TRANSITION RISK
IN EMERGING AND FRONTIER MARKETS

2022 TCFD REPORT

GlobalEvolution

Contents

TRANSITION RISK
IN EMERGING AND FRONTIER MARKETS
2022 TCFD REPORT

ABSTRACT. Decarbonization is a cornerstone in the sustainable development of the world. Emerging and frontier markets play a crucial role in the transition, and both risks and opportunities should also be recognized. In this year's (TCFD) climate report, the focus is on *transition risk of decarbonization* in emerging and frontier markets—aiming to provide new insights to inform the debate and improve the integration efforts into emerging and frontier market debt investing. Three key messages that we want to convey are: (i) Emerging markets possess resources from which they significantly benefit as the world transitions towards a global low-carbon economy. (ii) An investment rather than divestment approach is needed to support and help close the funding gap for emerging markets' low-carbon transition. (iii) With growing expectations for emerging markets to decouple their economic growth from increasing carbon emissions it is important to take into consideration the concept of a relatively 'fair' transition where emerging markets do not need to sacrifice growth prospects to pursue the industrialization levels that developed countries currently enjoy.

1. Introduction

Our mission is to generate attractive returns for our clients whilst contributing to sustainability in the countries and companies where we invest. Since climate change and decarbonization is likely to affect markets and financial risks, our strategy naturally extends to systematically integrate carbon-related transition risks into our investment process.

We are on a journey with the rest of the world towards lower greenhouse gas (GHG) emissions and the adoption of new technologies that make industries and the sources of GHG emission more efficient. The purpose is to conserve our planet for future generations to ensure a sustainable ecosystem, society, and economy for our children.[1] We therefore publicly declare our support and for the recommendations of the Task Force on Climate-related Financial Disclosures ("TCFD").

In this year's TCFD report, we reflect on our concerns about climate change while stating our expected corporate action plan for this existential journey for our company and our clients. Our approach to integrate carbon and climate-related concerns take a multi-pillared approach inspired by the TCFD thematic areas of organizational activity: *First*, our corporate governance structure will ensure oversight in management processes; *Second*, our strategies will be informed by climate-related concerns; *Third*, managing climate-related risks will be essential to protect our client's portfolios and our company while promoting sustainability in emerging markets (EM); *Fourth*, keeping our strategies fact-based and measurable, metrics and targets will be experimented with to inform our processes; *Fifth*, by systematically integrating climate-related factors into our investment process, we will strive to directly measure, track and disclose the carbon footprint of our portfolios transparently to our stakeholders and clients.

We have chosen the topic of transition risk in this year's TCFD report as we recognize that this area of development is a necessary long-term endeavor that must be integrated into our investment process to uphold our fiduciary duties, while learning what is most important to navigate towards in this rapidly evolving, decarbonization paradigm the world has embarked on.

[1] https://www.globalevolution.com/impact-investing/

2. Governance

Global Evolution has integrated environmental issues and dynamics into our investment process for several years, and TCFD recommendations are well-designed to complement our investment process and consequently an initiative that we endorse and support. Since part of the company's philosophy is to leave a legacy of impact investing in partnership with our investors, which assists in the process of lifting nations out of poverty, the Board is involved in tracking, informing, and leading this path.

- **The Board** of Global Evolution Fondsmæglerselskab A/S exists partly to ensure that the investment process reflects the company's values and targets. As a part of the sustainability-focus, the Board will receive and review annual TCFD reports, PRI Assessments, and relevant sustainability risk, engagement, together with an annual update on the compliance with the EU driven Sustainable Finance Disclosure Regulation (SFDR).
- **The Executive Management** is responsible for ensuring that sustainability is integrated into the investment process, including following the TCFD recommendations.
- **The Research Department** of the company is leading, developing, and implementing sustainability-related work. Led by the Research Director they are responsible for the entire ESG research and implementation for the sovereign and corporate emerging and frontier markets debt including the reporting to the TCFD, the PRI, the UN Global Compact, relations with the World Bank, and the Emerging Market Investor Alliance (EMIA). The responsibility for the work related to SFDR is shared responsibility with the head of Legal and Compliance.

Our ESG research and integration process is described in detail in our 2021 TCFD report and Sustainability Risk policy which we refer to for such insights. We believe we are at the forefront of ESG sovereign research and integration, and we continue to play an active role in the public domain with relevant stakeholders.

3. Strategy

Climate change is one of the most critical issues facing society in the 21st century. Climate change entails risks and opportunities, and Global Evolution is committed integrating such perspectives into our investment process. There are generally two types of (interrelated) risks that reflect the climate-related risks and opportunities identified for countries, people, our company, and for our clients' portfolios:

Table 1: Overview of climate risks and opportunities in an emerging markets context

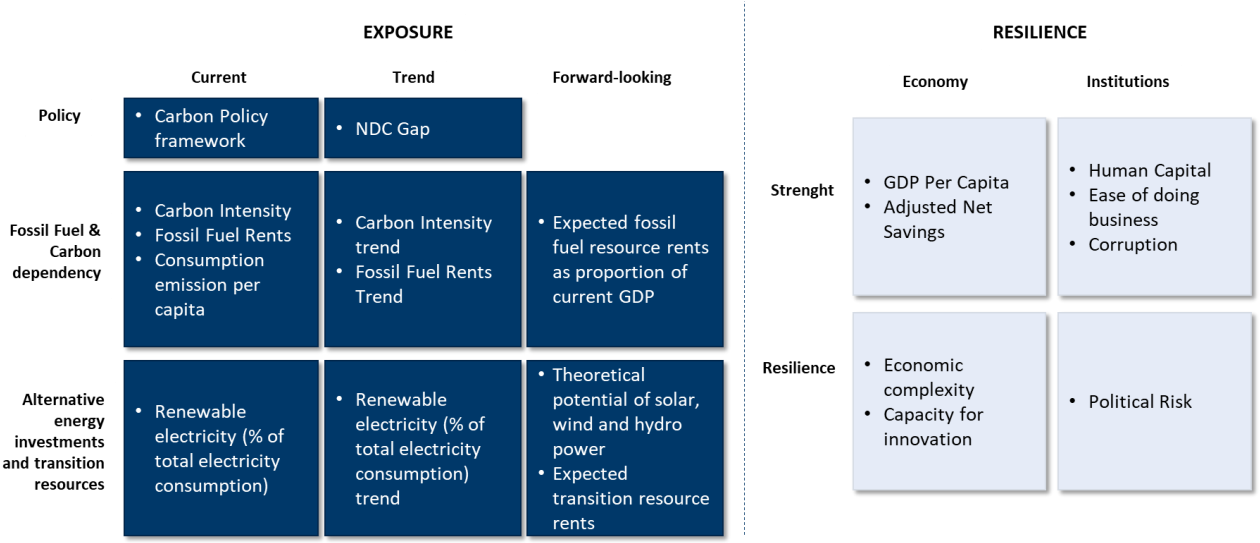
	Risks	Opportunities
Low-carbon transition	Economies dependent on fossil fuel rents are at risk of declining demands and prices Economies dependent on fossil fuel for generating economic output are subject to international pressure to reduce emissions, which could lead to operational costs and stranded assets	Countries rich in resources needed for the low-carbon transition, especially minerals, can benefit from increased demand and prices. The low-carbon transition could become an engine for growth in emerging markets through the expansion of affordable energy and green jobs Countries with large renewable energy potential can create new export markets
Physical consequences of climate change	Extreme weather events and changing climate with negative impacts on infrastructure, agriculture, and population health	Planned, anticipatory adaptation can reduce vulnerability and realize opportunities associated with climate change such as investment opportunities in new construction and infrastructure projects

3.1 Transition Risks

Assessing sovereign transition risks is no simple task and involves a variety of considerations. Deepening our understanding of potential risks, we have this year developed a proprietary transition risk assessment framework. Until now, we have relied on transition risk indices provided by our data providers, which have helped identify risk exposure. However, in need for more nuanced information, greater data transparency, and for capturing information on opportunities that can help counterbalance risk, we now combine methodologies from available frameworks from Verisk Maplecroft[2] and World Bank[3] with additional dimensions for our advanced understanding.

Inspired by Peszko et al. (2020), we assess both exposure and resilience to transition risks. Exposure refers to the extent to which countries are exposed to economic hardship from a low-carbon transition, their position to transition away from fossil fuels, and their potential to benefit from a global low-carbon transition. Resilience relates to countries' capacity to respond to risks and opportunities, relating to the quality of institutions and flexibility of economic structures. Our transition risk framework comprises of 12 components divided into transition risk exposure (8 components) and transition risk resilience (4 components).

Figure 1: Global Evolution Transition Risk Framework



In assessing sovereign transition risk exposure, we take into consideration three dimensions; 1) sovereign policy frameworks for low-carbon transitions, 2) sovereign economies' fossil fuel and carbon dependency, and 3) renewable energy resources. We take a dynamic assessment approach by considering current levels, a 5-year trend[4], and a forward-looking view. The three dimensions are briefly explained in the following:

- **Policy:** Governments capacity and intent to implement carbon policies play an important role in countries' trajectory towards decoupling economic growth from carbon emissions and ensuring an orderly transition. The carbon policy framework component of our framework includes an assessment of the presence of carbon initiatives, laws, and multilateral political commitments, as well as government effectiveness. We use the current NDC gap to assess policy trends with the logic that countries which have yet to fill a large gap to reach their NDC target will need stricter mitigation actions to transition from status quo and are therefore at risk of a more sudden and disorderly transition.[5]

[2] Verisk Maplecroft Low Carbon Index
[3] Peszko, G., Van Der Mensbrugghe, D., Golub, A., Ward, J., Marijs, C., Schopp, A., ... & Midgley, A. (2020). Diversification and cooperation in a decarbonizing world: climate strategies for fossil fuel-dependent countries. World Bank Publications.
[4] Past five years of available data compared with previous five years
[5] Verisk Maplecroft is data provider for both policy framework and NDC gap

- **Fossil Fuel and Carbon Dependency:** Economies are at risk when fossil fuel rents represent a large share of GDP (i.e., fossil fuel dependency[6]) and/or when fossil fuel is a driver of economic output (i.e., carbon intensity[7], e.g., when production methods and general infrastructure is run by fossil fuels). Consumption emission per capita[8] is included as indicator given an increased acknowledgement in the international community of the need for a just transition, whereby countries having contributed the least to climate change are punished the least from cross-border carbon policies. The component assessing the trend in fossil fuel and carbon dependency is based on the 5-year development in fossil fuel rents and carbon dependency with lower dependence reflecting a lower risk. The forward-looking component is the current valuation of countries' known fossil fuel reserves as share of current GDP[9]. A higher valuation as share of GDP reflects a higher expectation of future fossil fuel rents and hence a greater risk of stranded assets.[10]

- **Alternative energy investment and transition resources:** This dimension reflects the extent to which countries have initiated their low-carbon transition and their potential to benefit from the global transition. In assessing current level of transition, renewable electricity consumption as percentage of total electricity consumption is used as metric. The renewable trend component uses the same metric, however looking at the 5-year development. The forward-looking component in this dimension is two-fold. First, countries rich renewable resources have greater potential for large-scale renewable energy installations and could even benefit from exporting clean energy. Hence, countries' solar, wind and hydropower potential are identified.[11] Second, countries with large minerals reserves have the opportunity to benefit from the green transition by generating resource rents from the increased demand. We measure this potential as the estimated value of known mineral reserves[12] as proportion of current GDP to reflect the impact relative to the size of the economies.

