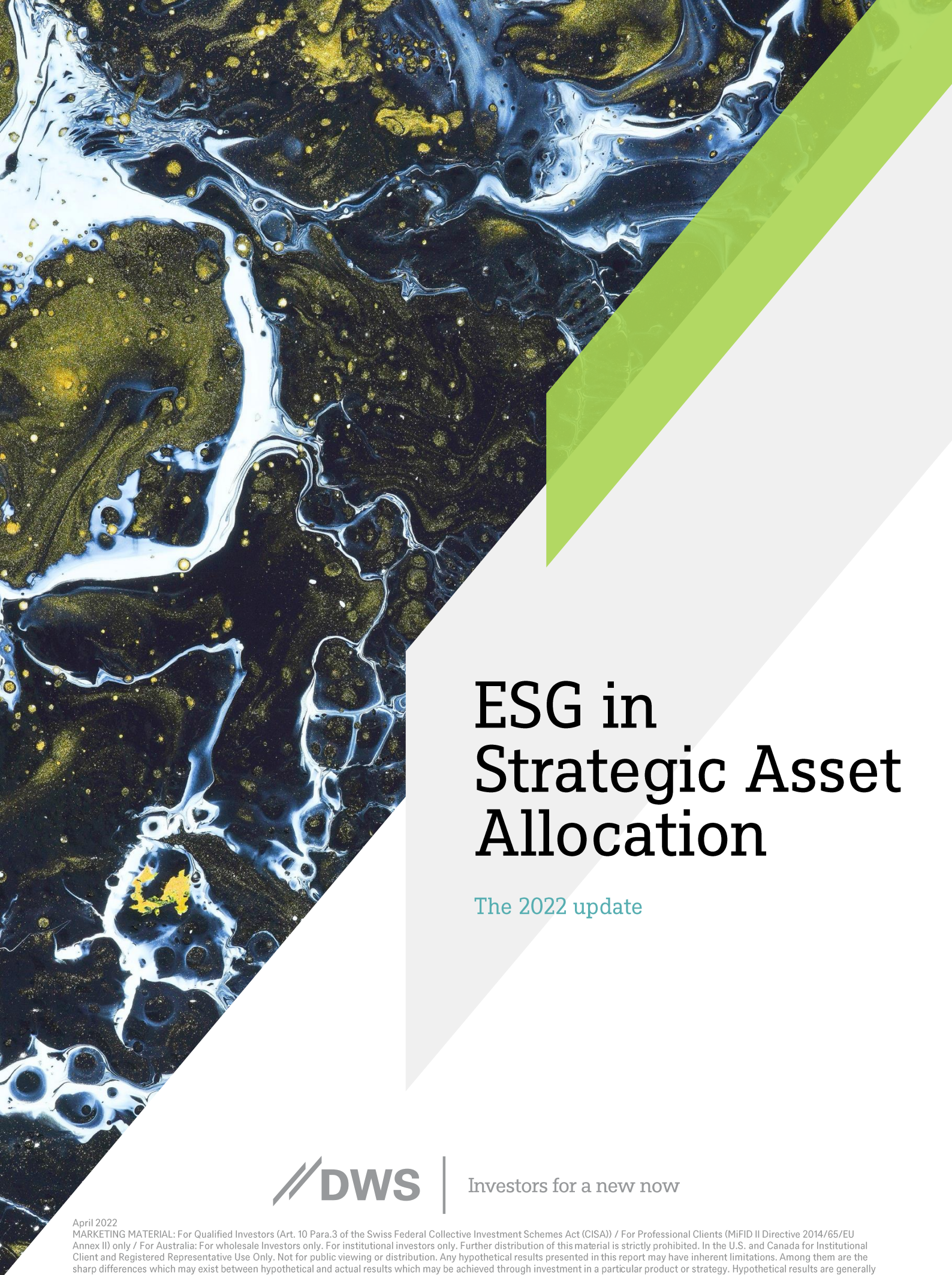

ESG in Strategic Asset Allocation

The 2022 update

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ESG in Strategic Asset Allocation (SAA): The 2022 update

