Estimating Carbon Footprints in the Insurance Industry

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Updated data as of March 2024

1. Introduction and Key Findings

Contrasting global warming requires a concerted effort from societies worldwide. How can the insurance sector contribute to these decarbonization efforts? One obvious way for insurers to actively support the transition to a low-emission economy is by reducing their own carbon footprint. There are many means to achieve this goal, such as converting to energy-efficient office buildings or implementing paperless business processes.

Insurers can also use their underwriting policies to incentivize policyholders to reduce risks by adopting adaptation and prevention measures to decrease their carbon footprint. This can be done through risk-based insurance premiums, requiring certain prevention measures as a condition of insurability, and other contractual clauses. EIOPA's recent survey on Impact Underwriting[2] highlights the progress made by the European insurance industry in promoting risk underwriting activities, prevention measures, and adaptation to climate change within their underwriting activities. These are tangible advancements, but further steps are needed. In particular, EIOPA emphasizes the need for improvements in standardizing the inclusion of climate adaptation measures in insurance contracts. This could be

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[2] The report is available on the website: https://www.eiopa.europa.eu/impact-underwriting-eiopa-reports-insurers-use-climate-related-adaptation-measures-non-life-2023-02-06_en..

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facilitated through certificates and risk-based programs, ensuring a more consistent approach across the industry.

Alongside risk management aspects, the role insurers play as institutional investors is crucial. The transition to a carbon-neutral economic model requires long-term financing, and insurers are among the largest institutional investors and play a key role in this field: according to some estimates, global insurance assets are over 15 times greater than the annual private sector financing needed to achieve all the United Nations Sustainable Development Goals.[3]

Insurance companies are at the forefront of sustainable investments, taking concrete actions such as implementing sustainability-related information, standards, and strategies in their portfolios. According to IVASS data, [4] almost all companies report having adopted or planned to adopt investment or underwriting strategies integrating ESG factors and have implemented various organizational interventions for this purpose. Two-thirds of the undertakings report having adopted one or more international standards in investment decisions. [5]

As of the fourth quarter of 2023, the investment portfolio amounts to €961 billion. Investments related to separate accounts amount to €701 billion, the majority of which are Italian government bonds (34%) and corporate bonds (approximately 19%), while investments held for unit-linked policies amount to €260 billion, of which 85.5% are represented by investment funds.

The value of the direct portfolio represents 66% of the total investment portfolio and amounts to approximately €634 billion, primarily composed of government bonds, followed by corporate bonds and other investments. Over the last three years, with the advent of the European Regulation governing disclosure in the field of sustainable finance (SFDR), companies have begun reporting sustainable investments in their portfolios, increasing the share in green instruments and social bonds. Despite the positive trend observed globally, the issuance of green bonds is currently still limited compared to overall bond issuance.[6] This restricts companies'

[3] Braun, A., Utz, S. & Xu, J. Are insurance balance sheets carbon-neutral? Harnessing asset pricing for climate change policy†. Geneva Pap Risk Insur Issues Pract 44, 549–568 (2019). https://doi.org/10.1057/s41288-019-00142-w.

4 IVASS(2023), Rapporto 2023 Rischi da catastrofi naturali e di sostenibilità: monitoraggio annuale available on the website https://www.ivass.it/pubblicazioni-e-statistiche/pubblicazioni/stabilita-finanziaria/2023/esg-2023/index.html.

[5] According to the already mentioned IVASS survey, the most cited standards are the United Nations Principles for Responsible Investments (UNPRI), adopted by 49% of companies, followed by the United Nations Global Compact (33% of companies) and the United Nations Principles for Sustainable Insurance (UNPSI, 17% of companies). Other companies have explicitly stated alignment with the goals of the Paris Agreement, the United Nations Framework Convention on Climate Change during COP 27 and COP 26.

[6] Greening the bond markets: MEPs approve new standard to fight greenwashing | News | European Parliament (europa.eu).

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investment strategies in sustainable emissions, which are still a limited component of the direct portfolio.[7]

The value of the indirect portfolio in the last quarter of 2023 amounts to €327 billion, of which approximately 80% is invested in traditional funds (mainly in bond and equity strategies) and 20% in alternative funds. The analysis of the delegated component in 2023 highlights that 61% of the analysed companies' funds are classified as Articles 8 and 9 under the SFDR, with a value of approximately €154 billion, an increase from previous years. Almost all of the value of ESG funds held by insurance companies is classified as Article 8 SFDR (light green). [8]

Despite the importance of the role of the insurance sector, there is a lack of shared indicators to measure the carbon footprint of the insurance sector as a whole. These indicators could play a fundamental role in facilitating and accelerating the green transition through:

- Standardizing the assessment of sustainability initiatives and measuring progress over time.
- Defining objectives and standards, thereby guiding industry efforts towards a common goal.
- Facilitating investment decisions, allowing investors to allocate their capital towards initiatives or projects that meet established sustainability benchmarks.
- Informing public policies and, in turn, helping policymakers develop effective regulatory policies that incentivize innovation in green technologies and guide sectors towards sustainable development.
- Promoting transparency and accountability of companies, encouraging them to adopt sustainable practices and making their efforts visible to stakeholders.

According to Article 4 of the SFDR Regulation, participants in financial markets are required to disclose, where considered, the main negative effects of investment decisions on sustainability factors, starting from June 30, 2023.

ANIA has started an analysis of emissions from the insurance sector, starting from Eurostat data and PAI statements. Specifically, Eurostat's annual accounts data are used in the second paragraph, while PAI data on the investment portfolio of

[7] In particular, the exposure to sustainable emissions of Italian companies has quadrupled from 2019 to 2022, increasing from €5.7 billion to over €20 billion by the end of 2022, reaching a weight equal to 4.26% of the direct bond portfolio.
[8] The evolution of regulation has created some interpretative uncertainties in defining sustainable products, resulting in downgrades in several Article 9 funds, especially for passive funds linked to climate benchmarks. It is hoped that the ongoing consultation on the SFDR Regulation will clarify the application doubts of the regulation in terms of labeling, supporting investors who, like insurance companies, are called upon to finance the energy transition, without exposing them to greenwashing risks.

