insightful benchmarks of climate risk associated to mortgage EPC labels.



UK CBES 2021

Figure 4.6: Impairment rates were much higher for properties with the lowest potential EPC ratings

Aggregate impairment rates by current and estimated EPC ratings (EA) (\underline{a}) (\underline{b})

Potential EPC rating	Current EPC rating		
	A-C	D and E	F and G
A-C	1.4%	1.4%	1.9%
D and E		1.1%	1.6%
F and G			35.8%

Projected total corporate loss rates from individual banks spanned a wide range, with the highest estimates typically being around twice as large as the lowest across scenarios.

Impairment losses for each EPC rating class higher in the short-term disorderly scenario than in the baseline

ECB CST 2022

Cumulative loan losses in the short-term disorderly vs baseline scenario by 2024

(basis points of the REA of exposures in scope)



While the overall exposure allocation to various EPC categories does not show significant concentration in any of them, as expected the increase in loan losses is most pronounced for the lower-rated and unknown categories

25

Dispersion of stress test outcomes are sign of large model/data proxy estimation risks and lack of industry standards as seen by wide range of impairment rates and emission data.

Chart 4.5: Projected losses on shared counterparties spanned a wide range Change in impairment rate on banks' lending to shared corporate counterparties (a) Minimum Average Maximum Percentage points 18 16 2.31x 2.27x 16 14 12 10 8 6 4 2.021x 0.22x 0 Early action Late action

UK CBES 2021

 Projected total corporate loss rates from individual banks spanned a wide range, with the highest estimates typically being around twice as large as the lowest across scenarios.

Dispersion of reported Scope 3 GHG intensity per counterparty



ECB CST 2022

 Estimating Scope 3 emissions using various proxy techniques leads to a high dispersion of the data reported (see Chart B). This dispersion is also observed when comparing the Scope emissions data from various data providers for the same corporate counterparties.

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RANGE OF BEST PRACTICES

Both exercises introduce physical risk maps showing the heterogeneity flood risk and other physical risks within countries and across Europe.



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ECB CRST Results in Detail

Appendix 2

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MODULE 1: Main gaps under Governance and Risk Appetite, Data & Methodology

Preparedness across key components of climate risk stress-testing frameworks



Banks' scores in Module 1 per block

(percentage share of participating banks)

59% of banks have not integrated climate risk into their ST framework. From those banks with a ST framework in place: •

Governance remains an issue, with lack of independence between development and validation

Most material gaps are found under Governance and

Risk Appetite, Data & Methodology.

- Around 40% do not consider climate stress test • outcomes when implementing their business strategy
- 60% do not currently disclose or intend to disclose • climate ST results under Pillar III
- 40% do not currently involve the internal audit • function in reviewing the framework.
- A large share of banks do not use climate risk ST outcomes to inform their business strategies.
- Only 22% of the banks apply or are considering applying a **dynamic balance sheet approach** for both transition and physical risk.
- Only 24% include liability and reputational risks in the climate-testing framework.

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Sources: Bank submissions and ECB calculations.

MODULE 2: Overall, banks have made widespread use of proxy data for Scope 1, 2 and 3 emissions and EPCs, with major dispersion per counterparty and per sector

Dispersion of reported Scope 3 GHG intensity per counterparty



Sources: Bank submissions and ECB calculations.

- Overall, banks have heavily use proxies to complete key data points for Scope 1, 2 and 3 emissions and EPCs. Proxies accounted for more than 80% of Scope 3 data and 65% of the EPC rating information.
- Material dispersion of reported GHG intensity, even for the same counterparty. Left graph shows dispersion of reported Scope 3GHG intensity per counterparty.
- On EPC, 17% of collateral was not allocated to any EPC label, and 65% of banks used proxies to calculate EPC rating, approach not enough robust in most cases given the nature and number of assumptions made.

Interest income and fee and commission income per sector from 22 carbon-intensive industries and median of the Scope 1, 2 and 3 GHG intensity

(percentage share; tCO₂ per EUR million of revenue)



Sources: Bank submissions and ECB calculations.

- The 22 industries selected represent around 54% of the EU economy in terms of gross value added. It represents more than 60% of the sample banks' interest income.
- The largest share of income correspond to low-intensive sectors such as construction, wholesale, retail trade and real estate activities.
- Top GHG-emitting sectors are mining and quarrying, manufacture of coke and refined petroleum products, manufacture of non-metallic products, electricity, gas and steam.

MODULE 2: Data shows material differences in GHG intensity by sector and across banks' business models



Sources: Bank submissions and ECB calculations.

Note: The figures represent the median GHG emission intensity (Scope 1+2 and Scope 3 respectively) of companies reported by all participating banks across the 22 sectors.

- Top GHG-emitting sectors are mining and quarrying, manufacture of coke and refined petroleum products, manufacture of non-metallic products, electricity, gas and steam.
- Collecting Scope 3 data is essential as it is the dominant scope by carbon intensity (see S3 GHG intensity).