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Overview

In December 2020, DWS published our approach on how to consider ESG aspects across different asset classes - at the strategic asset allocation (SAA) level. The study has stimulated many discussions with our clients and continues to enjoy a high level of interest. Reason enough to update and extend our approach in the swiftly developing world of ESG. ESG integration in strategic asset allocation appears to be still a relative blind spot of research and constitutes an important ingredient to further facilitate ESG integration at an overall multi-asset portfolio level. Compared to its practical relevance the topic has room to evolve.[1]

We made several updates in the 2022 update and present a more granular set of optimisation scenarios that now include **Paris alignment, EU Principle Adverse Impact (PAI),** or an **EU Taxonomy** focus. Moreover, we are very pleased to extend our Framework to **Liquid Alternatives** and the **DWS ESG Long View Estimates**. Our 2022 analysis reiterates several previous findings and adds new perspectives.

Our study objectives are unchanged. We seek to (i) understand the potential impact of integrating ESG factors on risk adjusted returns, and (ii) identify the potentially best approach to optimise impact, while minimizing tracking error (TE).

Our ESG approach is a **mixed, multi-faceted approach** of not only **minimizing typical exclusion criteria** (negative screening), but also in parallel **maximizing ESG impacts** (positive screening). This is all performed on index level rather than on single security basis to allow implementation scalability. We study the optimisation potential of traditional indices, ESG replacements, and combined optimisations.

We also analyse if the **integration of Alternatives** is possible without diluting the ESG profile or risk-adjusted returns vs. traditional index SAAs and at low levels of asset allocation tracking error ("TE").

The results of our 2022 analysis can be summarised as follows:

- We are starting with studying the **optimisation potential among traditional indices**. The relative reduction potential within the set of traditional instruments for the worst Carbon performers have slightly improved versus our 2020 analysis. A Carbon intensity optimisation within traditional sectors appears superior compared to one on traditional regional basis. The carbon intensity reduction can be as high 45% for a TE of 1.00% when optimising the sector allocation via traditional instruments. The relative reduction potential of the worst Norm violators (Norm F's) via traditional indices is comparably high compared to our 2020 analysis.
- While optimising within traditional instruments might be a valid option for some investors, enhanced ESG portfolio features are only achievable via the integration of ESG indices. On an ex-post basis, the **1:1 switch to passive ESG indices** now averages at an implementation tracking error of roughly 0.9% during our back test, slightly above our previous year's analysis. But this active risk also comes with slightly higher returns. The historic information ratio (IR) since 2014 is calculated at 0.56. This is accompanied with very good ESG performance across the board.
- Further improvements for the ESG profile and the ex-ante asset allocation tracking error can be achieved in a **combined optimisation approach** that optimises the asset

[1] See also e.g. Principles for Responsible Investment. (September 2019). "Embedding ESG Issues into strategic asset allocation frameworks: Discussion paper."

allocation of our ESG index instruments. For example, the relative **carbon intensity** of the total portfolio can be further improved. An EU PAB level **carbon reduction (-50%) is achievable with an estimated TE of slightly below 0.25%**. We also check, if for such reduction potential a dedicated Paris filter (leaving out all other ESG facets) is necessary. This can be denied. Such carbon reductions are always accompanied by better performance in other ESG facets. **NZAM** (Net Zero Asset Manager Alliance) **path modelling including different ESG facets** while incorporating SBTi (Science Based Targets Initiative) targets **are plausible to us**.