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insurance companies are used for the first time published by each company in the Statement on the principle adverse effects.[9] Further analysis was conducted based on non-financial reports (NFR), although these are currently mandatory only for some companies.

The main result of the work is that the total emissions of the Italian insurance sector can be estimated at around 120 thousand tCO2e, while the total emissions of investments by Italian insurance companies can be estimated at around 110 million tCO2e, almost 1,000 times higher than the emissions of the insurance sector derived from Eurostat data, highlighting, if further evidence were needed, how delicate and effective interventions in this matter can be. Moreover, the results obtained from the analysis of the non-financial reports, despite the small sample size of companies that have compiled the NFR, would seem to support the estimates obtained from the macro analysis.

The second result is that Italian and European data report a very similar picture of the carbon footprint of the portfolio: in particular, using synthetic measures to describe the distribution of sample observations leads to comparable conclusions. This demonstrates a good degree of homogeneity in the ways in which PAI questionnaires are completed. However, there are differences that will need to be carefully investigated to determine whether they are due to methodological problems in completing the PAIs or to real investment decisions. Furthermore, further investigation will be necessary to assess the impact of investment in government bonds on the carbon footprint of the entire portfolio.

In conclusion, numerous methodological refinements are still needed to refine the analysis and arrive at representative and shared indicators.

[9] The Annual PAI statement is an annual document provided by a financial company on how it considers the relevant sustainability indicators in its investment decisions. The annex to the SFDR Delegated Regulation provides a template for the PAI statements and a list of all identified PAI indicators: in particular, the PAI indicators cover a wide range of environmental, social, and governance (ESG) risks. The template is divided into various elements such as descriptions of the identified PAI indicators, PAI indicators, shareholder engagement policies, descriptions, and historical comparisons (with reference to the relevant provisions of the SFDR Delegated Regulation).

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2. Eurostat Accounting Data

2.1 Greenhouse Gas Emissions in Europe: Data by Countries and Sectors

In 2022, the value of Greenhouse Gas Emissions in Europe from productive activities amounted to 2,897 billion tonnes of CO2 equivalent (tCO2e). When considering emissions generated by households as well, the total emissions remained almost unchanged compared to the 2021 value, standing at approximately 3,614 billion tonnes of CO2 equivalent (tCO2e). This represents a slight decrease of 1% compared to the previous year but a 22% decrease compared to the 2008 value. Eurostat collects and publishes data on GHG emissions from 64 emitting branches (classified according to NACE) and households defined and classified in national accounts. These branches are then grouped into sectors, as presented in Table 2.1.[10]

Table 2.1 - Greenhouse gas emissions by economic activity, EU, 2008, 2022

	2008		2022		change from 2008 to 2022	
	CO2 equivalent (thousands)	Share of total	CO2 equivalent (thousands)	Share of total	Ind 2008=100	Absolute Change
Agriculture, forestry and fishing	481.557,01	10%	467.182,94	12,9%	-3%	- 14.374,07
Mining and quarrying	91.230,73	2%	55.120,13	1,5%	-40%	- 36.110,60
Manufacturing	1.032.825,54	22%	744.735,63	20,6%	-28%	- 288.089,91
Electricity, gas, steam and air conditioning supply	1.188.080,83	26%	745.363,45	20,6%	-37%	- 442.717,38
Transportation and storage	484.737,27	10%	433.503,82	12,0%	-11%	- 51.233,45
Other services, water supply and constructions	512.125,85	11%	451.386,18	12,5%	-12%	- 60.739,67
Total activities by households	858.985,34	18%	717.559,58	19,9%	-16%	- 141.425,76
All NACE activities plus households	**4.649.542,57**	**100%**	**3.614.851,73**	**100,0%**	**-22%**	**- 1.034.690,84**

Source: Eurostat (online data code: env_ac_ainah_r2)

In 2022, the manufacturing sector emitted 20.6% of the total and was one of the sectors with the highest emissions, despite a 28% reduction compared to 2008. The electricity, gas, steam, and air conditioning sector, which was the most polluting sector in 2008, reduced its emissions by almost half a billion tonnes during the period, equivalent to a 37% decrease compared to the 2008 value. The mining and quarrying sector recorded the greatest reduction in emissions (-40%) compared to 2008. Finally, the reduction during the period was more modest for the household sector (-16%), other services, water, and construction (-12%), the transportation and storage sector (-11%), and especially for agriculture (-3%).

Emissions vary significantly among EU Member States and various sectors (see Table 2.2). These differences are partly due to different economic structures and

[10] The sectors considered are: Agriculture, forestry, and fishing - NACE Rev. 2, section A; Mining and quarrying - NACE Rev. 2, section B; Manufacturing industry - NACE Rev. 2, section C; Electricity, gas, steam, and air conditioning supply - NACE Rev. 2, section D; Transportation and storage - NACE Rev. 2, section H; Other services, water supply, and construction - sections E to G of NACE Rev. 2 and from I to U, which include all other economic activities defined in NACE; Households - households as consumers.

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different mixes of renewable and non-renewable energy sources. Italy accounts for 11.90% in terms of European emissions, with a value of almost 429 million tonnes of CO2 equivalent, while Germany was found to be the most polluting Member State (22% of the EU, with a value of almost 800 million tonnes of CO2 equivalent emissions), followed by France and Poland, each representing just over 11% of the total. In nine EU Member States, the manufacturing industry was the main emitter of greenhouse gases, while in seven other Member States, companies providing electricity, gas, steam, and air conditioning were the main emitters. Households and transportation and storage activities were the main sources of greenhouse gases in five and four Member States, respectively.

Despite the slight reduction of European emissions recorded in 2022 (from 3,665 to 3,614 billion tCO2e), nine countries, including Spain, Portugal, Greece, Ireland, and Italy, have experienced slight increases in their greenhouse gas emissions from both productive activities and households compared to 2021.