In our assessment of countries' resilience to transition risks, we rely on four components including economic strength, institutional strength, economic resilience, and institutional resilience.[13]

- **Economic Strength*:*** Countries with strong economies and savings have more strength to act towards a low-carbon transition. We measure this through GDP per capita and adjusted net savings.[14] A higher GDP per capita suggest that countries have reached an income level that allows for investing in new technologies.[15] Adjusted net savings reflects the true saving in an economy after considering investments in human capital and depletion of natural resources[16], where positive savings allow wealth to grow over time. In the EM universe, countries with greatest economic strength include Qatar, UAE, and Kuwait. Zimbabwe, Mozambique, Rwanda, Guinea, and Cameroon are those with least strength.

[6] World Bank is used as source for oil, natural gas, and coal rents as share of GDP
[7] Carbon intensity is the carbon emissions per GDP. Data is sourced from Verisk Maplecroft
[8] Consumption emission is adjusted for imports and exports of carbon, sourced from the Global Carbon Project. Population data is sourced from the World Bank.
[9] Source: World Bank Changing Wealth of Nations
[10] Stranded assets is the situation where fossil fuel assets are left unburned, machinery is stranded to no longer produce value, and stranded labor will need re-education
[11] Solar power potential is assessed using data from the Global Solar Atlas. Wind power is assessed using data from the study Lu, X., & McElroy, M. B. (2017). Global potential for wind-generated electricity. In Wind Energy Engineering (pp. 51-73). Academic Press. Hydropower potential is assessed using data from the study Hoes, O. A., Meijer, L. J., Van Der Ent, R. J., & Van De Giesen, N. C. (2017). Systematic high-resolution assessment of global hydropower potential. PloS one, 12(2), e0171844.
[12] Data from World Bank Changing Wealth of Nations
[13] This approach is largely inspired (though modified) by Peszko, G., Van Der Mensbrugghe, D., Golub, A., Ward, J., Marijs, C., Schopp, A., ... & Midgley, A. (2020). Diversification and cooperation in a decarbonizing world: climate strategies for fossil fuel-dependent countries. World Bank Publications.
[14] Both measures based on World Development Indicators
[15]Cleveland, et. al. (2001), The Economics of Nature and the Nature of Economics, Advances in Ecological Economics, International Society for Ecological Economics, Edward Elgar.
[16] World Bank data

- **Economic Resilience:** Economies are better positioned to manage risks and pursue opportunities when they exhibit resilience and flexibility. We measure this by relying on data capturing the level of complexity and diversity of an economy[17] and countries' capacity to innovate[18]. EM countries in our investment universe with strongest resilience include Czech Republic, Malaysia, China, Hungary, and Mexico. Countries with poorest resilience are not surprisingly frontier countries with Angola, Papua New Guinea, Gabon, Venezuela, and Mozambique representing bottom five.

- **Institutional Strength:** Quality institutions are an important enabler for creating environments to act on a low-carbon transition. Poor institutional quality is often considered the driver of the 'resource curse' whereby resource-rich countries grow more slowly compared to less resource-rich countries.[19] Hence, good governance is instrumental for current fossil fuel producers having reinvested rents into other types of capital, and for mineral-rich countries to leverage future rents. We assess this component with data on human capital, corruption, and ease of doing business[20], which give three perspectives on institutional quality. Among our investable countries, UAE, Chile, Costa Rica, and Qatar have the strongest institutions, while Angola, Venezuela, Cameroon, and Mozambique are scored to have the weakest institutions.

- **Institutional Resilience:** Political risk[21] affects countries resilience to transition risk. High political risk imposes unfavorable investment environments for investing in climate change transition opportunities. UAE, Czech Rep, Croatia, Qatar, and Romania have the lowest risk, while Myanmar, Venezuela, Nigeria, Cameroon, Pakistan have the highest risk.

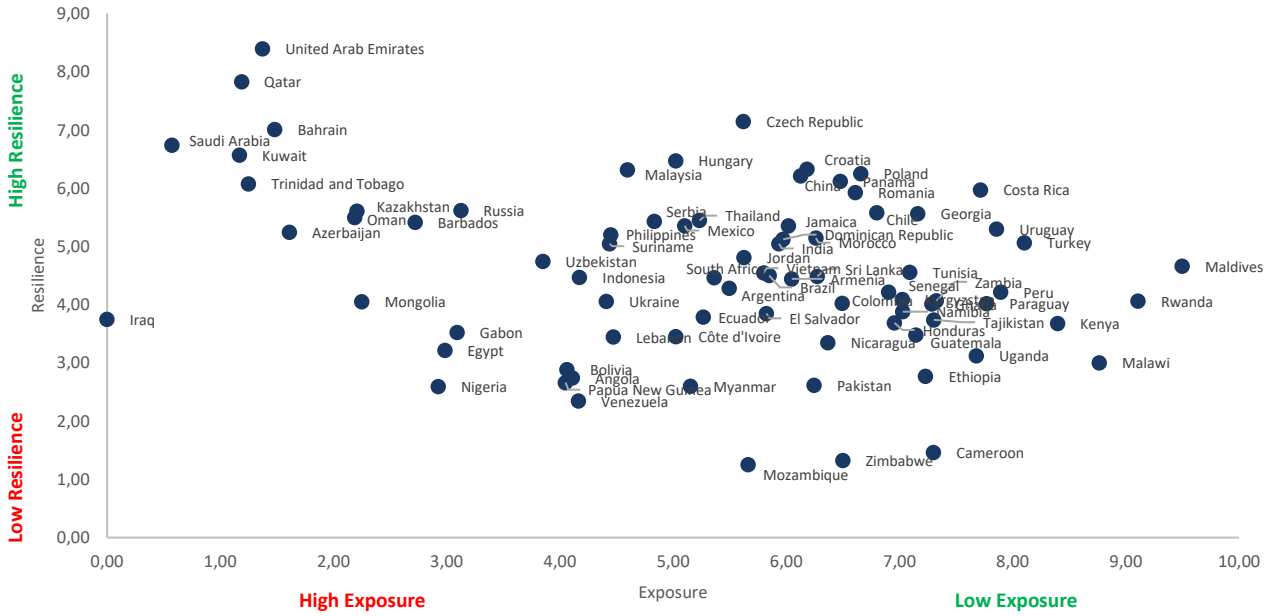
All data inputs are normalized to scales 0-10 for easy comparison and averaged into the two types of risk ratings, exposure and resilience. Both have also been normalized into scales 0-10 for all countries in the world with data available. Figure 2 maps emerging markets in our portfolios and benchmarks based on their transition risk exposure and resilience.

With an exposure score of 0, Iraq is the country in the world most exposed to transition risk. Iraq's economy is highly dependent on fossil fuel rents, carbon intensity is extremely high, and renewables account for a minimum of electricity output. Not surprisingly, other fossil fuel producing economies such as UAE, Qatar, and Saudi Arabia also display extreme risk, yet these countries have relatively high resilience. It is however important to note that resilience does not have any value alone; rather it demonstrates that the country have stronger prerequisites for acting aimed at reducing transition risk with action being key to successfully managing risks and exploring opportunities. Frontier countries such as Nigeria, Angola, Gabon, and Egypt are also at risk with relatively poor resilience.

While our transition risk framework assists in identifying the extent of countries exposure and resilience relative to each other, the value of the framework lies as much in the identification of the underlying nature of risks and opportunities as outlined in the framework components. The nature of Qatar and UEA's transition risk exposure differs from that of South Africa and Indonesia, and so do their resilience. Qatar and UAE's exposure is explained by the exceptionally high dependence on fossil fuel rents that are at risk of being compromised as effect of reduced demand and prices. South Africa and Indonesia have much lower fossil fuel rents at risk, yet economic activities and infrastructure in these countries are carbon heavy. A low-carbon transition would require retirement of infrastructure and machinery leading to stranded assets.

[17] Economic Complexity Index, available from Observatory of Economic Complexity
[18] Verisk Maplecroft
[19] Sachs, J. D., & Warner, A. M. (2001). The curse of natural resources. *European economic review*, *45*(4-6), 827-838.
[20] The two first measures are based on data from Verisk Maplecroft, while ease of doing business is based on the World Bank Doing Business project
[21] Verisk Maplecroft

Figure 2: Transition Risk Exposure and Resilience



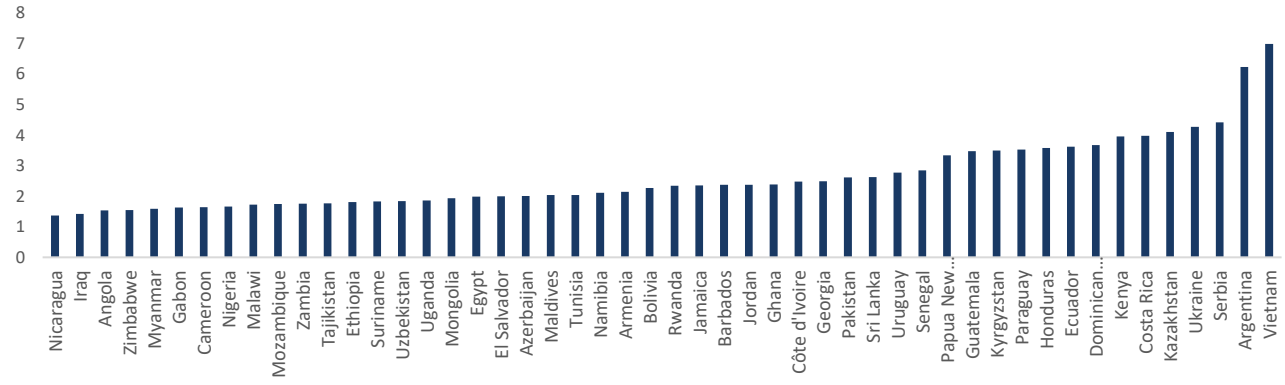
Note: Transition risk exposure and resilience is normalized to scales 0-10 where 0= highest exposure / lowest resilience and 10=lowest exposure / highest resilience.
Source: Global Evolution proprietary framework

In the following sections, we go into depth with some key aspects of the three dimensions of transition risk exposure. We do so to exemplify our approach to transition risk analysis and how risk may materialize.