Business model differentiation by carbon intensity of the corporate portfolio (x-axis) and exposures to seven most carbon-intensive sectors (y-axis)



Sources: Bank submissions and ECB calculations.

Notes: The x-axis describes the median exposure-weighted average of the GHG emission intensity (Scope 1, 2 and 3) of counterparties reported by banks per business model. The y-axis describes the median share of exposures to the top seven most GHG-intensive sectors in the total exposures reported by banks per business model. The top seven most GHG-emitting sectors are mining and quarrying (B05-B09) and manufacture of coke and refined petroleum products (C19), followed by manufacture of non-metallic products (C23, e.g. cement), electricity, gas, steam and air conditioning supply (D35), water transportation (H50), manufacture of chemical products (C20) and manufacture of metal products (C24-C25).

 By emission intensity (measured as weighted average of the GHG emission intensity based on Scope 1, 2 and 3 emissions), results show material differences across business models: G-SIBs and universal banks hold the largest share of exposures to the seven most carbon-intensive sectors.

MODULE 3: Modest projected loan losses in short and long terms due to benign macro scenarios, projected exposures reduction and limitations in data/modeling capabilities

Projected loan losses under the orderly scenario are lower than those both under a disorderly transition scenario and under a scenario with no transition policies (Hot house world)

Projected loan losses per decade in the long-term scenarios



(% of performing exposures in each decade)

Sources: Bank submissions and ECB calculations.

- Orderly scenario will lead to much lower losses compared to a disorderly or hot house scenario.
- Disorderly scenario projects much lower losses vs. capital ST'21 due to several reasons: different scope, benign macro indirect scenario, data/modeling limitations from banks and no supervisory overlays.
- Weaknesses in bank's data and modeling capabilities affect accuracy

Banks project decreasing exposures to most carbon-emitting sectors, which mitigates to some extent the cumulated loan losses under the disorderly and hothouse world scenarios

Cumulative loan losses in the period 2030-2050 (LHS) and exposure changes (RHS) in the long-term scenarios to 2050

(% of performing exposures)



Sources: Bank submissions and ECB calculations.

 Most banks do not report significantly different balance sheet projections across the three long-term transition scenarios. And those who project a dynamic balance sheets materially reduces their exposure in brown sectors (see above graph by sector) without a clear strategy in place.

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MODULE 3: Certain sectors accumulate most of the losses in the short-term. In the long-term, only high-level mitigations objectives and little sensitivity across scenarios.

Losses from 22 GHG-intensive sectors increase significantly in a short-term disorderly transition scenario

Cumulative loan losses in the short-term disorderly vs baseline scenario by 2024





Sources: Bank submissions and ECB calculations. Note: REA stands for risk exposure amount.

- Under the short-term disorderly transition scenario, banks show an increase in cumulated impairments of 73 basis points vs. baseline.
- Main impacted sectors are refined petroleum products, mining, minerals and land transportation, which experience cumulated loan losses of more than 200 basis points, largely affected by the carbon price short-term shock.

Institutions' long-term strategies

(percentage growth between 2021 and 2050)



Sources: Bank submissions and ECB calculations.

- Most most banks (67%) provided quantitative information on green bond acquisition, but only 15% provided such information at sector level.
- 59% of banks described significant actions as part of their corporate balance sheet, but most of them (61%) do not cover concrete targets.
- Regarding key indicators, only one-third of banks provided information at global level, while just a 5% provided information at sector level.
- While many banks indicated a reduction of exposures to the most GHG-emitting sectors in the long term, banks showed little sensitivity across scenarios.

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Accumulated loan losses under the drought and heat scenario

MODULE 3: Banks with material footprint in mining, construction or agricultural activities, are highly impacted by physical risks' shocks

Loan losses in the drought and heat vs baseline scenario (basis points of the REA of exposures within scope per sector) 100 80 60 40 20 Wholesale d retail trade Storage and post Forestry Mining Electricity and energy Water collection Construction Land Water eal estate Fumiture lectronics and machinery Crop and animi production Basic metal Chemic and rubber Miner d petroleu roducts Aotor vehicl Agricultural Manufactures Transportation activities

Sources: Bank submissions and ECB calculations. Note: REA stands for risk exposure amount.

- Banks with material footprint in mining, construction or agricultural activities, are highly impacted by physical risks' shocks.
- This shock is especially relevant in regions more vulnerable to high temperatures.
- Most banks did not incorporate insurance coverage or public natural disaster relief schemes into their projections, which may lead to an overestimation of the total losses.

b) Cumulative loan losses under the flood scenario

(basis points of REA of exposures within scope per region)

Mortgages

Corporate exposures Secured by real estate



Sources: Bank submissions and ECB calculations. Note: REA stands for risk exposure amount.

- Most banks report low allocation of exposures to high flood-risks areas (exposures to high or medium only accounted for 31%).
- Those high or medium risk exposures represented 31% of the exposure but 50% of total losses.
- Like in drought and heat shock, less than 25% included insurance coverage or public natural disaster relief schemes into their projections.



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