Table 2.2 Greenhouse gas emissions by country and economic activity, EU 2022 (Thousands of tonnes)

NACE code	A	B	C	D	H	(E,F,G,I-U)	TOTAL NACE	HH	TOT NACE+HH	
	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas, steam and air conditioning supply	Transportation and storage	Other services, water supply and constructions	Total - all NACE activities	Total activities by households	All NACE activities plus households	% EU All NACE activities plus households
European Union - 27 countries (from 2020)	**467.182,9418**	**55.120,1254**	**744.735,6270**	**745.363,4517**	**433.503,8193**	**451.386,1827**	**2.897.292,1479**	**717.559,5823**	**3.614.851,7301**	100%
Belgium	12.371,7092	453,9058	32.819,8431	13.751,1142	6.284,4649	14.027,9262	79.708,9634	25.748,5238	105.457,4872	3%
Bulgaria	6.457,8449	1.596,9793	8.395,0969	26.203,0697	7.438,2255	4.642,6196	54.733,8360	4.218,6918	58.952,5278	2%
Czechia	9.405,0008	4.657,1245	17.662,1616	41.763,1480	10.272,9041	11.236,5883	94.996,9271	13.238,5002	108.235,4273	3%
Denmark	13.527,6374	1.424,2923	5.509,4967	5.556,2440	40.573,6227	6.445,3106	73.036,6038	6.394,2067	79.430,8105	2%
Germany	64.440,6860	4.941,0264	181.748,5765	220.509,6868	78.918,8875	68.859,9209	619.418,7840	169.402,7641	788.821,5481	22%
Estonia	1.751,7905	51,4446	1.697,2996	7.860,2329	1.454,9477	978,7427	13.794,4579	1.745,1485	15.539,6065	0%
Ireland	23.391,9023	57,4697	7.114,1955	9.137,2822	16.338,8506	5.693,7206	61.733,4208	12.162,4127	73.895,8335	2%
Greece	9.464,7956	384,0515	16.801,3371	19.717,4580	21.473,3213	10.223,0189	78.063,9824	13.950,2105	92.014,1929	3%
Spain	44.413,0263	1.850,2605	74.416,5719	40.828,9933	43.002,3935	30.806,6611	235.317,9066	69.120,3081	304.438,2147	8%
France	81.649,1405	731,1087	81.457,6751	27.784,7245	62.474,9409	76.284,7828	330.382,3724	108.351,4452	438.733,8176	12%
Croatia	3.615,8721	609,6883	4.369,6406	3.221,1338	1.329,9512	4.620,9269	17.767,2128	6.279,6959	24.046,9087	1%
Italy	41.019,5524	3.206,1309	86.284,4174	82.619,8554	42.202,9644	64.843,7120	320.176,6325	108.738,1893	428.914,8218	**12%**
Cyprus	647,8228	25,2733	1.533,6747	3.113,1913	285,7666	1.369,8677	6.975,5964	1.808,2788	8.783,8752	0%
Latvia	2.900,6045	44,5586	1.250,4145	1.087,2508	2.384,0653	1.623,5699	9.290,4635	2.287,1306	11.577,5940	0%
Lithuania	4.701,9709	11,4851	4.362,9946	1.672,1322	7.405,2294	1.571,3469	19.725,1589	4.572,1505	24.297,3095	1%
Luxembourg	791,7871	5,8368	1.112,1521	266,7931	4.858,4338	861,3518	7.896,3547	1.452,7217	9.349,0764	0%
Hungary	8.630,3842	866,8230	9.769,6307	10.662,4466	7.868,3952	11.401,3488	49.199,0285	16.550,2301	65.749,2586	2%
Malta	99,6809	19,6768	64,8060	787,1375	387,8303	610,4882	1.969,6197	357,6737	2.327,2934	0%
Netherlands	26.332,7329	1.956,9783	42.168,5735	30.744,4224	23.592,4905	20.843,6103	145.638,8077	28.682,0586	174.320,8664	5%
Austria	8.283,1723	833,0278	25.790,5547	5.856,0117	7.123,6830	6.940,5792	54.827,0286	14.596,1172	69.423,1458	2%
Poland	53.779,5299	22.949,6661	62.916,7111	141.009,9908	13.412,6214	58.953,0539	353.021,5731	52.710,4549	405.732,0280	11%
Portugal	9.323,4720	341,3010	13.872,5767	6.194,3785	9.093,7721	11.998,4988	50.823,9991	9.990,7936	60.814,7927	2%
Romania	20.027,7083	6.319,9761	23.311,6270	19.031,9004	6.220,4624	16.047,6275	90.959,3017	20.660,8699	111.620,1717	3%
Slovenia	2.072,9647	277,8023	2.727,9543	3.508,5923	1.188,8134	2.596,3450	12.372,4719	4.309,2928	16.681,7647	0%
Slovakia	2.215,3457	260,5030	14.404,5497	4.818,9917	2.389,6456	6.649,0459	30.738,0817	7.224,5529	37.962,6346	1%
Finland	7.603,5941	378,0083	9.355,1795	11.955,4331	8.477,8254	5.225,6228	42.995,6633	5.186,6812	48.182,3445	1%
Sweden	8.263,2137	865,7267	13.817,9159	5.701,8367	7.049,3109	6.029,8955	41.727,8995	7.820,4788	49.548,3783	1%

Source: Eurostat (online data code: env_ac_ainah_r2)

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Specifically, Italian emissions from productive activities increased in 2022 by just under 1%, while those from the household sector, which remains the most polluting sector (accounting for approximately 25% of Italian emissions), decreased by 1.3%.

2.2 Greenhouse gas emissions for the 64 production activities.

Table 2.3 compares greenhouse gas emissions for the 64 production activities (NACE classification) for 2022, ordered starting from the activity with the highest percentage of emissions produced.