- Such additional ESG facets can be e.g. the Waste and Water intensity or the UNGC signatoryship that have been analysed this year for the first time as part of our PAI focus. Across the TE profiles, noteworthy improvements could be expected via the combined optimisation approach. For an allocation TE of 1.00% the **water intensity** is modelled on relative basis to be **reduced by 69%, waste intensity by 51% and the UNGC signatoryship improved by 37%.**
- Our combined ESG optimisations are superior for nearly all facets of analyses and allocation TE compared to either the traditional regions / sectors or the 1:1 passive ESG index replacements. Except for one small area: the **improvement potential for the SDG revenue** share for higher TE's (>1.00%) is currently marginally higher for traditional sector indices compared to ESG tilted indices/optimisations. All else equal, our **combined optimisations beat at anytime the 1:1 index replacements**.
- But there is also a potential **blind spot in ESG indices** that also transpose into our combined optimisations. The PAI aspect of **Board Diversity** seems not part of current ESG indices constructions/ETF's as we cannot detect noteworthy improvement potential via our optimisations achievable (at least via our index set).
- We also can confirm that an **Alternatives integration is possible without diluting either the ESG profile or the risk-adjusted returns** vs. the traditional SAA. We find that even traditional Alternative instruments may come with a natural ESG tilt – even without applying dedicated ESG versions for these asset classes. In the majority of cases, the ESG profile of our SAA including Alternatives improves slightly.
- Last but not least, based on the weighted relative ESG improvements of our different optimization approaches for the defined TEs, we find a massive improvement already at ex-ante asset allocation TEs of 0.25%, which however grows with higher TEs at much lower slopes. The **optimal trade-off between ESG and TE** depends on the investors' utility function in terms of ESG impact and risk budget to determine the specific optimum.

DWS Approach to ESG in SAA

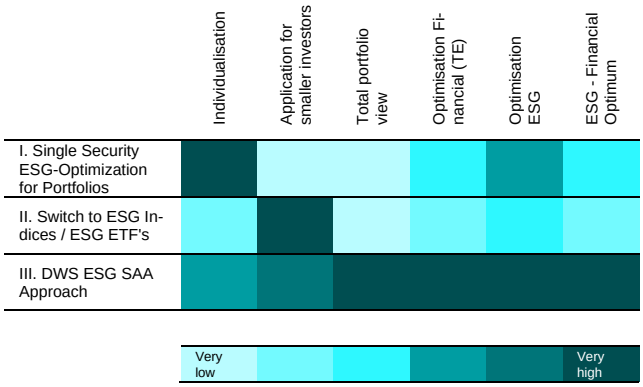
It is challenging for every market participant to integrate ESG aspects on an SAA level in a holistic manner as it affects various aspects. Several challenges need to be addressed. It starts with the complexity of the investment universe and the reference SAA including various sub-asset classes and alternatives. Besides the financial modelling, the need for ESG data availability and data look-through from an index level to the underlying security amplifies complexity. Bringing together the tools for the traditional risk-return optimisation with the ESG parametrization is therefore key.

If investors want to assess the ESG implications on a strategic asset allocation level, they have to overcome several restrictions, as the ESG impacts, because of complexity, are often only measured on a portfolio sub-component basis. Therefore, a holistic view of portfolio ESG impact is essential for comprehensive portfolio construction of ESG portfolios. It needs to be highlighted, that its clearly useful to not solely optimise on ex-post basis, but also incorporate where possible, ex-ante estimates. This is additionally provided by our proven long-term return forecasting model - the DWS Long View framework.

To date, we observe two main approaches for the integration of ESG aspects in the market. It is either the integration of a single security focussed ESG-Optimisation for Portfolios or a general replacement to ESG Indices or ESG ETF's. Both approaches have their strength and weaknesses.

The first is very individual allowing investor-specific consideration of ESG criteria. Unfortunately, this is typical only possible for larger investors. It allows as well only a partial portfolio view as the optimisation is only applied for a sub-asset class. The portfolio tracking error is typically an outcome of the ESG restrictions. Therefore, it remains for such optimisations approaches unclear if a combined ESG and financial optimum was reached.

FIGURE 1. DWS APPROACH TO ESG IN SAA APPROACH IN COMPARISON



DWS Investments GmbH. As of 30 December 2021

The other option is switching to ESG indices / ETF's for integration in the SAA. This cannot consider any individual ESG restrictions of investors as the approach is very much determined by existing indices / ETF's / funds, but this approach is easy implementable for different investor groups. Still, it presents a partial portfolio view with the tracking error defined by the ESG approach or the index construction. Whether a combined ESG / financial optimum is achieved remains however unclear.

