BMI
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BMI ESG Country & Physical Climate Risk

BMI's data-led ESG country service enables sustainability, risk & portfolio managers to quantify ESG risk exposure at a granular and systematic level.

ESG Country Index Methodology

BMI's proprietary ESG Country Index underpins the BMI ESG Country service. The index quantifies the economic impact of different ESG (environment, social and governance) issues. In our ESG Country Reports and other analysis, we use the index to predict the trends and material implications of ESG issues per country over the next 10 years. The index is grouped into three pillars (Environment Risk, Social Risk, and Governance Risk), each of which has five core components.

ESG Country Index		
Environment Risk	**Social Risk**	**Governance Risk**
Natural Disasters	Human Rights	Regulatory Quality
Resource Scarcity	Working Conditions	Political Rights
Nature Risk	Gender	Political Stability
Pollution	Health	Crime Risk
Environment Policy	Education	Conflict Risk

Altogether, the ESG Country Index consists of more than 650 indicators, which are published on the BMI website.

Environment Risk

Our Environment Risk subindex measures aggregate environment risks in a territory. It consists of five equally weighted components, each of which has multiple subcomponents, amounting to more than 500 indicators in total.

Environment Risk	Definition
Natural Disasters	Economic risks due to natural disasters, calculated based on the daily-average impact of six main disaster types on 10+ assets and 50+ resilience factors, and forecast using BMI and the Intergovernmental Panel on Climate Change forecast data.
Nature Risk	Risk to the economic value provided by ecosystem services due to deforestation.
Resource Scarcity	Risk of food and water scarcity, calculated based on water/food stress and resilience indicators.
Pollution	Impact of air and water pollution on people and the environment.
Environment Policy	Sustainability of environmental policies based on emissions, fossil subsidies and nature protections.

Natural Disasters & Climate Risk

The Natural Disasters and Climate Risk components underpin physical climate-risk and disaster-risk analysis provided by BMI's ESG Country service.

We analyse economic risk from natural disasters by assessing the risk to the population and a range of key assets and industries. Assets and industries include: buildings, agriculture, mining, and transport and energy infrastructure. Natural disasters include: heatwaves, storms, fires and more. See the table below.

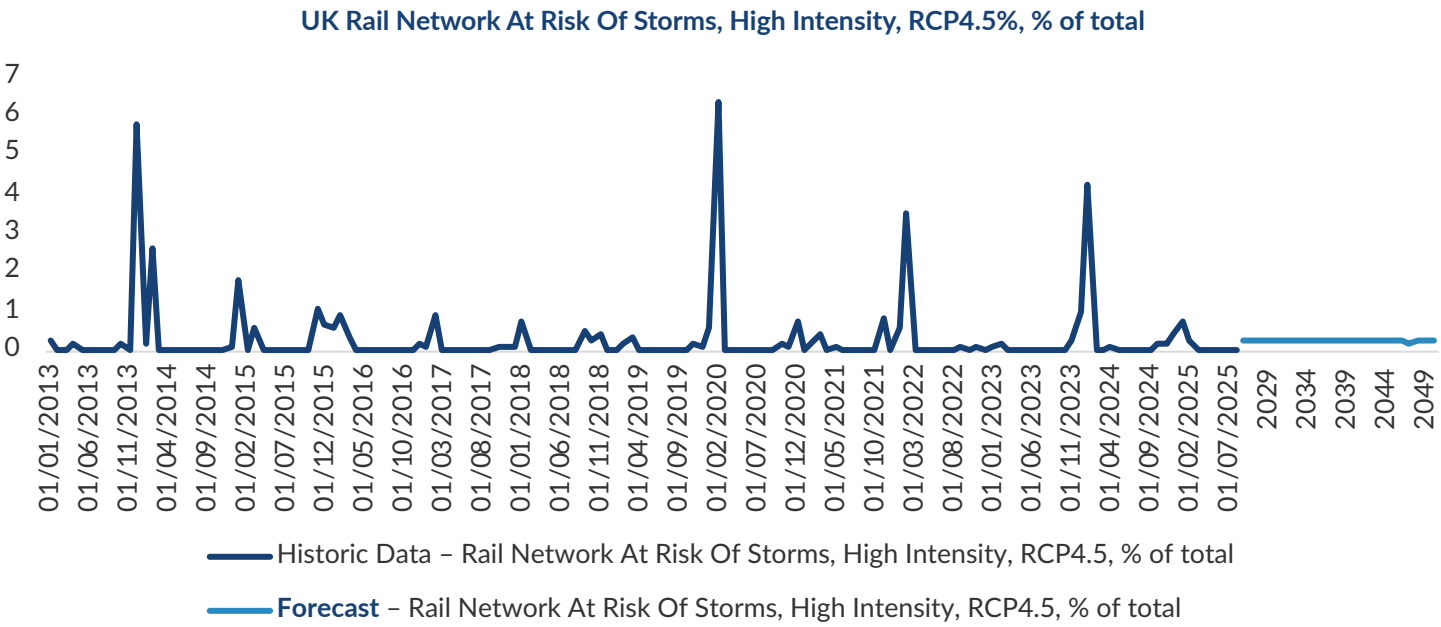
		Hazard					
		Floods	Heatwaves	Storms	Fires	Droughts	Earthquakes
Asset	Population						
	Buildings						
	Agriculture						
	Mining						
	Oil & Gas Infrastructure						
	Power Plants						
	Airports						
	Ports						
	Roads						
	Rail						