Table 2.3 - Greenhouse gas emissions by NACE industry codes, EU 2022 (%)

64 economic activity	NACE code	GHG emissions %
Electricity, gas, steam and air conditioning supply	D	25,726%
Crop and animal production, hunting and related service activities	A01	15,763%
Manufacture of other non-metallic mineral products	C23	5,939%
Land transport and transport via pipelines	H49	5,356%
Manufacture of basic metals	C24	5,261%
Water transport	H50	5,077%
Sewerage, waste management, remediation activities	E37-E39	4,828%
Manufacture of chemicals and chemical products	C20	4,671%
Manufacture of coke and refined petroleum products	C19	4,535%
Air transport	H51	3,637%
Manufacture of food products; beverages and tobacco products	C10-C12	1,974%
Mining and quarrying	B	1,902%
Wholesale trade, except of motor vehicles and motorcycles	G46	1,841%
Construction	F	1,769%
Manufacture of paper and paper products	C17	1,012%
Retail trade, except of motor vehicles and motorcycles	G47	0,987%
Public administration and defence; compulsory social security	O	0,945%
Warehousing and support activities for transportation	H52	0,666%
Human health activities	Q86	0,578%
Wholesale and retail trade and repair of motor vehicles and motorcycles	G45	0,491%
Accommodation and food service activities	I	0,468%
Rental and leasing activities	N77	0,442%
Education	P	0,420%
Manufacture of fabricated metal products, except machinery and equipment	C25	0,391%
Residential care activities and social work activities without accommodation	Q87_Q88	0,374%
Manufacture of motor vehicles, trailers and semi-trailers	C29	0,313%
Security and investigation, service and landscape, office administrative and support activities	N80-N82	0,300%
Manufacture of machinery and equipment n.e.c.	C28	0,288%
Manufacture of rubber and plastic products	C22	0,260%
Legal and accounting activities; activities of head offices; management consultancy activities	M69_M70	0,231%
Postal and courier activities	H53	0,228%
Real estate activities	L	0,203%
Fishing and aquaculture	A03	0,201%
Manufacture of basic pharmaceutical products and pharmaceutical preparations	C21	0,196%
Other personal service activities	S96	0,192%
Manufacture of textiles, wearing apparel, leather and related products	C13-C15	0,179%
Water collection, treatment and supply	E36	0,163%
Forestry and logging	A02	0,161%
Activities of membership organisations	S94	0,155%
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	C16	0,152%
Financial service activities, except insurance and pension funding	K64	0,151%
Architectural and engineering activities; technical testing and analysis	M71	0,132%
Sports activities and amusement and recreation activities	R93	0,125%
Computer programming, consultancy, and information service activities	J62_J63	0,111%
Manufacture of furniture; other manufacturing	C31_C32	0,103%
Manufacture of electrical equipment	C27	0,102%
Manufacture of computer, electronic and optical products	C26	0,095%
Printing and reproduction of recorded media	C18	0,090%
Employment activities	N78	0,088%
Repair and installation of machinery and equipment	C33	0,086%
Creative, arts and entertainment activities; libraries, archives, museums and other cultural activities; gambling and betting activities	R90-R92	0,085%
Scientific research and development	M72	0,070%
Telecommunications	J61	0,069%
Other professional, scientific and technical activities; veterinary activities	M74_M75	0,060%
Advertising and market research	M73	0,059%
Manufacture of other transport equipment	C30	0,057%
Activities auxiliary to financial services and insurance activities	K66	0,052%
Motion picture, video, television programme production; programming and broadcasting activities	J59_J60	0,046%
Repair of computers and personal and household goods	S95	0,038%
Insurance, reinsurance and pension funding, except compulsory social security	K65	0,035%
Travel agency, tour operator and other reservation service and related activities	N79	0,034%
Publishing activities	J58	0,030%
Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	T	0,008%
Activities of extraterritorial organisations and bodies	U	0,001%

Source: Eurostat - Air emissions accounts by NACE Rev. 2 activity [env_ac_ainah_r2__custom_9524375]

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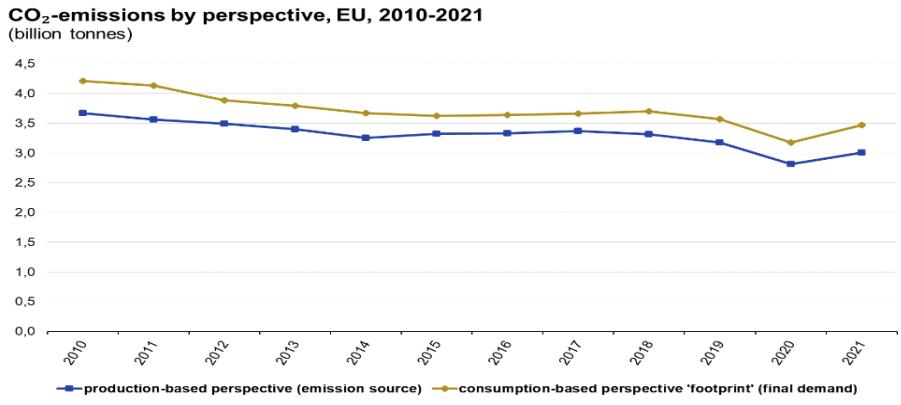
The top five emitters represent 58% of greenhouse gas emissions related to the entire set of 64 production activities and contribute only 7% to GDP.[11] Specifically, these five activities are: electricity, gas, steam, and air conditioning supply (NACE D), crop and animal production, hunting, and related service activities (NACE A01), manufacture of other non-metallic mineral products (NACE C23), land transport and transport via pipelines (NACE H49), and manufacture of basic metals (NACE C24). Considering the top 10 polluting sectors, they account for 80% of total emissions and yet contribute less than 10% to gross value added.

The European insurance industry (NACE K65) represents 0.035% of emissions from productive activities in 2022 and 0.76% of GDP. When including the insurance distribution network (NACE K66), the combined emissions amount to slightly less than 0.1% and 1.50% of GDP. Finally, the entire financial system represents 0.24% of emissions.

2.3 The carbon footprint of Europe

So far, we have analyzed emissions resulting from economic production activities (excluding household emissions); in this paragraph, we shift to emissions associated with final demand or the consumption of products, a concept known as "carbon footprint." Figure 2.1 compares Eurostat estimates for total emissions and carbon footprint over time, showing how from 2010 to 2020, emissions and the carbon footprint followed a negative trend, only to record a slight increase in emissions in 2021, the latest available data for the carbon footprint, aligning with pre-Covid levels.

Figure 2.1 - CO_2 EMISSIONS, UE, 2010-2021 (Thousands of tonnes)



Source: Eurostat (online data code: env_ac_co2fp)

[11] All GDP (or gross value added) values are updated to Eurostat data for 2021.