In assessing transition risks from the current policy landscape, we rely on Verisk Maplecroft's index "*Capacity and intent to introduce carbon policies".* Figure 3 lists emerging markets in our portfolios and/or their benchmarks based on the countries' risk level. Those at highest risk are furthest to the left and those at lowest risk are furthest to the right.

Nicaragua, Iraq, Angola, Zimbabwe, and Myanmar are assessed to have the lowest capacity and intent to introduce carbon policies, contributing to their transition risk from demonstrating a low level of political action toward a low carbon transition. On the other end of the spectrum are Vietnam, Argentina, Serbia, Ukraine, and Kazakhstan. These countries show greater political commitment to the low carbon transition and hence we can expect these to prepare more for the low-carbon transition.

Figure 3: Capacity and intent to introduce carbon policies

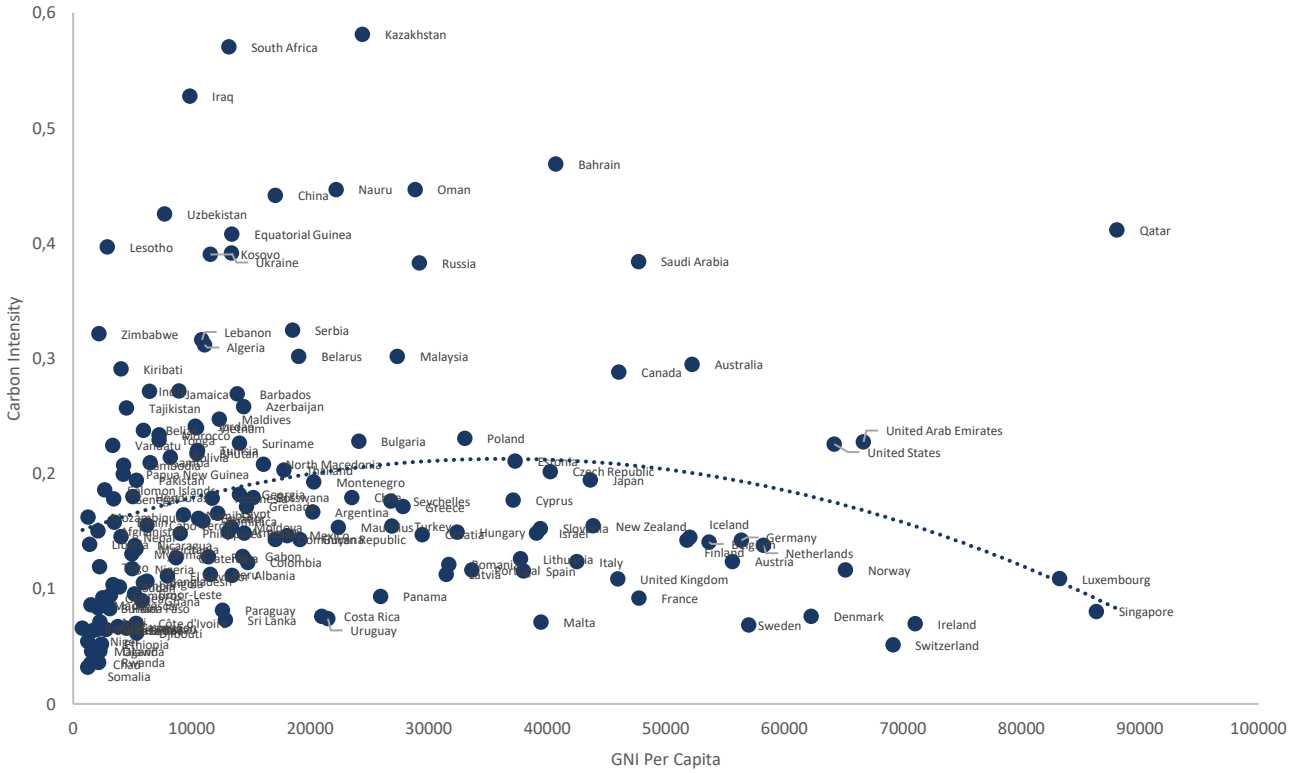


Countries are scored on a scale 0-10 where 0 = highest risk and 10 = lowest risk
Source: Verisk Maplecroft. Prepared by Global Evolution

3.2 Carbon intensive economies

Emerging markets face a dual challenge of simultaneously undergoing economic development and meeting growing expectations to commit to net zero climate ambitions. Historically, there has been a clear link between economic and emissions growth with advanced economies bearing disproportionate responsibility for climate change. Yet, as these economies advanced, their economies have increasingly decoupled from rising carbon emissions.

Figure 4: Environmental Kuznets curve



Source: Prepared by Global Evolution using data from The Global Carbon Project and World Bank

Theorists refer to this as the "environmental Kuznets curve" (figure 4), suggesting that carbon emissions increase during industrialization yet start to decrease once the country reaches a tipping point at a certain income level that allows for investments in new technologies and diversifying the economy.[22] Mapping countries on the environmental Kuznets curve based on their income level and carbon intensity clearly illustrates that a vast number of countries has yet to undergo development; If doing so with business as usual and looking to advanced economies' development path the global problem will be further aggravated.

The countries' position along the Environmental Kuznets Curve also reveals which countries face higher transition risks as consequence of the carbon intensity of their economies. Kazakhstan, South Africa, China, and Uzbekistan are some of the economies with highest carbon intensity with a level much higher than what is expected from their income level. These countries supply the world with fossil fuels to some extent but are also highly dependent on fuels combustion for growing their economies. Those with higher carbon intensity and lower income per capita are at highest risk as they have not yet reached a development level where human capital and technological advancement drives an improvement.

[22] Cole, M. A., & Neumayer, E. (2005). 19 Environmental policy and the environmental Kuznets curve: can developing countries escape the detrimental consequences of economic growth?. *Handbook of Global Environmental Politics*, 298.

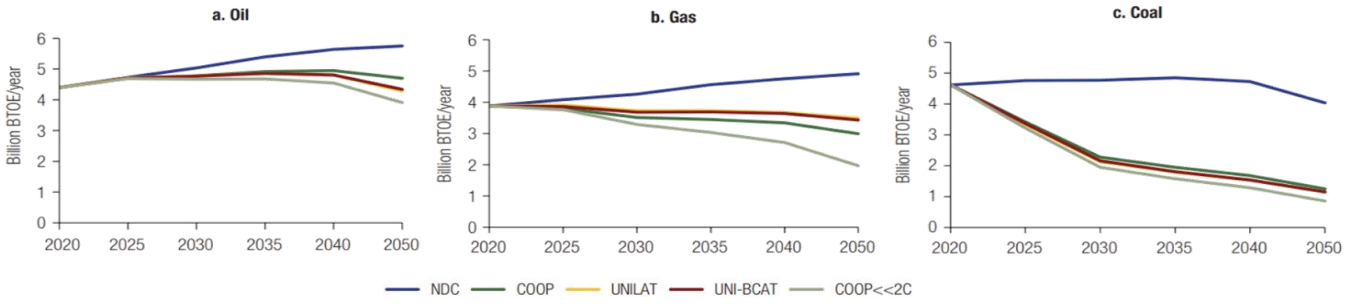
While expectations are growing for frontier and emerging markets to follow a different growth trajectory decoupled from growing carbon emissions,[23] the concept of a *just transition* is gaining foothold. From the view of a just transition, emerging markets should be supported in reaching net zero without leaving anyone behind and without them sacrificing growth and prosperity.[24] Given their lower level of development, frontier and emerging markets are in a weak position in terms of human and financial capital to diversify their economies and invest in technology for a low-carbon development.

Standard Chartered has identified a funding gap of USD 95 trillion dollars for emerging markets to transition to net zero.[25] Without support, emerging markets are unlikely to transition to net zero and financing will be key to reaching the Paris Agreement goals. Importantly, climate change does not know national boundaries, hence collective responsibility and action is instrumental for emerging markets' low carbon transition. Therefore, from our view, an investment rather than divestment approach is needed to support emerging markets' low-carbon transition. A low-carbon transition can even be an engine of growth and contribute significantly to poverty eradication and social inclusion for emerging markets.[26]

3.3 Fossil fuel dependent economies

Understanding the materiality of transition risks is a challenging undertaking and is based on a variety assumption. The prevailing assumption of fossil fuel dependent economies' transition risk is that the demand for fossil fuels will decline, followed by a decline in prices. Indeed, fossil fuel demands will need to decline to reduce emissions to a level compatible with the Paris Agreement, but the actual trajectory towards the goals is uncertain, can take many shapes, and actual success in reaching goals is not guaranteed. In advancing our understanding of such trajectories for risk to materialize, we rely on simulations run by World Bank analysts from the report "Changing Wealth of Nations 2021". The World Bank modelled five trajectories for the simulations of fossil fuel production volumes and rents. These include a path following current Nationally Determined Contributions (NDC) pledges that will not reach the goals of the Paris agreement, three different paths that are constituent with the 2° degrees warming goal of the Paris Agreement (COOP, UNILAT and UNI-BCAT)[27], and a path with ambitious cooperation representing a pathway well below 2° degrees (COOP <2)[28]. Graphs a, b, and c in figure 5 display the simulated production volumes of oil, gas and coal as effect of supply and demand from the different trajectories.

Figure 5: Production volumes of oil, natural gas and coal (BTOE = billion tons of oil equivalent)

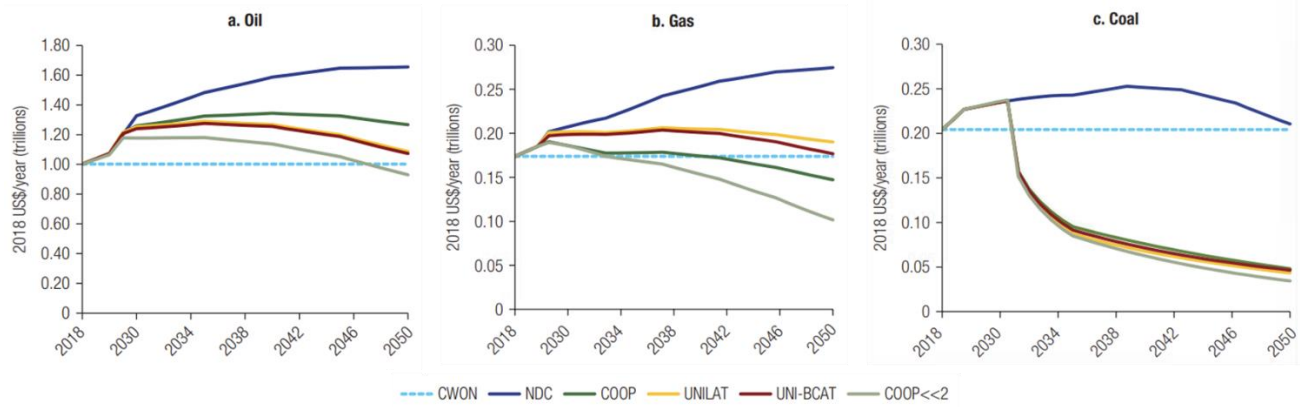


Source: World Bank. (2021). The Changing Wealth of Nations 2021: Managing Assets for the Future. The World Bank.