Natural Disaster Sensitivity & Exposure

For each asset-hazard combination, we calculate the share of the economy's asset of that type that is affected by that hazard under different climate scenarios. For each scenario, we calculate a high-intensity and an extreme-intensity exposure value. See below:

		Climate Scenario		
		Optimistic (RCP2.6)	Core (RCP4.5)	Pessimistic (RCP8.5)
Impact	High Intensity			
	Extreme Intensity			

To give an example, the below chart shows the share of the UK rail network that is exposed to high-intensity storms, under the RCP4.5 scenario. The historical data are published at a monthly and annual frequency (annual averages) and the forecasts are published at an annual frequency (annual averages).



Source: World Bank, OSM, Copernicus Climate Change Service, BMI

Across all hazards and assets, we calculate the historical data using Geographic Information System data. In this case, we calculate the daily average percentage of the UK's railway network that is exposed to high-intensity winds by analysing the spatial overlap between railway lines and grid cells experiencing wind speeds exceeding 28 metres per second (m/s) (we apply a higher threshold for extreme-intensity exposure). For each grid cell, we determine the fraction of days in the month when the wind threshold is surpassed and multiply this fraction by the railway line length (in kilometres) within that cell to obtain length-weighted exposure values. These values are then summed across all relevant grid cells in each country and expressed as a share of the total railway length. The formula is: daily average % railway length exposed = 100 × [Σ(rail_km × days_exceeding_28m/s_per_grid_cell / days_in_month)] / total_rail_km. The result is a monthly, economy-level indicator of the daily average percentage of railway network exposed to high-intensity winds. The approach is broadly similar across hazard-asset combinations.

Forecasts use the historic data and a hazard-specific index of RCP2.6 climate projections for wind speed, air pressure, precipitation and cloud cover to project future exposure. We calculate the average exposure for each month in the first forecast year over the historic period (Jan 2025 = average exposure of all Jan in the historic period). The first forecast year is the first year with a mix of historical and forecast values. We calculate the median likelihood of a hazard occurring over the historic period (2015 - current year and month). We use the rolling median to control for outlier bias in climate models. For each scenario and country, we determine the percentage rate of change (ROC) between the median historic value and future values in the hazard index series (current - 2100). We then apply the scenario-based ROC series to the average exposure value for each month in the first forecast year. Lastly, we aggregate the monthly series into annual values. Again, the approach is broadly similar across hazard-asset combinations.