The DWS ESG SAA approach allows an optimisation based on readily available instruments (ETF's that mirror ESG indices) making it applicable in a wide set of solutions. One of the advantages of our approach is that various individual SAA specifications can be taken into account, while at the same time an implementation is possible for different investor groups. Our model always takes a total portfolio view as all asset classes in a multi asset portfolio are considered in an integrated way. Based on a defined set of parameters, the determination of a combined ESG and financial optimum (based on defined ESG indicator weights and the ex-ante allocation TE) is possible. Our approach therefore can demonstrate how positive and negative ESG factors, like various exclusions, CO2 intensity, SDG factors, EU Principles Adverse Impacts or EU Taxonomy considerations can be implemented with the lowest possible active risk in the SAA compared to a SAA based on traditional indices.

The achieved impact varies in dependency of the recalibration approach, the selected indices/universe, data availability, degrees of freedom, the ESG restrictions and different ESG target functions, the traditional risk/return restrictions, and the potential trade-offs between ESG and financial metrics. As such, exploring this trade-off across simulated approaches allows investors to determine the appropriate ESG SAA construction methodology by comparing the empirical output of both financial and ESG metrics for a variety of possible steps of ESG optimisation.

All our analyses are based on the belief in the underlying data. Often, a pinch of salt is however necessary for deriving the right implications considering the fuzziness of ESG data. This fuzziness can be further amplified at index level. However, we consider this large, representative investment set sufficient to smooth out blurring and draw solid conclusions as we also only select indices with sufficient ESG data coverage.

Our 2022 updates in context

Since our initial research on the ESG Integration in Strategic Asset Allocation, the global ESG landscape further developed at light-speed - not only in the EU but across the world. This also shaped the path of this year's update and provided interesting questions and challenges for investors to address. It is clear to most market participants that **engagement** is, in combination with a portfolio optimisation, a **vital ingredient to achieve impact**. Our optimisation is limited as it cannot include this yet.

Besides regulatory actions, the most important investor trends have been the march for **climate neutrality of portfolios** with the ever-growing alliance of **the Net Zero Asset Manager alliance** and the related alliances encapsulated by the Glasgow Financial Alliance for Net Zero (GFANZ). DWS Group is one of the proud founding members of NZAM, part of the larger GFANZ association, and is committed to achieve for the in-scope assets a 50 % reduction in weighted average inflation-adjusted financial carbon intensity of their investments by 2030. In particular, the **SBTi** and the commitments of invested firms provides reference for DWS on our path to net zero for our investment portfolios. Because of still relatively few SBTi, RE 100 or Carbon neutral commitments we did not opt to calculate portfolio temperature alignments. A further complexity for multi asset portfolios arises from the limitations to effectively use Climate Action Tracker data for sovereigns. Instead, we checked for the share of SBTi commitments of portfolio holdings to indirectly estimate their net zero alignment.

These thoughts are reflected in on our **new scenario S5**, where we optimised, without other restrictions, how a potential **Paris alignment** is achievable.[2] Considering the outright importance for many investors and the difference to our previous analysis we are not blending it with other ESG requirements, but rather make it a standalone scenario and optimise for the carbon intensity[3] of the portfolio. To gain higher certainty in these optimisations we also, at the same time, co-optimise for the highest share possible of firms with SBTi commitment and minimize any coal or oil sands production share.

In the EU, the upcoming regulatory requirements for investors were further specified with several Technical Reporting Standards (RTS) for SFDR or the EU Taxonomy and the delegated acts on MiFID II. This, for example, outlined the **EU Principle Adverse Impact Indicators (PAII)** or eligibility- and alignment-criteria for the **EU Taxonomy**.

All these new terminologies inform our new scenarios S6 and S7. In scenario **S6** we apply a **Principle Adverse Impact focus** and try to optimise all yet available PAI indicators. Beside the carbon intensity from S5, we minimize the waste and water intensity, maximize any UNGC signatory ship among our investments, and maximize the board diversity.