[23] Standard Chartered (2022). Just in Time.
[24] World Economic Forum (2022). Why net zero without a 'just transition' is not an option. https://www.weforum.org/agenda/2022/05/why-net-zero-without-a-just-transition-is-not-an-option/
[25] Standard Chartered (2022). Just in Time.
[26] UNDP (2022). How Just Transition Can Help Deliver the Paris Agreement. Climate Change Promise UNDP
[27] COOP, UNILAT and UNI-BCAT represent scenario with different carbon taxes and level of cooperation. COOP = cooperative carbon tax is implemented by all countries. UNILAT = unilateral carbon taxes are applied by climate policy leaders (i.e., EU countries and some fossil fuel importers taking action, but not fossil exporters) without border carbon adjustment taxes. UNI-BCAT = unilateral carbon taxes by climate policy leaders with border carbon adjustment taxes.
[28] World Bank. (2021). The Changing Wealth of Nations 2021: Managing Assets for the Future. The World Bank.

Based on the simulation, the trajectory outlined from current NDC targets would continue to increase demand for oil and gas, while coal demand flatten out and later decrease. More ambitious scenarios will see production decline over time. Gas and coal would see greater and faster drop in production in the more ambitious trajectories with coal being particularly exposed. The different scenarios will have different impacts on the global rent profiles for the three categories of fossil fuels as displayed in figure 6.

Figure 6: Global Rent Profiles for Oil, Natural Gas, and Coal Assets



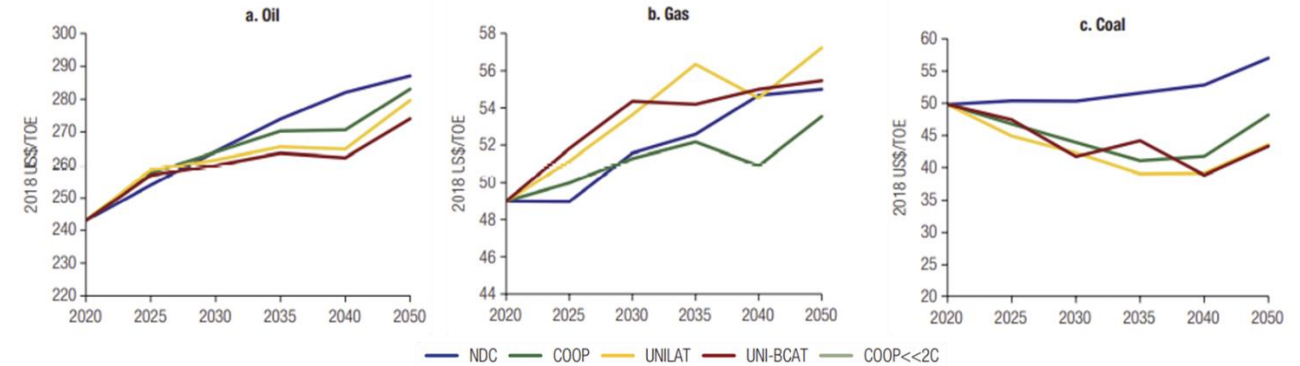
Source: World Bank. (2021). The Changing Wealth of Nations 2021: Managing Assets for the Future. The World Bank.
Note: CWON = Constant value based on Changing Wealth of Nations most recent estimation.

The simulated scenarios suggest that the NDC trajectory will lead to increasing global rents profiles for oil and gas, whereas coal rents will peak around 2040. However, the positive rent profile trends abruptly and breaks as more ambitious carbon policies are implemented. Oil rents are more resilient to more ambitious trajectories and decline slower compared to natural gas and coal. Coal rents are most vulnerable and are expected to drop significantly along any trajectory more ambitious than the current NDC pathway.

In the case where fossil fuel producers' current expectations of increased demand, which is somewhat in line with the NDCs are not met, shockwaves are expected to be sent to their valuations. As effect, investors are likely to lose confidence in the industries and non-competitive producers will find it difficult to survive the transition. The competitive producers surviving the transition will increase their market power and could be able to secure higher prices and rents.

This breaks with the prevalent assumption and narrative that fuel prices will drop following a decrease in global demand as environmentalist narratives are focused on reducing volumes and a problematization of fossil fuel producers' rents. However, it is plausible to expect that fossil fuel producers will adjust production to meet demand. The World Bank's scenario simulation takes such behavior into consideration. The resulting average unit rents for oil, natural gas, and coal are depicted in figure 7.

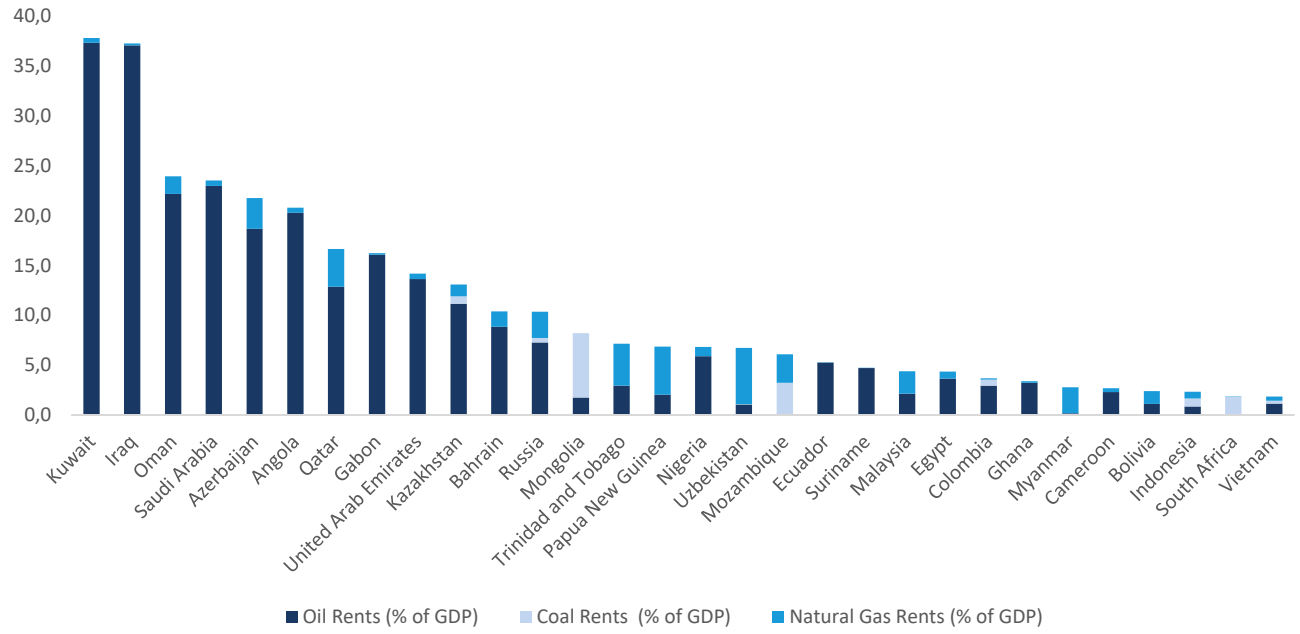
Figure 7: Profile of Average Unit Rents for oil, natural gas, and coal



Source: World Bank. (2021). The Changing Wealth of Nations 2021: Managing Assets for the Future. The World Bank.

The World Bank's simulation shows that increasing prices can help offset economic impact of declining demands, though varying depending on the fossil fuel. Oil and gas rich countries that overcome the low-carbon transition can actually enjoy higher rents per units as compared to 2020 levels. On the contrary, coal producers will suffer from any trajectory more ambitious than the current trajectory outlined by current NDC targets. Based on the above simulations, we can conclude that coal rents are by far at largest risk in any scenario. At the same time, coal is generating the least rent for fossil fuel dependent emerging markets, while oil is by far generating the largest share of rents.

Figure 8. Fossil fuel rents[29] per fossil fuel (as % of GDP) by country



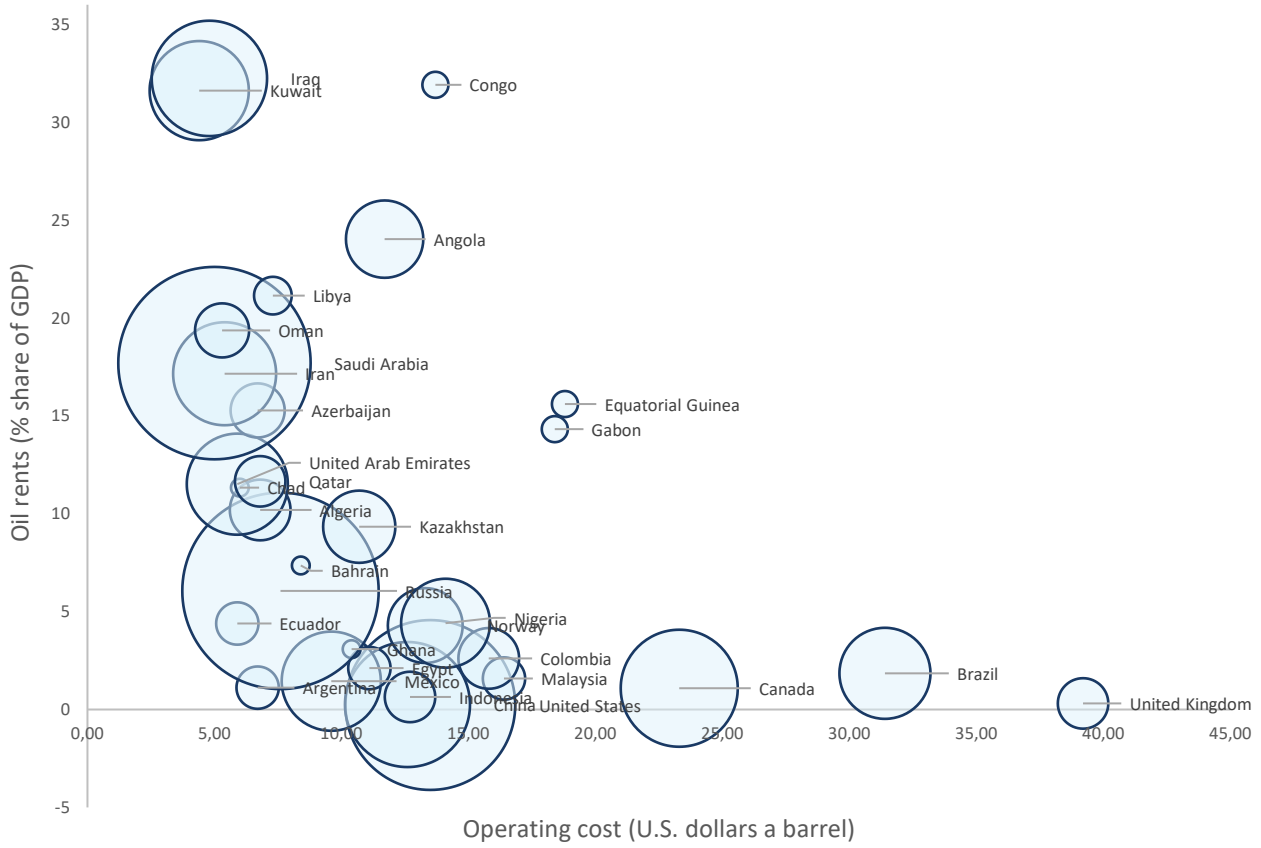
Top-30 fossil fuel dependent economies included in our portfolios and/or benchmarks.
Source: World Bank estimations (World Development Indicators). Prepared by Global Evolution.