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As reported in the subsequent Table 2.4, in 2021, the EU contributed 3 billion tons of emissions, corresponding to 8% of the 37.9 billion tons of global CO2 emissions (an increase from the 34.4 billion tons of global CO2 emissions in 2020). The total EU emissions consist of 2.4 billion tons linked to final demand (consumption) within the EU, while 0.6 billion tons are associated with consumption in other parts of the world, such as through exports from the EU. To arrive at the carbon footprint, we need to add to the final demand in European countries the 1.1 billion tons resulting from emissions in non-EU countries for consumption (final demand for goods and services) within the EU. Overall, the carbon footprint of the EU was 3.5 billion tons, representing approximately 9% of global emissions, an increase from the observed value in 2020 (3.2 billion tons).

Table 2.4 - EU vis-a-vis the rest of the world, 2021 (CO_2 - billion tonnes)

	serving EU's consumption (final demand)		serving consumption (final demand) in the non-EU rest of the world		Total produced	
produced in EU	2,4	6%	0,6	2%	3,0	8%
produced in the non-EU rest of the world	1,1	3%	33,8	89%	34,9	92%
Total consumed	3,5	9%	34,4	91%	37,9	100%

Source: Eurostat (online data code: env_ac_co2fp)

Between 2010 and 2021, the carbon footprint was on average 12.1% higher than the total emissions produced (Table 2.5); this value remained relatively stable over time, making the temporal analysis of the two indicators quite similar.

In particular, between 2010 and 2021, per capita emissions decreased by 19% (from 8.3 to 6.7 tons), while the per capita carbon footprint decreased by 18% (from 9.5 to 7.7 tons). If the comparison had been made with 2019 – as the pandemic significantly reduced emissions in 2020 – the reduction compared to 2010 would have been 14.5% for emissions per capita and 16% for the carbon footprint per capita.

Table 2.5 - CO_2-emissions by perspective, EU 2010-2021, KG per capita

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
production perspective (emission source)	8.314	8.091	7.915	7.693	7.335	7.470	7.472	7.560	7.425	7.105	6.292	6.733
consumption perspective (final demand)	9.545	9.380	8.817	8.581	8.284	8.151	8.166	8.206	8.281	7.990	7.105	7.761

Source: Eurostat (env_ac_co2fp, demo_gind)

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2.4 An estimation of emissions from the European and Italian insurance sector

According to Eurostat estimates reported in paragraph 2.1, the insurance sector accounts for 0.035% of production emissions, which in 2022 amounted to 2,897 million tCO2e. In absolute terms, the emissions from the European insurance sector would be around 1 million tCO2e. Considering that Italy represents 12.3% of insurance premiums according to EIOPA data for the period 2017-2022,12 the total emissions from the Italian insurance sector would be slightly above 120,000 tCO2e. A similar result is obtained by applying 0.035% to the total emissions from the Italian production sector (320.2 million tCO2e).

12 In particular, according to the annual EIOPA data related to "solo entity" available on the website https://www.eiopa.europa.eu/tools-and-data/insurance-statistics_en for the period 2017-22, the share of Italian premiums in the total European premiums was 7.54% for non-life insurance and 15.5% for life insurance.

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3. The greenhouse gas emissions of the insurance investment portfolio (PAI statements)

3.1 The Italian sample and the analyzed indicators

To estimate the greenhouse gas emissions of the investment portfolio in the Italian insurance sector, Statements on the Principal Adverse Impacts (PAI) of investment decisions on sustainability factors were collected in accordance with Article 4 of Regulation (EU) 2019/2088 (SFDR). These statements were first published on June 30, 2023, and referred to the year 2022. The selected Italian sample, as shown in Table 3.1, includes 21 companies representing ca 80% of total reserves and 83% of the investment portfolio.

Table 3.1 - Italian sample: by Companies and their respective weights in terms of total reserves and total assets (end-of-2022 values)

Companies	weights in terms of total reserves	weights in terms of total assets
Company 1	17,92%	15,93%
Company 2	9,58%	9,52%
Company 3	5,26%	5,14%
Company 4	12,75%	11,87%
Company 5	4,61%	4,16%
Company 6	3,81%	3,76%
Company 7	3,49%	3,18%
Company 8	0,03%	3,36%
Company 9	2,98%	2,64%
Company 10	3,06%	2,91%
Company 11	4,21%	3,67%
Company 12	1,10%	1,18%
Company 13	1,06%	0,92%
Company 14	1,52%	1,35%
Company 15	0,47%	0,49%
Company 16	1,01%	0,87%
Company 17	1,25%	1,10%
Company 18	0,83%	0,78%
Company 19	0,55%	0,49%
Company 20	1,10%	7,35%
Company 21	2,28%	2,15%
Total	**79%**	**83%**

The PAI indicators used relate to greenhouse gas emissions (GHG) and carbon footprint and refer to the year 2022. GHG emissions (PAI 1) were reported by almost all companies in tons of CO2 equivalent (tCO2e) and are divided into three scopes:

- Scope 1, which includes direct emissions controlled by the undertaking.

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- Scope 2, which concerns indirect emissions from energy sources (such as electricity, steam) generated off-site and consumed by the undertaking.
- Scope 3, which comprises indirect emissions from the undertaking's value chain.

Carbon footprint (PAI 2) represents the total greenhouse gas emissions associated with 1 million EUR invested in tons of CO2 equivalent (tCO2e/MEUR).

In determining the value of GHG emissions and the carbon footprint, companies followed the framework outlined in the delegated SFDR regulation (Table 3.2).