These indicators, ie, 'asset *a* exposed to hazard *b*, *c* intensity, RCP*d*', are published and form the basis of our natural disaster exposure analysis. For each hazard-asset combination, we calculate an overall exposure value, which is a weighted average of the high-intensity (33.3%) and extreme-intensity (66.7%) intensity exposure values under the RCP4.5 scenario. Based on these, we produce the aggregate *hazard sensitivity* score, which is normalised and out of 100. The *hazard exposure* score is a normalisation of 'people exposed to hazard a, % of total'. Due to greater data availability, for mining, agriculture, and oil and gas infrastructure exposure, we also produce scores that show the hazard's impact on the economy via industry exposure, eg, 'Storm Impact On Economy Via Agriculture Exposure', by multiplying the % of total industry exposed to the hazard by the contribution of the industry to the overall economy, eg, 'Agribusiness Market Value, % Of GDP' multiplied by 'Agriculture At Risk Of Storms'. The overall *hazard risk* score is a simple average of the *hazard exposure*, *hazard sensitivity* and *hazard resilience* (*see below*).

Disaster Resilience

In addition to direct measures of natural disaster impacts on various assets, we also construct response, resilience and recovery metrics as part of our Natural Disaster Risk component.

We construct four core sub-indices, which measure a country's disaster response and preparedness system, the fiscal buffers in place to finance response and recovery, and the quality and resilience of its infrastructure and healthcare.

These sub-indices use proprietary BMI data, as well as publicly available third-party data from reputable organisations such as the World Bank and the World Justice Project. We apply multiple processing steps, which are listed in more detail in the Conventional Data Processing section in the Appendix at the bottom of this document.

Disaster Preparedness	Fiscal Resilience	Infrastructure Resilience	Health Resilience
Disaster Strategy Score	Debt Service As % Of Government Revenue	Infrastructure Quality Gap	Population Health Outcomes
Early Warning Systems	Gross Life Premiums	Infrastructure Growth Gap	Life Expectancy At Birth
Multi-Hazard Early Warning System	Gross Non-Life Premiums	Infrastructure Availability	Under-5 Mortality
Multi-Hazard Monitoring & Forecasting	Access To Disaster Relief Finance	Power Loss During Distribution Percent Of Generation	Maternal Mortality
Local Response Plans		Transport Network	Healthcare Spending Per Capita
Disaster Response Awareness		Utilities Network	Disease & Injury Burden
State Capacity		Access To Basic Sanitation Services Per Capita	Adult Overweight Prevalence
Corruption Risk		Access To Basic Drinking Water, Per Capita	Alcohol Consumption
Procedural Safeguards		Population Living In Slums Per Capita	WASH-Related Mortality

Nature Risk

Our Nature Risk component estimates the share of economic value provided by ecosystem services that is at risk from deforestation and how well a country is equipped to deal with related fallout. The ecosystem services layer used in our index maps services by whether their benefits are primarily enjoyed globally (based on carbon storage and moisture regulation) or nationally (based on food, energy, water quality, disaster protection, recreation and tourism), based on Chaplin-Kramer and Kennedy (2022). Each map of ecosystem services is optimised to show the areas that provide more than 90% of ecosystem value (which we define as critical) and more than 50% (which we define as highly critical). We then overlay this with geospatial data that tracks deforestation on an annual basis based on data of the University of Maryland and Hansen et al (2013). Using these overlays, we make four calculations, which estimate the extent to which deforestation risks undermining the value provided by ecosystem services. These four calculations are used to create our Nature Loss indicator, which is one of two pillars making up our Nature Risk sub-index (*see selected inputs below*).

We also create a Resilience To Nature Loss indicator using proprietary BMI data, as well as publicly available third-party data from reputable organisations such as the World Bank and the UN. We apply multiple processing steps, which are listed in more detail in the Conventional Data Processing section in the Appendix at the bottom of this document. A full list of indicators and inputs is available on request.