As figure 8 indicates Mongolia, Mozambique, and South Africa are at greatest risk from declining coal demand and prices with fossil fuel rents counting 6.5%, 3.1% and 1.8% of GDP respectively. Uzbekistan, Papua New Guinea, and Trinidad & Tobago have the highest resources rents from natural gas (5.6%, 4.8%, and 4.2% of GDP respectively). Oil rents accounts for a much larger share of emerging markets' GDP and the graph clearly shows that several emerging market economies are extremely dependent on oil rents. In understanding the risk, it is important to take into consideration the shift in market dominance and potentially higher rents as effect of non-competitive producers leaving the market.[30]

For this purpose, it is helpful to consider operating costs[31] associated with oil production. Countries with higher operating costs relative to other oil producing countries are likely to be the least competitive and the first to halt production, while those with lower operating costs can gain market shares and benefit from the increasing unit rents. Figure 9 below compares operating costs across both emerging and developed markets to display the relative competitiveness.

[29] Fossil fuel rents are the difference between the value of crude oil production at regional prices and total costs of production multiplied by the physical quantities countries reported as a share of gross domestic product (GDP)
[30] World Bank. (2021). The Changing Wealth of Nations 2021: Managing Assets for the Future. The World Bank.
[31] Operational expenditures include the costs of lifting oil out of the ground, paying employee salaries and general administrative duties

Figure 9: Oil rents and operating costs per barrel by country



Bubble size reflects the number of barrels produced a day. Data is from 2015 given that this allowed for more data for comparison. Operating costs are likely to have lowered from improved technologies.
Sources: Oil rents data sourced from World Bank. Operating costs and number of barrels data sourced from IMF (2015). World Economic Outlook: Uneven Growth Short- and Long-Term Factors. Prepared by Global Evolution.

The graph illustrates that Iraq and Kuwait are the two countries in our investment universe that have the highest dependence on oil rents and also have the lowest operating costs associated with the production of a barrel of oil followed by Saudi Arabia, Oman, and Iran. As effect of their favorable extraction conditions, these countries are likely to increase their market shares and market powers. Fossil fuel producers in Brazil, Malaysia and Columbia are less competitive reflecting greater transition risk, even though these economies are less dependent on oil rents. The smaller economies Equatorial Guinea and Gabon are at risk from lacking competitiveness but are highly dependent on oil rents. Returning to our framework, such countries also have a relatively low resilience and hence will need international assistance in their transition.

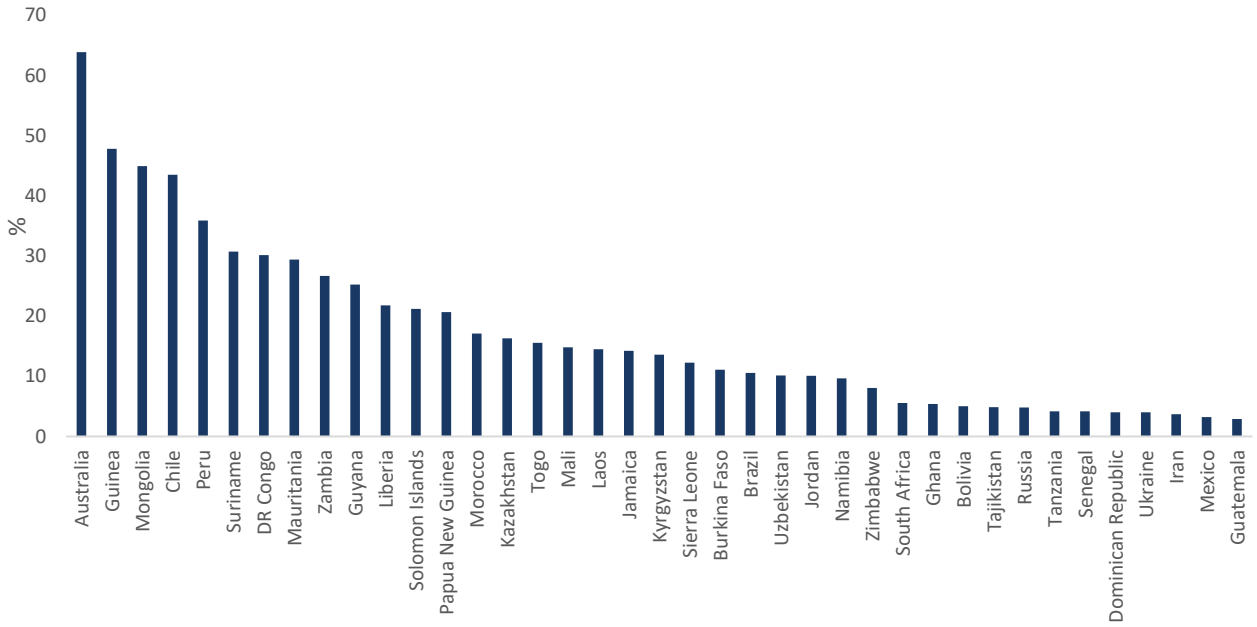
Meanwhile, we are amid a global energy crisis that has led to a global fossil fuel rush and surging energy prices. Europe imported 40% more coal from South Africa in the first five months of 2022 as compared to the full year 2021 and is looking to Qatar's large gas reserves to fill the gap left from the cut of Russian gas.[32] Soaring energy prices benefiting fossil fuel producers do not currently indicate transition risks to materialize for fossil fuel dependent countries. However, the energy crisis may be a steppingstone towards decarbonization, in which case the more ambitious scenarios may be realized. We continue to monitor developments in the low-carbon transition and global efforts that could lead to transition risks materializing.

[32] https://www.reuters.com/markets/commodities/europe-imports-more-south-african-coal-russian-ban-looms-2022-06-15/

3.4 Low-carbon transition opportunities

The low-carbon transition not only represent risks but also opportunities. The growth of low-carbon generation depends on minerals and metals, which are essential inputs to green energy technologies. Hence, economies rich in minerals (figure 10) and metals can benefit from increased demands. Our assessment of low-carbon transition opportunities is based on the World Bank's valuation of countries' known mineral reserves and compare these to countries' current GDP.

Figure 10: Value of known mineral reserves as % share of current GDP



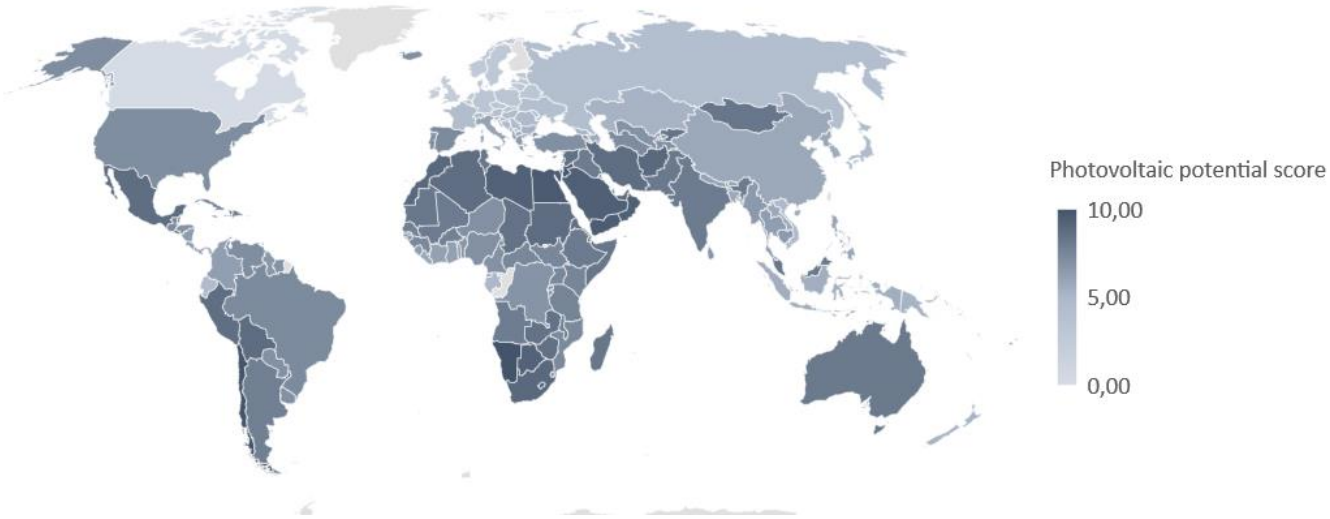
Top 40 countries with highest share of minerals as % share of current GDP, based on latest valuations based on 2018 data. Minerals included to the valuation comprise bauxite, copper, gold, iron ore, lead, nickel, phosphate, silver, tin, and zinc.
Source: World Bank. Prepared by Global Evolution.

Except for Australia, only emerging markets make it to the list of top 40 countries with the largest potential to generate significant value to GDP. Smaller economies such as Guinea and Mongolia will experience a larger impact on their economies from realizing the value of their mineral reserves. Mongolia is already experiencing a mineral boom being home to some of the world's largest mining projects and the economy is expected to grow significantly from these projects. Lower in the list are larger economies such as South Africa and Mexico who can also generate significant returns, though smaller relative to their economies. South Africa is even the world's leading platinum-mining country and producer of other key minerals that are expected to increase in demand. If overcoming the resource curse, i.e., the situation where the abundance of natural resources becomes a barrier to socio-economic development[33], emerging markets can benefit significantly from the green transition.