Table 3.2 - Methodology used for calculating the indicators

(1) 'GHG emissions' shall be calculated in accordance with the following formula:

$$\sum_{n}^{i}\left(\frac{current\ value\ of\ investment_i}{investee\ company's\ enterprise\ value_i} \times investee\ company's\ Scope(x)\ GHG\ emissions_i\right)$$

(2) 'carbon footprint' shall be calculated in accordance with the following formula:

$$\frac{\Sigma_n^i\left(\frac{current\ value\ of\ investment_i}{investee\ company's\ enterprise\ value_i} \times investee\ company's\ Scope\ 1,2\ and\ 3\ GHG\ emissions_i\right)}{current\ value\ of\ all\ investments\ (€M)}$$

3.2 The Italian sample

The SFDR regulation does not provide specific indications on the composition of portfolios to consider for calculating PAIs, suggesting the total portfolio; consequently, companies have adopted criteria that are not always homogeneous, and information on the composition of the portfolio used for PAI calculation ("current value of investments") has not always been provided. It should be noted that the numerator of GHG emissions and the carbon footprint considers only the corporate component of the portfolio, while the current value of all investments in the denominator also includes emissions related to Sovereign States.

To increase the comparability of data among companies, an attempt has been made to estimate the share of the portfolio used to calculate emissions, considering the carbon footprint formula expressed in millions of euros.

$$Carbon\ Footprint = \frac{GHG\ emissions}{covered\ portfolio} \rightarrow Covered\ Portfolio = \frac{GHG\ emissions}{Carbon\ footprint}.$$

From the carbon footprint formula, it is indeed possible to derive the share of the portfolio used by companies for the calculation. It appears that the analysis focused on approximately 50% of the total portfolio estimated at around €400 billion out of just over €750 billion for the Sample considered in 2022.

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The total emissions of the investment portfolio of this sample amount to approximately 88 million tCO2e (Table 3.3). Taking into account that the sample represents almost 80% of the Italian industry, it can be inferred that the emissions associated with the total portfolio are approximately 110 million tCO2e. It's important to note that this value is about 1,000 times higher than the direct emissions of the Italian insurance sector estimated based on Eurostat data. This data confirms, if needed, how important the analysis of the investment portfolio is to measure the relevance of insurance companies.

Table 3.3 - The Italian sample (2022) – GHG emissions by Scope

Companies	GHG Emissions Scope1	GHG Emissions Scope2	GHG Emissions Scope3	Total GHG emissions (Scope 1,2,3 tCO2e)
Company 1	2.049.739,00	266.335,00	14.345.419,00	16.661.493,00
Company 2	1.911.674,69	374.346,78	10.879.153,23	13.165.174,70
Company 3	251.149,00	37.769,00	1.708.041,00	1.996.959,00
Company 4	1.627.287,00	278.048,00	12.699.196,00	14.604.531,00
Company 5	663.017,38	93.914,15	3.512.164,25	4.269.095,78
Company 6	644.800,00	112.280,00	3.970.340,00	4.727.420,00
Company 7	288.560,00	46.300,00	1.295.450,00	1.630.310,00
Company 8	1.077.821,35	193.960,87	7.424.013,74	8.695.795,96
Company 9	927.981,00	218.028,00	366.189,00	1.512.198,00
Company 10	303.801,00	37.036,00	2.376.774,00	2.717.611,00
Company 11	771.088,86	137.429,55	4.677.631,65	5.586.150,06
Company 12	82.878,59	19.043,30	833.389,92	935.311,81
Company 13	80.445,00	16.225,00	620.169,00	716.839,00
Company 14	191.583,00	20.801,00	2.354.267,00	2.566.651,00
Company 15	26.881,14	4.282,56	175.598,41	206.762,11
Company 16	109.627,91	19.326,36	983.837,16	1.112.791,43
Company 17	47.735,85	7.684,75	404.558,56	459.979,16
Company 18	117.135,26	28.376,32	854.158,52	999.670,10
Company 19	188.928,00	34.647,00	2.384.777,00	2.608.352,00
Company 20	73.929,26	15.875,79	681.033,28	770.838,33
Company 21	170.065,00	32.348,00	1.628.338,00	1.830.751,00
Total	**11.606.128,29**	**1.994.057,43**	**74.174.498,72**	**87.774.684,44**

Table 3.4 provides an analysis of the distribution of emissions. Scope 1 emissions are about 6 times those of Scope 2 emissions; the interquartile range is 1.2. A significant indicator is the ratio between the sum of Scope 1 and 2 emissions and the total: for this indicator, the median value is 13.9% (the weighted average is 15.5%), and the interquartile range is 4.3.

Table 3.4 - The Italian sample (2022) – Distribution of selected indicators

N. Companies = 21			
	scope1/scope2	scope1/scope3	(scope1+scope2)/TOT
weighted average	**5,8**	**15,6%**	**15,5%**
median	**5,7**	**13,7%**	**13,9%**
5-pcentile	4,3	8,1%	8,6%
10-pcentile	4,4	9,9%	10,9%
25-pcentile	5,1	11,1%	11,7%
75-pcentile	6,3	16,2%	16,0%
90-pcentile	7,7	18,9%	17,7%
95-pcentile	8,2	22,3%	20,5%

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Finally, Table 3.5 presents useful statistics to describe the distribution among companies in the sample of the carbon footprint measured as the total greenhouse gas emissions in tCO2e associated with 1 million EUR invested, and the so-called beneficiary GHG intensity, the latter represented by the ratio between GHG emissions in tons and the revenue in million euros of the beneficiary companies of the investments. Additionally, the percentage share of investments in companies active in the fossil fuel sector is reported.

Table 3.5 - The Italian sample (2022) – Distribution of selected indicators

N. Companies = 21			
	Carbon footprint	**GHG intensity of investee companie**	**Exposure to companies active in the fossil fuel sector**
mean	**409,08**	**787,27**	**10,17**
median	**361,00**	**885,70**	**9,60**
5-pcentile	98,00	203,15	3,60
10-pcentile	132,00	265,47	4,00
25-pcentile	162,00	390,00	6,07
75-pcentile	569,02	1025,16	14,00
90-pcentile	671,14	1510,00	17,47
95-pcentile	903,00	1539,00	18,40

The average value of the carbon footprint per million invested is approximately 409 tCO2e; the median value is 361, with a very high interquartile range of 407. This wide variance certainly depends on the characteristics of the invested companies, but perhaps also reflects the treatment of government securities (excluded from the numerator but included in the denominator).