Nature Risk	
Nature Loss	Resilience To Nature Loss
Globally Critical Ecosystem Exposed To Deforestation	Ecosystem Resilience
Globally Highly Critical Ecosystems Exposed To Deforestation	Nature Protections
Nationally Critical Ecosystem Exposed To Deforestation	Wastewater Treatment
Nationally Highly Critical Ecosystems Exposed To Deforestation	Solid Waste Treatment
	Plastic Pollution
	Environment Policy

Resource Scarcity, Pollution & Environment Policy

In addition to Natural Disasters and Nature Risk, there are three more components used to calculate our Environment Risk subindex. These are Resource Scarcity, Pollution and Environment Policy.

We construct these components to measure risks of food and water insecurity, pollution of air and water resources, and the sustainability of environmental policies. These subcomponents use proprietary BMI data, as well as publicly available third-party data from reputable organisations such as the World Bank and the World Justice Project. We apply multiple processing steps, which are listed in more detail in the Conventional Data Processing section in the Appendix at the bottom of this document.

Selected inputs into these indices are listed below. A full list of indicators and inputs is available on request.

Resource Scarcity		Pollution		Environment Policy
Water Insecurity	Food Insecurity	Water Pollution	Air Pollution	Energy Production
Water Stress Index	Food Insecurity Exposure	Water Pollution Exposure	Air Pollution Exposure	Energy Mix
Water Insecurity Resilience	Dietary Energy Supply Adequacy	Wash-Related Mortality	Air Pollution Deaths	Emissions Per Capita
Alternative Water Supply	Prevalence Of Food Insecurity	Water Pollution Resilience	Urbanisation	Fossil Fuel Subsidies, % Gdp
Water Consumption Gap	Children Affected By Wasting	Wastewater Treatment Coverage Per Capita	Dependent Population	Fossil Fuel Subsidies Per Capita
Water Consumption Need	Food Imports Shock Sensitivity	Quality Of Wastewater Treatment	Health Resilience	Nature Protections
Water Consumption Actual	Political Violence	Wastewater River Impact	Infrastructure Resilience	
Water Desalination Per Capita	State Capacity	Wastewater Coastal Impact		
Wastewater Recycling Per Capita	Food Insecurity Resilience	Solid Waste Treatment Coverage (Per Waste Generated)		
Desalinated Water Produced	Prevalence Of Undernourishment	Solid Waste Treatment Coverage (Per Capita)		
Water System Resilience	Food System Resilience	Quality Of Solid Waste Treatment		
	Drought Resilience	Open Dump Treatment		
		Unaccounted Treatment		
		Controlled Landfill Treatment Percent Of Waste		
		Sanitary Landfill Treatment Percent Of Waste		



Our Social Risk subindex measures the incidence of human rights abuses, workplace problems, women's rights, and health and education outcomes. It consists of five equally weighted components, each of which has multiple subcomponents, amounting to more than 80 inputs in total.

Social Risk	Definition
Human Rights	Prevalence of human rights abuses based on civil, political, social, cultural and minority rights.
Working Conditions	Quality of working conditions based on job quality, remuneration and social protections.
Gender	Strength of women's rights, participation in the economy, educational attainment and social inclusion.
Health	Health outcomes of the population, quality of healthcare services, and disease and injury burden.
Education	Educational outcomes and attainment of the population.

To calculate the Social Risk subindex, we use proprietary BMI data, as well as publicly available third-party data from reputable organisations such as the World Bank and the World Justice Project. We then apply multiple processing steps, which are listed in more detail in the Conventional Data Processing section in the Appendix at the bottom of this document.

We then calculate individual components of the Social Risk subindex based on custom calculations. A full list of indicators and inputs is available on request.