Another aspect of opportunities arising from the low-carbon transition is the varying potential for renewable energy. Countries rich in wind, solar and hydro power have greater potential for large-scale renewable energy installations and could even benefit from exporting renewable energy. In estimating renewable energy potential, we assess countries theoretical potential for generating solar, wind and hydro power. Figure 11 depicts the theoretical potential of solar power.

[33] Ross, M. L. (1999). The political economy of the resource curse. *World politics*, *51*(2), 297-322.

Figure 11. Solar Power Potential



Practical Photovoltaic Potential is the potential photovoltaic power output of a PV system taking into consideration land constrained by physical obstacles to photovoltaic plants (however not taking into consideration protected land). Potential is standardized to scale 0-10 (0 reflecting lowest potential, 10 reflecting highest potential).
Source: Global Solar Atlas country factsheets. Prepared by Global Evolution

From our assessment we identify that the best (yet largely untapped) solar resources can be found on the African continent and in the GCC region. Realizing this potential requires significant investments, which in turn could generate affordable energy and new jobs and thereby fueling the African continent's growth. Fossil fuel dependent countries in the GCC region have already invested significantly in renewable energy (solar and wind) and have reached a level where renewables have become competitive with fossil fuels. This is important for the GCC countries in reducing the risk associated with their dependence on oil revenues and diversifying their economies. Our framework integrates similar assessment of wind and hydropower.

3.6 Transition risk

Lower global CO_2 emission will generate lower demand and production in EM, and this transition risk away from fossil fuels will translate into higher but not substantial credit risk. There are several caveats, as this is an aggregate analysis where the many counteracting effects are not assessed in this analysis. Limiting carbon emission is key, and we find an interesting correlation that a 1% reduction in CO_2 emission will lead to an effect of 1% increase in sovereign bond spreads. To reach the target of 1.5° temperature increase, we find that countries are likely to face a modest 20 basis points spread widening per year until 2030 which is statistically insignificant compared to normal market volatility. However, CO_2 emission may not all in EM since such countries may take a different path compared to advanced economies as industrialization and development gains traction.[34]

[34] This analysis was conducted in our 2021 TCFD report, "Carbon Efficiency", section 5.1, to which we refer for detail of the study. Such scenario analysis and climate dynamics do not change high-frequently, so we do not deem it necessary to revise the estimates in this year's report and consequently refer to our 2021 TCFD report for such scenario analysis. It is relevant to assessing the financial risks to our asset class is a scenario analysis of sovereign credit risk depending on various trajectories for CO_2 emission over the next 10 years. The UNEP (2020) assessment is that a new high was hit in 2018 of 55.3 $GtCO_2e$. To reach the 1.5° target as announced by the IPCC, CO_2 emission over the next 10 years must decline by 58%; and to reach the 2.0° has to decline by 27.1%. Different scenarios for the transition to a low-carbon World can take many forms, and we adopt those formulated by the IPCC and UNEP that relate to these three scenarios for our scenario analysis: *Scenario 1*: Global CO_2 emission stays at current levels; *Scenario 2*: Global CO_2 emission falls by 27% (2.0° temperature target above preindustrial levels); *Scenario 3*: Global CO_2 emission falls by 58% (1.5° temperature target above preindustrial levels). Our proprietary analysis indicates that EMBIGD spreads will increase by 0.9% when CO_2 emission falls by 1%; essentially a 1-to-1 relationship in percent. Consequently, if CO_2 emission must fall by 57.9% by 2030, this translates into a drop in 187 basis points (bp) from current spread levels. This translates into approx. 20bp spread widening per year up to 2030.

In conclusion, our transition risk analysis reveals that the 1.5° and 2.0° targets can be met by rather large adjustment in CO_2 consumption, and that will also entail a massive build-up of investments in renewable energy forms. Furthermore, these analyses are preliminary as part of our first TCFD report, and our preliminary conclusion is that lower global CO_2 emission will generate lower demand and production in EM, and this transition will translate into higher credit and portfolio risk but not substantially.

3.7 Physical risk

To evaluate risks pertaining to physical risk we rely on nuanced data on aggregate vulnerability to climate change. It is now widely accepted that global climate is changing, with the consequential need for human societies to adapt to both the changing climate as well as the resulting alterations to the natural environment. The effects of climate change will be felt both in the short and long term. Future projected changes in the frequency and intensity of forest fires, tropical cyclones, droughts, and floods will affect the population, economy, and infrastructure of a country.

The effects of increasing temperatures, shifting rainfall patterns, and rising sea level will also be felt globally, impacting coastlines, plant and animal species, agriculture, and human health. To minimize the worst effects of climate change, it is necessary to fully understand the extent and degree of regional, national, and subnational vulnerability to climate extremes and long-term climate change.

While businesses may be familiar with some of the reputational and regulatory risks and opportunities associated with climate change, many now also face the pressing need to understand the direct physical impacts. Risks to supply chains are greater than ever, as climate change is already affecting the frequency and intensity of climate extremes such as severe storms, flooding, and drought. The implications of climate change for industrial processes, supply chains, tourism and infrastructure are potentially devastating. Given the varying global vulnerability that this index highlights, it is not enough for companies to plan for physical exposure alone without also recognizing the complex political and socio-economic contexts in which their operations or interests may be rooted.

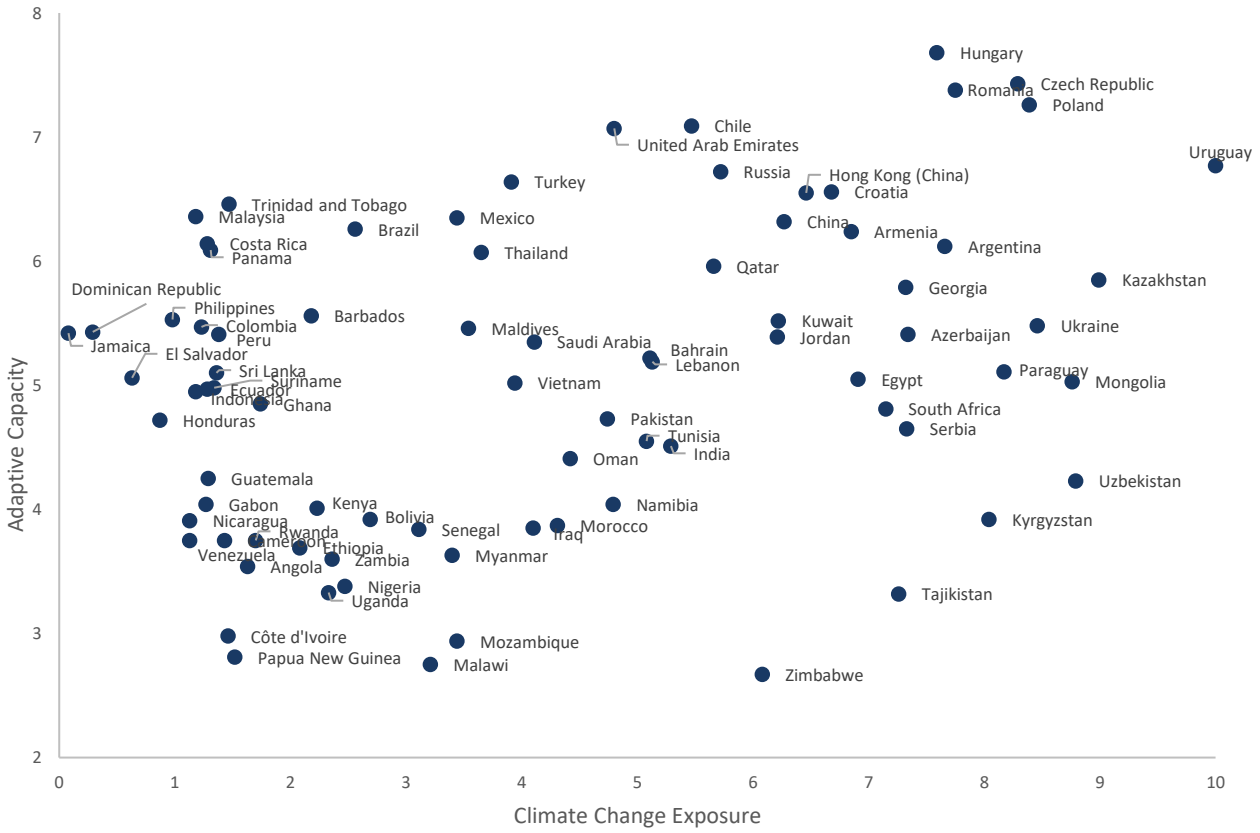
Our assessment of physical risks is based on two components: Countries' exposure to the negative consequences of climate change and their adaptive capacities to the stresses resulting from climate change. Both components are assessed through Verisk Maplecroft indices (figure 12). The Climate Change Exposure Index assesses the degree to which countries are currently exposed to the physical impacts of climate extremes, the changes in climate extremes, and the future changes in climate over the next three decades. Current climate extremes include floods, droughts, tropical storms and cyclones, landslide, severe storms, wildfire hazards, and flood hazards. Changes in climate extremes represent the changes in the frequency and/or intensity of climate extremes between current climate and future climate. Among others, factors under consideration include drought length, number of days with maximum temperatures exceeding 90th percentile, heatwave duration etc.

The Climate Change Adaptive Capacity Index assesses the present abilities of a country's institutions, economy, and society to adjust to, or take advantage of, existing or anticipated stresses resulting from climate change. The assessment includes education and innovation, strength of institutions; management of resources (e.g., healthcare provision and food and water supply); vulnerability of the economy based on

Since the over the past 10 years the standard deviation (normal extent of variation) is approx. 60bp, the effect coming from achieving climate change targets of 1.5° lies within the normal variation in EM credit risk and can therefore not be substantial.

agriculture; public awareness about climate change; and current financial vulnerabilities. We assess the two indices in conjunction to have a nuanced assessment of physical risks.

Figure 12: Climate Change Exposure vs. Adaptive Capacity to Climate Change



Source: Verisk Maplecroft. Countries scored on scale 0-10. Low scores represent higher exposure risk and lower adaptive capacity while higher scores reflect lower exposure risk and higher adaptive capacity.