Similarly, the emission intensity per million in revenue also shows a rather wide variability. The average value of the sample is 787 tCO2e; the median value is 885, with an interquartile range of 635. It's interesting to note that, as expected, the correlation per company between the carbon footprint and intensity is 0.67, indicating a very significant correlation. In other words, companies with a portfolio with a higher carbon footprint proportionally invest more in companies that have a higher emission intensity per revenue amount.

Finally, the percentage share of investments in companies active in the fossil fuel sector is, on average, 10.2% for companies, while the median is 9.6% with an interquartile range of 7.93 percentage points. In this case as well, we would have expected a positive correlation between this indicator and the carbon footprint per million euros invested. Indeed, the correlation is positive, but the coefficient is 0.07. This evidence also indicates that further investigation is needed into the methodologies used to calculate the carbon footprint.

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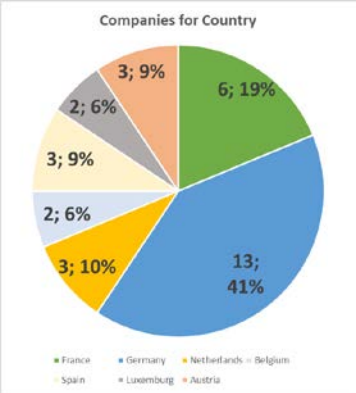
3.3 A robustness check: comparison with the PAIs of a sample of European insurance undertakings

For the purpose of benchmarking analysis with the Italian insurance sector, a sample of 32 European insurance companies was selected, differentiated by country (Table 3.6), also collecting the PAI indicators related to greenhouse gas emissions and carbon footprint contained in the Statements on Principal Adverse Impacts (PAIs) of investment decisions on sustainability factors. It's important to note that the sample is not random and that the size of the included companies is on average larger than that of Italian companies. These characteristics make the comparison of the analyzed measures more challenging.

Table 3.6 - The EU sample: by Company and by Country (2022 data)

Company	Country
Company 1	France
Company 2	France
Company 3	Germany
Company 4	Netherlands
Company 5	Netherlands
Company 6	Belgium
Company 7	Luxemburg
Company 8	Belgium
Company 9	France
Company 10	France
Company 11	Germany
Company 12	Germany
Company 13	Luxemburg
Company 14	Germany
Company 15	Germany
Company 16	Germany
Company 17	Germany
Company 18	Germany
Company 19	Germany
Company 20	Germany
Company 21	Germany
Company 22	Germany
Company 23	Germany
Company 24	Spain
Company 25	Spain
Company 26	Spain
Company 27	Austria
Company 28	Austria
Company 29	Austria
Company 30	Netherlands
Company 31	France
Company 32	France



Total emissions of the investment portfolio of this sample amount to approximately 212 million tCO2e (Table 3.7), which is more than double those reported for the Italian sample.

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Table 3.7 - The EU sample (2022) – GHG emissions by Scope

Company	Country	GHG Emissions Scope1	GHG Emissions Scope2	GHG Emissions Scope3	Total GHG emissions (Scope 1,2,3 tCO2e)
Company 1	France	9.711.792,00	1.696.445,00	65.391.139,00	76.799.376,00
Company 2	France	1.018.121,00	176.380,00	11.128.022,00	12.322.523,00
Company 3	Germany	4.122.053,00	949.413,00	18.762.494,00	23.833.960,00
Company 4	Netherlands	277.663,20	94.397,10	2.252.310,80	2.624.371,10
Company 5	Netherlands	445.530,00	108.161,00	5.395.903,00	5.949.594,00
Company 6	Belgium	109.277,00	30.761,00	911.449,00	1.051.487,00
Company 7	Luxemburg	45.330,08	877,58	9.102,72	55.310,38
Company 8	Belgium	54.704,97	15.879,95	556.536,71	627.121,63
Company 9	France	954.372,00	203.150,00	6.844.080,00	8.001.602,00
Company 10	France	87.490,00	16.734,00	692.571,00	796.795,00
Company 11	Germany	153.147,00	27.732,00	580.500,00	761.379,00
Company 12	Germany	458.261,20	97.710,80	5.027.855,00	5.583.827,00
Company 13	Luxemburg	339,90	147,50	3.680,70	4.168,10
Company 14	Germany	0,20	0,20	112,30	112,70
Company 15	Germany	71.485,60	11.688,10	880.031,40	963.205,10
Company 16	Germany	39.968,70	9.122,40	525.200,70	574.291,80
Company 17	Germany	1.175.668,70	27.308,10	1.591.266,60	2.794.243,40
Company 18	Germany	2.686.806,00	547.858,00	20.724.250,00	23.958.914,00
Company 19	Germany	38.279,00	9.267,00	435.496,00	483.042,00
Company 20	Germany	105.461,00	21.467,00	759.733,00	886.661,00
Company 21	Germany	113.962,00	23.029,00	836.625,00	973.616,00
Company 22	Germany	26.084,00	6.202,00	340.415,00	372.701,00
Company 23	Germany	10.934,00	2.838,00	124.836,00	138.608,00
Company 24	Spain	1.941.572,80	402.969,80	13.389.481,00	15.734.023,60
Company 25	Spain	468.898,17	109.565,56	3.733.811,08	4.312.274,81
Company 26	Spain	238,92	91,15	1.781,18	2.111,25
Company 27	Austria	172.627,63	46.743,73	2.203.759,36	2.423.130,72
Company 28	Austria	1.015.828,00	138.955,00	5.280.123,00	6.434.906,00
Company 29	Austria	140.098,00	19.014,00	721.251,00	880.363,00
Company 30	Netherlands	411.840,00	127.641,00	4.199.537,00	4.739.018,00
Company 31	France	1.167.543,00	224.046,10	5.251.556,70	6.643.145,80
Company 32	France	311.511,10	49.880,40	1.247.382,30	1.608.773,80
Total	**EU**	**27.336.888,17**	**5.195.475,47**	**179.802.292,55**	**212.334.656,19**

Table 3.8 provides an analysis of the distribution of emissions by Scope. Scope 1 emissions are approximately 5 times those of Scope 2 emissions, with an interquartile range of 1.8. Looking at the ratio between the sum of Scope 1 and 2 emissions and the total, it is noted that for this indicator the median value is 13.4% (the weighted average is 15.3%) and the interquartile range is 6.3. It's important to note that these values are very similar to those found in Italy.