Human Rights	Working Conditions	Gender	Education	Health
Civil And Political Rights	Job Security And Quality	Economic Empowerment And Opportunity	Education Access And Participation	Population Health Outcomes
Voice And Accountability	Vulnerable Employment	Women Business And Law Score	Primary School Enrollment	Life Expectancy At Birth
Freedom Of Opinion And Expression	Part-Time Employment	Female Labour Force Participation	Secondary School Enrollment	Under-5 Mortality
Freedom Of Belief And Religion	Self-Employment, % Of Total Employment	Female Senior/Middle Management	Educational Outcomes	Maternal Mortality
Privacy Protections	Remuneration And Earnings	Female Top Managers	General Education Outcomes	Health Service Quality
Freedom Of Assembly And Association	Wage And Salaried Workers	Educational Attainment	Tertiary Education Outcomes	Skilled Birth Attendance
Civil Liberties	Mean Income	Female Adult Literacy	Education System Investment	Out-Of-Pocket Health Spending
Political Violence	Social Protection And Benefits	Literacy Gender Parity	Human Capital	Physicians Per Capita
Economic, Social, And Cultural Rights	Labour Flexibility	Female Primary School Enrollment		Healthcare Spending Per Capita
Life Expectancy At Birth	Fundamental Labour Rights	Female Upper Secondary Completion		Disease & Injury Burden

Human Rights	Working Conditions	Gender	Education	Health
Safely Managed Water Services	Social Insurance Coverage	Female Bachelor's Degree Or Higher		HIV Incidence
Poverty Ratio	Social Protection Coverage	Health And Reproductive Rights		TB Incidence
Protection Of Vulnerable Groups	Safety Net Coverage	Maternal Mortality		Adult Overweight Prevalence
Migration Policy	Child Employment, Ages 7-14	Contraceptive Prevalence		Alcohol Consumption
		Prenatal Care Coverage		Wash-Related Mortality
		Adolescent Births		Road Traffic Deaths
		Child Marriage		

Future values of the subindex are created through proprietary forecasts of BMI Country Risk, Geo Risk Signals and Industry Risk teams, which are used to calculate the individual components of the Social Risk subindex. The variables with proprietary forecasts that are used in the Social Risk subindex are listed below:

Variable	Definition
Civil Liberties	Analyst scoring of freedom of expression, assembly and state-sanctioned violence.
Political Violence	Analyst scoring of violence or threat of violence by non-state actors motivated by political ideologies, anti-government action.
Health	Analyst scoring of quality and access to healthcare, and resilience to disease and epidemic threats.
Healthcare Spending Per Capita	Sum of funds mobilised by government and private systems for healthcare system operation.
Human Capital	Analyst scoring of events that affect the quality and level of education and technical skills.
Gender	Analyst scoring of protection of women's rights and related policies.
Migration Policy	Analyst scoring of migration policy and the impact of migration on social cohesion.
Ethno-Religious	Analyst scoring of ethnic and religious tensions and related policies.



Our Governance Risk subindex measures the presence and impact of governance issues including quality of government regulation, corruption, political rights and instability, crime and conflict. It consists of five equally weighted components, most of which have multiple subcomponents, amounting to 50 inputs in total.

Governance Risk	Definition
Regulatory Quality	Efficiency of regulation, corruption risk, and strength of institutional and procedural safeguards.
Political Stability	Impacts of political stability based on state capacity, mass and elite support, and economic outcomes.
Political Rights	Protection of fundamental political rights and constraints on executive power.
Crime Risk	Incidence of crime and strength of crime-fighting agencies.
Conflict Risk	Incidence of armed conflict, international tensions and political violence.

To calculate the Governance Risk subindex, we use proprietary BMI, as well as publicly available third-party data from reputable organisations such as the World Bank and the World Justice Project.

We then apply multiple processing steps, which are listed in more detail in the Conventional Data Processing section in the Appendix at the bottom of this document.

We then calculate individual components of the Governance Risk subindex based on custom calculations. A full list of indicators and inputs is available on request.