Countries adaptive capacities vary among those at greatest exposure risk. The Dominican Republic and Jamaica have the highest exposure risk but are also judged to be more resilient than countries such as the Ivory Coast and Papua New Guinea that are also at extreme risk.[35] Paradoxically, the countries at largest exposure to the physical consequences of climate changes are countries that have contributed proportionally little to climate change in the first place. While informing our investment process and seeking to protect our clients' portfolios against physical risk, we also seek to integrate a fairness measure to support countries in building resilience to endure the physical consequences of climate change.

4. Risk Management

In the management of climate-related risks, and ESG risks more broadly, we take a three-pillar approach of *negative screening*, *positive screening*, and *ESG portfolio monitoring*. A description follows below where we demonstrate an example of carbon footprint portfolio monitoring. The management of climate-related risks, and ESG risks more broadly, we take a three-pillar approach including *negative screening*, *ESG integration*, and *engagement*.

[35] Countries with a score <2.5 are considered to be at extreme risk

Table 2 ESG integration

	Objective	Action
Negative screening	To exclude issuers with exceptional poor ESG performance	Our proprietary exclusion framework monitors basic ESG criteria, which are required to be above a certain threshold to be included into our investment universe.
ESG integration	To integrate climate-related risks and opportunities into our investment decisions	Proprietary analytical framework developed in 2022 for holistic sovereign ESG assessment across a variety of ESG issues Sentiment analytics for high-frequent monitoring of ESG issues Thematic analysis on relevant ESG topics impacting investments Portfolio monitoring
Engagement	To engage with governments on key risks and opportunities	Direct engagement with issuers Indirect engagement through organizations

Source: Global Evolution

4.1 ESG negative screening

Global Evolution maintains proprietary ESG ratings for all emerging and frontier market countries across a set of more than 100 E, S and G indicators. Our ESG ratings are calculated in our ESG-simulator which is integrated into our proprietary IT systems and contributes valuable information to the investment process.

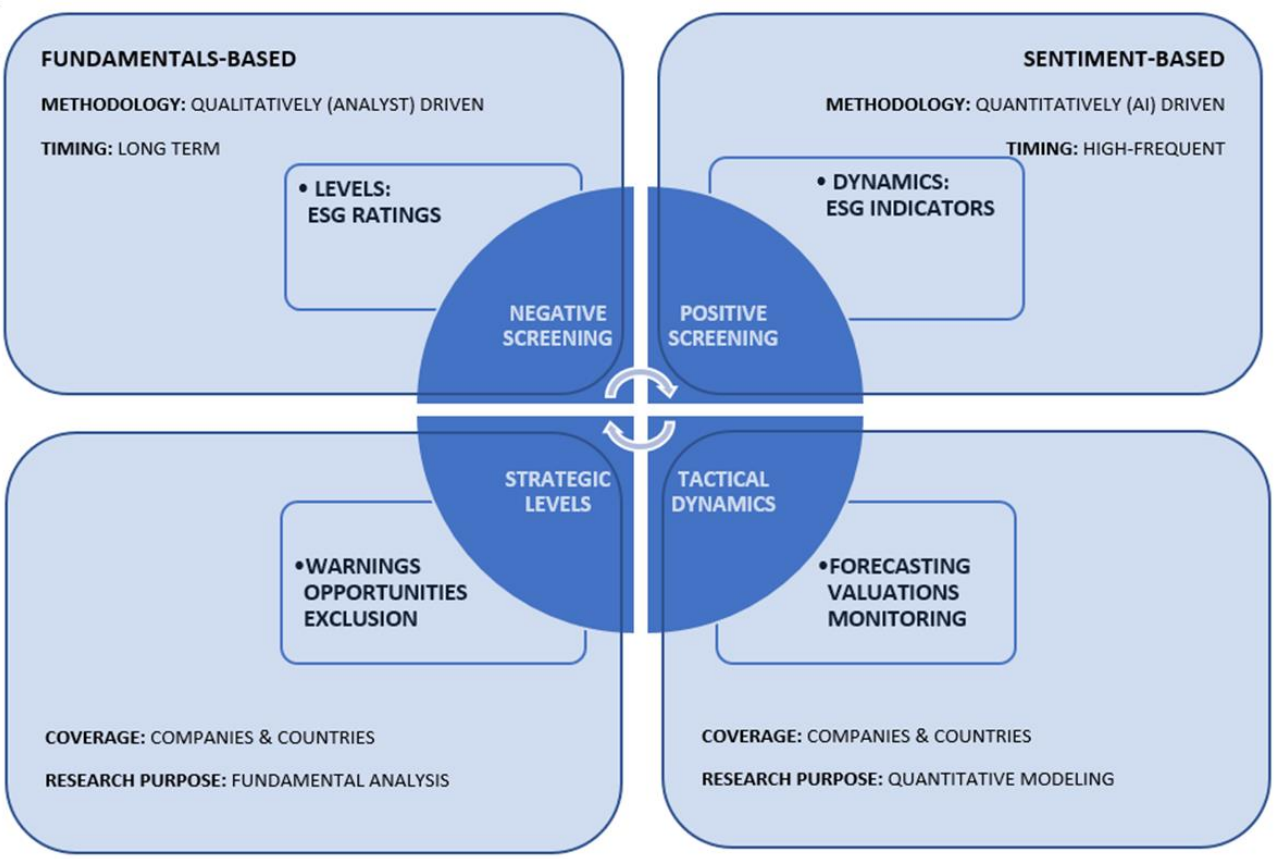
The ESG Ratings are optimized through simulations of the several variables and weightings and only includes indicators with substantial influence on the sustainable economic and socio-economic development of countries. In that context, the ESG dynamics are linked to long term sovereign investments through sustainable development.

The ESG Ratings inform our investment process and serve as ongoing input to our quantitative valuation and rating models. The ESG scores informs our negative screening whereby we exclude certain countries from our investable universe.

4.2 ESG positive screening

Global Evolution's approach to ESG integration is two-fold with analyses supporting our strategic and tactical decisions (figure 13). Our fundamentals-based approach has been extended recently, and will be the main focus in this subsection, while the sentiment-based approach that relies on high-frequent ESG data is at a more experimental development stage and will be the focus of next year's 2023 TCFD report.

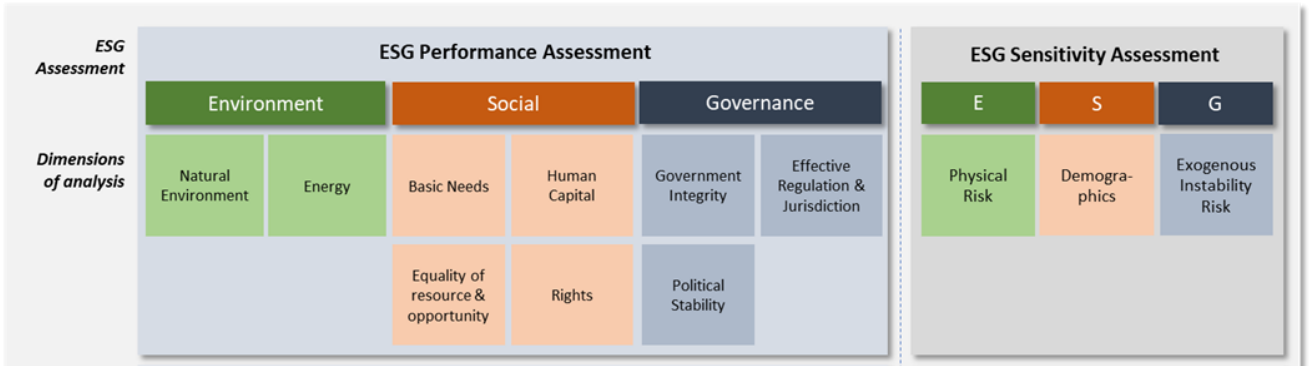
Figure 13: Global Evolution ESG Integration



Source. Global Evolution

In 2022 we have developed an extensive analytical ESG framework integrating key environmental, social, and governance factors material to countries' socio-economic development. With our framework, we take a two-legged assessment approach analyzing ESG performance and ESG sensitivity.

Figure 14: Global Evolution fundamental-based ESG Framework



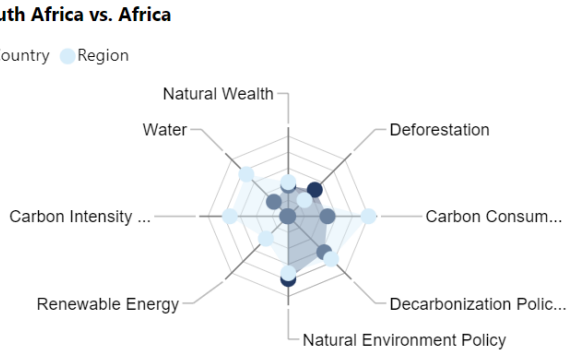
Source: Global Evolution

Our ESG performance assessment is designed for the purpose of rating sovereign ESG performance based on ESG factors that can largely be influenced through government interventions, whereas our ESG Sensitivity assessment is focused on monitoring ESG risks that are more endogenous and which governments will need to navigate and build resilience to (figure 14). The aim of this approach is to avoid penalizing countries for factors outside their influence; yet acknowledging that such ESG risks can have material risk to portfolio performance. Given that governments can introduce carbon policies to drive a low-carbon transition, transition risks are assessed as part of our ESG performance as part of the energy dimension. This dimension includes measures of carbon intensity, consumption per capita, renewable electricity, and de-carbonization policy support, reflecting key elements of our transition risk framework.

Acknowledging that emerging markets generally have done little to contribute to climate change, physical risks are included to our ESG Sensitivity assessment. In this dimension of analysis, we both include the level of climate change exposure and the level of adaptive capacity. Our proprietary ESG ratings inform investment decisions and country overviews are easily available, allowing to track levels and performance. Figure 15 is a snapshot from our Internal ESG platform with data on environmental performance available for South Africa.

Figure 15: Environmental Performance South Africa, Global Evolution ESG assessment Framework

ENVIRONMENT PERFORMANCE	2017	2018	2019	2020	2021	2022
Energy	**3,07**	**3,18**	**2,96**	**2,97**	**3,08**	**3,23**
Carbon Consumption per Capita	5,00	5,00	5,00	5,00	5,00	5,00
Carbon Intensity of Economy	0,00	0,00	0,00	0,00	0,39	0,89
Decarbonization Policy Support	7,14	7,55	6,61	6,52	6,26	6,26
Renewable Energy	0,14	0,17	0,23	0,34	0,68	0,75
Natural Environment	**4,91**	**4,87**	**4,86**	**4,89**	**4,86**	**4,84**
Deforestation	4,81	4,81	4,81	4,81	4,81	4,81
Natural Environment Policy	7,51	7,56	7,56	7,51	7,51	7,52
Natural Wealth	4,42	4,20	4,18	4,23	4,15	4,07
Water	2,91	2,91	2,91	2,99	2,97	2,97
Total	**3,99**	**4,02**	**3,91**	**3,93**	**3,97**	**4,03**



Indicators are scored on a scale 0-10 where 0=poorest performance and 10=strongest performance
Source: Global Evolution based on multiple sources.