Table 3.8 - The EU sample (2022) – Distribution of selected indicators

N. Companies = 32			
	scope1/scope2	**scope1/scope3**	**(scope1+scope2)/TOT**
weighted average	**5,3**	**15,2039%**	**15,3213%**
median	**4,7**	**12,5954%**	**13,4576%**
5-pcentile	2,5	7,6389%	8,5960%
10-pcentile	3,0	7,8623%	8,7018%
25-pcentile	3,8	9,0333%	9,9127%
75-pcentile	5,6	15,9486%	16,2118%
90-pcentile	7,2	24,6991%	22,3452%
95-pcentile	23,4	47,7572%	32,4396%

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Finally, Table 3.9 presents statistics related to the carbon footprint, the GHG intensity of beneficiary companies, and the percentage share of investments in companies active in the fossil fuel sector (Exposure to companies).

Table 3.9 - The EU sample (2022) – Distribution of selected indicators

N. Companies = 32			
	Carbon footprint	**GHG intensity of investee companie**	**Exposure to companies active in the fossil fuel sector**
mean	**348,68**	**1223,97**	**7,22**
median	**328,75**	**774,84**	**7,24**
5-pcentile	49,30	84,80	0,93
10-pcentile	55,95	115,40	2,53
25-pcentile	83,68	509,98	4,88
75-pcentile	532,83	993,93	9,25
90-pcentile	607,16	4159,19	13,15
95-pcentile	723,59	4639,84	14,00

The carbon footprint has an average value of 348.68 tCO2e/MEUR, a median value of 329, and a very high interquartile range of 449. In this case as well, median values and the size of the interquartile range are comparable to those reported in Table 3.5 for Italian companies, despite the heterogeneity of the samples considered.

Similarly, the emission intensity per million in revenue also shows a rather wide variability. The average value of the sample is 1224 tCO2e; the median value is 774, with an interquartile range of 484. It's interesting to note that, as expected, the correlation per company between the carbon footprint and intensity has a significant value of 0.406, but slightly lower than that calculated for Italian companies.

Finally, the percentage share of investments in companies active in the fossil fuel sector has an average and median value of 7.2%, while the interquartile range is 4.37 percentage points. Both the mean and median are lower than the values observed for the Italian portfolio.

In this case - but differently from what was observed in Italy – it is also observed a positive correlation between this indicator and the carbon footprint per million euros invested, with a value of 0.46; while looking at the correlation between this indicator and emission intensity, it is always positive but with a value just equal to 0.21.

In conclusion, the data from Italy and Europe provide a very similar picture of the carbon footprint of insurance companies' active portfolios. In particular, using synthetic measures to describe the distribution of sample observations leads to comparable conclusions. This demonstrates a good degree of consistency in the methods of completing the PAI questionnaires.

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However, there are differences. In particular, both the mean and median of the percentage share of investments in companies active in the fossil fuel sector referred to the Italian sample are higher than the share referred to the European insurance sample; conversely, the emission intensity per million in revenue of the European sample is higher than the corresponding intensity of the Italian insurance sample, in terms of mean. These differences will need to be carefully investigated to verify if they depend on methodological issues in completing the PAIs or on real investment decisions. Additionally, further investigation will be necessary to assess the impact of investing in government securities on the carbon footprint of the entire portfolio.

3.4 Analysis of Non-Financial Reports

An additional analysis was carried out on direct emissions (Scope 1) at the entity level, starting from the Non-Financial Reports (NFR) published by companies as of December 31, 2022, included in the Accounting Reports or prepared as a separate report.

In particular, the total direct emissions for a sample of 12 Italian insurance groups were considered, including 2 financial conglomerates, of which only the proportion of direct emissions related to the insurance entity was taken into account. The total Scope 1 emissions of the analysed Italian companies amounted to 55,223.37 tCO2e, which are consistent with the data collected at the macro level. As matter of fact, considering the sample represents 56% in term of total reserve, the emissions for the Italian insurance sector resulting from the NFR could be estimated at nearly 100,000 tCO2e.

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4. Conclusions

The imperative to mitigate climate change underscores the importance of decreasing greenhouse gas emissions, aligning with the objectives of the Green Deal. To scrutinize emissions originating from the insurance sector, we initiated analysis on dual fronts.

On a macro scale, we're utilizing Eurostat data to quantify emissions from the European and Italian insurance sectors, as well as to determine the carbon footprint of the EU. Concurrently, on a micro level, we're examining portfolio and entity-specific emissions for a representative subset of the sector. This involves analyzing Principle Adverse Impact statements (PAIs) statements and non-financial reports (NFR) issued by insurance undertakings.

In 2022, based on Eurostat data, production activities across Europe contributed approximately 2,897 million tCO2e to emissions. When households' emissions are included, the total European emissions surged to 3,6 billion tons of CO2 equivalents. The European insurance sector's emissions accounted for a modest 0.035% of the total, equivalent to roughly 1 million tCO2e. Meanwhile, emissions from the Italian insurance sector were estimated at just over 120,000 tCO2e.

Moving to the micro level, analysis of Principle Adverse Impact (PAI) data revealed a stark contrast. Italian companies' investments were found to produce around 110 million tCO2e in total emissions, nearly a thousandfold higher than the emissions from the insurance sector based on macro data. Additionally, according to 2022 Non-Financial Reporting (NFR) data, the total Scope 1 emissions of the 12 Italian companies stood at 55,223 tCO2e. Considering the sample size, this figure appears consistent with the estimates derived from macro analysis.

In conclusion, our analysis underscores the importance of assessments at both macro and micro levels in understanding the dynamics of emissions within the insurance sector. While macro-level data reveal the sector's relatively modest contribution to overall emissions, micro-level examination reveals - unsurprisingly - significant emissions linked to investment activities. This highlights the importance of incorporating ESG criteria - implemented in recent years by all European companies - into insurance firms' investment decisions, balancing socio-environmental impact with adequate financial returns. For future research, there will be a need to refine portfolio emission estimation methodologies and improve the accuracy of reference data to adequately assess the decarbonization trend of the portfolio over time.

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