Regulatory Quality	Political Rights	Crime Risk	Conflict Risk	Political Stability
Corruption Risk	Fundamental Rights	Crime Exposure	International Relations	Elite Support
Independent Regulation Enforcement	Equal Treatment And Non-Discrimination	Homicide Rate	Security Force (External)	State Capacity
Control Of Corruption	Constraints On Executive Power	Order And Security	Elite Support	Mass Support
Procedural Safeguards	Institutional Stability	Crime Control	State Capacity	Misery Index
Regulatory & Bureaucratic Environment	Constraints On Government Powers	Crime Mitigation	Mass Support	
Legal Environment	Non-Violent Grievance Resolution	Police Force Capability		
Open Government	Executive Branch Corruption	Right To Life And Security		
Regulatory Enforcement	Rule Of Law	Criminal Justice		
Civil Justice Corruption	Civil Liberties	Security Force (Internal)		
Civil Justice Independence	Freedom Of Opinion And Expression			
Criminal System Corruption	Freedom Of Assembly And Association			
Criminal System Independence				

Regulatory Quality	Political Rights	Crime Risk	Conflict Risk	Political Stability
Regulatory Policy				
Investment and Trade Policy				
Microeconomic Policy				
Corporate Governance				

Future values of the Governance Risk subindex are created through proprietary forecasts of BMI Country Risk, Geo Risk Signals and Industry Risk teams, which are used to calculate the individual components of the Social Risk subindex. The variables with proprietary forecasts that are used in the Governance Risk subindex are listed below:

Variable	Definition
Civil Liberties	Analyst scoring of freedom of expression, assembly and state-sanctioned violence
Crime	Analyst scoring of general criminal activity, including economic crime
Elite Support	Analyst scoring of support for current government from leaders of social, political and economic organisations, including powerful individuals (eg, union and business association leaders)
Institutional Stability	Analyst scoring of the stability and resilience of state institutions, including legitimacy of current regime
Investment And Trade Policy	Analyst scoring of the openness and predictability of investment environment and trade policy
Mass Support	Analyst scoring of popular support for the current government
Microeconomic Policy	Analyst scoring of the quality of policies and regulations governing economic/ commercial activity
Misery Index (6-Month Lagged)	Index calculated as a sum of the inflation and unemployment rates and lagged by six months (assuming impacts of economic dissatisfaction weigh on political stability with a time lag.
Political Violence	Analyst scoring of violence or threat of violence by non-state actors motivated by political ideologies, anti-government action (including civil war, insurgency, terrorism), interstate violence
Rule Of Law	Analyst scoring of the strength/independence of the legal system, and the predictability of legal and regulatory enforcement
Security Force (External)	Analyst scoring of capabilities and quality of external security forces
Security Force (Internal)	Analyst scoring of capabilities and quality of internal security forces
State Capacity	Analyst scoring of the state's ability to implement and enforce policy, deliver public goods and services



ESG Country Coverage

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ESG Country Reports

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▲ Annual publication ◆ Bi-annual publication

Conventional Data Processing

With the exception of geospatial data, the processing and data manipulation steps applied to indicators used in the ESG Country dataset follow the same series of steps, listed below.

First, missing data points are identified and filled in using linear interpolation if a data series is missing some individual data points. For data series where no data points are available, a predefined clustering method is used to create estimates, which are used in the calculation of the index.

To estimate missing data through clustering, we designate a group of territories for each unique territory-variable combination, and we fill missing values for that combination using the median of the designated group of territories in the given year. These groups are designated based on analyst judgement of shared characteristics, and are available on request.

We then rescale data to a scale of 0-100, where 100 represents highest risk. We remove outlier values (defined as four standard deviations from the mean). We then apply a fixed dataframe with safety margins of +/- 10% applied for each variable individually, so that future updates of the data (which may include extreme outlier values) cannot move the entire dataset.

About BMI

In an uncertain macroeconomic environment, BMI's systematic, independent and data-driven market insights, analysis and forecasts enable you to recognise and assess risks and opportunities across 200+ markets and 20+ industries.

For over 40 years, we have provided impartial and transparent analytics, data and research across themes, countries and sectors, with deep insight into emerging markets. Our detailed intelligence is frequent, consistent and systematic, enabling you to easily make comparisons and interrogate data to support your strategic plans and investment decisions.

Learn more at **fitchsolutions.com/bmi**

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