Our thematic analyses are aimed at understanding a variety of ESG issues that influences our investments. These analyses take the shape of smaller insights and more thorough analyses. By integrating fundamental macroeconomic, financial and ESG factors into our valuation models, we estimate signals for valuations of sovereign credit spreads and currencies. Importantly, the approach we have developed integrates ESG factors directly into our valuation models. We believe and can econometrically document that such approach adds value in terms of estimating more accurate trade signals to inform our investment process.

4.3 ESG and carbon portfolio monitoring

We monitor risks and opportunities associated with the low-carbon transition and physical consequences of climate change. There is however deep uncertainty of how and to what extend risks materialize. Such uncertainty is difficult to capture in frameworks and scenario analysis and for which qualitative information is an important addition. While frameworks help identify countries at risk and the underlying drivers, our approach aims to minimize risks and leverage opportunities rather divesting from countries with high risk by default.

This reflects our acknowledgement that frontier and emerging markets historically have contributed the least to climate change in the first place. Yet our approach is naturally also to be seen in the light of our fiduciary responsibility and in the case that climate change risk materialize to financial performance action is taken accordingly.

We also monitor our portfolios across individual indicators such as carbon emission. This is both because we find it valuable to qualitatively assess the effects on the climate of our portfolios but also because this is to an increasing extent requested by our clients.

5. Metrics and Targets

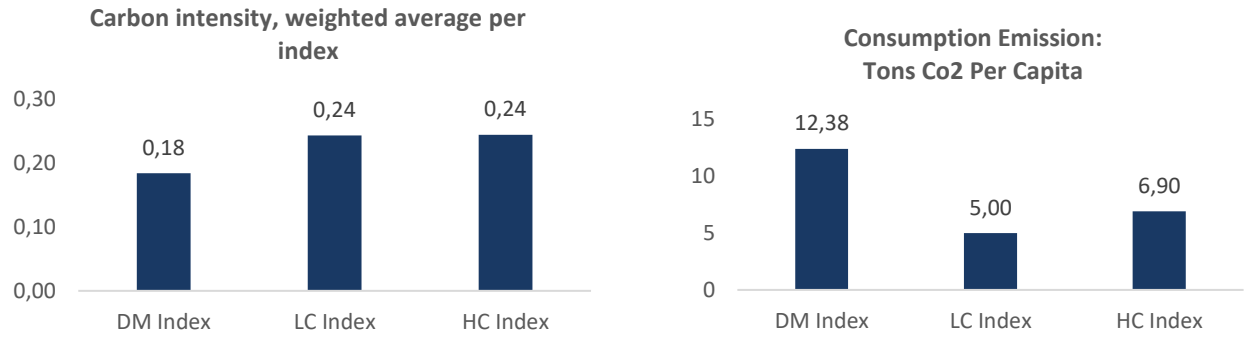
The metrics for carbon footprint that we monitor are seven-fold because we seek a nuanced approach to carbon footprints of the portfolios we manage:

1. CO_2 emission in production terms; CO_2 emission in consumption terms
2. CO_2 emission in production terms (per capita); CO_2 emission in consumption terms (per capita)
3. CO_2 emission in production terms (share of GDP); CO_2 emission in consumption terms (share of GDP)
4. Renewable energy as a share of electricity consumption.

While carbon footprint and carbon intensity are the most widely used metrics, we find that these metrics place emerging markets in a highly disadvantaged position. Along with their diversification of economies, advanced economies have outsourced much of their emissions to emerging markets yet still being the largest carbon consumers when accounting for import and export. This is reflected in emerging vs. developed market indices as depicted in figure 16.

Using carbon intensity as metric, the index including developed markets performs better than the emerging markets indices. On the contrary, carbon consumption per capita is significantly higher in the DM index compared to the emerging markets indices. Using carbon intensity alone gives a skewed perspective to understanding carbon emissions.

Figure 16: Comparison indices based on carbon intensity and carbon consumption



DM Index = ICE BofA Global Government Bond. LC index = JP Morgan GBI-EM Global Diversified. HC Index = JP Morgan EMBI Global Diversified. Please see index definitions at the back of this paper. Source: Global Carbon Project.

6. The future sustainability integration

We continue to expect the decarbonization agenda to an increasing extent will be driven by client and international demand for reporting and adherence to carbon targets and disclosures. As a result, the above sections reflect our current thinking but should be expected in the future to be enlarged and refined in terms of details and coverage.

While a solid framework is necessary for analyzing and integrating sustainability risk—including the decarbonization paradigm elaborated on in this year's TCFD report—the key challenge is still information and data on sustainability related metrics. The frequency of ESG data is low and scarce. However, this is also the biggest opportunity in sustainability-related research.

Our current exploratory work for sustainability integration involved the development and experimental use of high-frequent ESG sentiment data developed using new technologies. This will be the focus of next year's TCFD report, focusing on the potential for sustainability integration into our investment process alongside broader ESG integration.

7. Definitions of Indices

Index	Definition
J.P. Morgan EMBI Global Diversified	is the J.P. Morgan EMBI Global Diversified Index (EMBI GD): The index is a market capitalization-weighted total return index of U.S. dollar and other currency denominated Brady bonds, loans, Eurobonds and local market debt instruments traded in emerging markets.
J.P. Morgan GBI-EM Global Diversified	is the J.P. Morgan Government Bond Index for Emerging Markets Global Diversified (J.P. Morgan GBI EM GD) : The index is a comprehensive global local emerging markets index, and consists of regularly traded, liquid fixed-rate, domestic currency government bonds to which international investors can gain exposure.
ICE Bofa Global Government Bond	The index tracks the performance of public debt of investment-grade sovereign issuers, issued and denominated in their own domestic market and currency. It is a market value-weighted measure of these bonds.

8. Disclaimer & Important Disclosures

Global Evolution Fondsmæglerselskab A/S ("Global Evolution DK") is incorporated in Denmark and authorized and regulated by the Finanstilsynets of Denmark (the "Danish FSA"). Global Evolution DK is located at Buen 11, 2nd Floor, Kolding 6000, Denmark.

Global Evolution DK has a United Kingdom branch ("Global Evolution Fondsmæglerselskab A/S (London Branch)") located at Level 8, 24 Monument Street, London, EC3R 8AJ, United Kingdom. This branch is deemed authorized and regulated by the Financial Conduct Authority. Details of the Temporary Permissions Regime, which allows EEA-based firms to operate in the UK for a limited period while seeking full authorization, are available on the Financial Conduct Authority's website.

In the United States, investment advisory services are offered through Global Evolution USA, LLC ('Global Evolution USA"), an SEC registered investment advisor. Registration with the SEC does not infer any specific qualifications Global Evolution USA is located at: 250 Park Avenue, 15th floor, New York, NY. Global Evolution USA is an wholly-owned subsidiary of Global Evolution Fondsmæglerselskab A/S ("Global Evolution DK"). Global Evolution DK is exempt from SEC registration as a "participating affiliate" of Global Evolution USA as that term is used in relief granted by the staff of the SEC allowing U.S. registered investment advisers to use investment advisory resources of non-U.S. investment adviser affiliates subject to the regulatory supervision of the U.S. registered investment adviser. Registration with the SEC does not imply any level of skill or expertise. Prior to making any investment, an investor should read all disclosure and other documents associated with such investment including Global Evolution's Form ADV which can be found at https://adviserinfo.sec.gov.

In Singapore, Global Evolution Fund Management Singapore Pte. Ltd has a Capital Markets Services license issued by the Monetary Authority of Singapore for fund management activities. It is located at Level 39, Marina Bay Financial Centre Tower 2, 10 Marina Boulevard, Singapore 018983.

Global Evolution is affiliated with Conning, Inc., Goodwin Capital Advisers, Inc., Conning Investment Products, Inc., a FINRA-registered broker dealer, Conning Asset Management Limited, Conning Asia Pacific Limited and Octagon Credit Investors, LLC are all direct or indirect subsidiaries of Conning Holdings Limited (collectively, "Conning") which is one of the family of companies owned by Cathay Financial Holding Co., Ltd., a Taiwan-based company. Conning has offices in Boston, Cologne, Hartford, Hong Kong, London, New York, and Tokyo.

Conning, Inc., Conning Investment Products, Inc., Goodwin Capital Advisers, Inc., Octagon Credit Investors, LLC, are registered with the Securities and Exchange Commission ("SEC") under the Investment Advisers Act of 1940 and have noticed other jurisdictions they are conducting securities advisory business when required by law. In any other jurisdictions where they have not provided notice and are not exempt or excluded from those laws, they cannot transact business as an investment adviser and may not be able to respond to individual inquiries if the response could potentially lead to a transaction in securities. Conning, Inc. is also registered with the National Futures Association and Korea's Financial Services Commission. Conning Investment Products, Inc. is also registered with the Ontario Securities Commission. Conning Asset Management Limited is authorized and regulated by the United Kingdom's Financial Conduct Authority (FCA#189316), Conning Asia Pacific Limited is regulated by Hong Kong's Securities and Futures Commission for Types 1, 4 and 9 regulated activities.

This publication is for informational purposes and is not intended as an offer to purchase any security. Nothing contained in this communication constitutes or forms part of any offer to sell or buy an investment, or any solicitation of such an offer in any jurisdiction in which such offer or solicitation would be unlawful.

All investments entail risk and you could lose all or a substantial amount of your investment. **Past performance is not indicative of future results which may differ materially from past performance.** The strategies presented herein invest in foreign securities which involve volatility and political, economic and currency risks and differences in accounting methods. These risks are greater for

investments in emerging and frontier markets. Derivatives may involve certain costs and risks such as liquidity, interest rate, market and credit.

This communication may contain Index data from J.P. Morgan or data derived from such Index data. Index data information has been obtained from sources believed to be reliable but J.P. Morgan does not warrant its completeness or accuracy. The Index is used with permission. The Index may not be copied, used, or distributed without J.P. Morgan's prior written approval. Copyright 2022, J.P. Morgan Chase & Co. All rights reserved.

While reasonable care has been taken to ensure that the information herein is factually correct, Global Evolution makes no representation or guarantee as to its accuracy or completeness. The information herein is subject to change without notice. Certain information contained herein has been provided by third party sources which are believed to be reliable, but accuracy and completeness cannot be guaranteed. Global Evolution does not guarantee the accuracy of information obtained from third party/other sources.

The information herein is not intended to provide, and should not be relied upon for, accounting, legal or tax advice or investment recommendations.