2 Due to insufficient data granularity we did not include a 7% reduction path but assumed a sufficient Paris-Alignments at a 50% reduction level against the reference in t0.

3 (we equal-weighted scope 1 and 2 and scope 1, 2, and 3 incl. avoided emission)

For **S7** we apply experimentally an **EU Taxonomy focus** and, besides S6, additionally maximize for an EU Taxonomy alignment score and aligned revenues of the portfolio holdings. As neither company ESG disclosure nor ESG research provider data is yet ready to the ambitions of the EU, some data gaps remain in these analyses. This once again shows, there is an urgent need for more uniform data for the EU regulatory required data in the future like Green Capex/Green Revenues, all PAI Indicators, Carbon Scope 1- 3 data, data on waste or water and general governance indicators. Investors like us handle existing data gaps with estimated data by third-party ESG research providers. In turn, any EU Taxonomy-aligned revenue share or PAI-alignment is currently based to a large degree on estimations rather than company reported data.[4] It also underlines the necessity for an integrated European capital market where no national arbitrage for EU Taxonomy-based allowances or investment instrument design shall be possible.

All new scenarios S5-S7 are combined with our previous optimisation approaches S1-S4 in the new scenario **S8** which we dub the **Multi Facet Extended** scenario, effectively combining the scenarios S1 to S7.

Last but not least, from a dedicated multi asset perspective new liquid and illiquid asset classes are increasingly captured by ESG like infrastructure, private debt, or real estate with more available indices and investable solutions. In comparison to our previous analysis, we were able to identify enough investable instruments with ESG information. We were however unable to identify dedicated ESG instruments whose time series go back sufficiently long, which is why we opted for traditional alternative instruments for this bucket.

This is reflected in the additional analyses set which is calculated in parallel to the non-alternatives asset classes. So all our calculations are also available without Alternatives. But as a default we **added Alternatives with a 10% allocation weight** - proportionately reducing Equities and Bonds each by 5% - into our analysis framework.

FIGURE 2. DEFINITION OF TARGET SCENARIOS BASED ON ESG METRICS AND RISK PARAMETERS

Default Scenarios

S1: Minimize Climate Transition Risks (“CTR”) and UN Global Compact (“UNGC”) risks via excluding F-rated securities in the respective categories (Basic ESG Integration)

S2: (additionally) Minimize DWS Overall ESG Score F-rated securities (S1+S2)

S3: (additionally) Minimize CO2 intensity, maximize Solutions Provider (A and B-rated securities for SDG-Ratings and CTR-Ratings (S1+S2+S3)

S4: (additionally) Minimize controversial sectors + minimize DWS Overall ESG Score for E-rated securities (S1+S2+S3+S4)

Added scenarios for 2022

S5: Paris aligned: minimize CO2 intensity, maximize SBTi share, minimize coal and oil sands share

S6: Principle Adverse Impact focus: additionally minimize waste and water intensity, maximize UNGC signatory, maximize board diversity (S5+ S6)

S7: EU Taxonomy focus: additionally maximize EU Taxonomy alignment score and aligned revenues (S5 + S6 + S7)

S8: Multi Facet Extended: scenarios S4 + S7 combined

Source: DWS Investments GmbH. Data as of 30 December 2021

[4] The current environment for investors is characterized by a dichotomy of the ever-growing need for more granular ESG data and the need to ensure more company-reported data in the future, instead of increasing number of data estimations by ESG research houses. For example, less than 25% of carbon scope 3 data of the largest global companies is actually company disclosed, only around a thousand companies globally report on SBTi targets, not mentioning water intensity numbers or biodiversity data. All our calculations are based on, from our view, best available data sources but encapsulate estimated data and may therefore incorporate third-party estimation and model errors. This clearly highlights to companies and regulators alike how important it is for investors to anchor their analyses and models on reported data. A central ESG data hub like the EU is planning would be welcomed by many market participants. Moreover, companies may front-load the upcoming changes in their reporting requirements through the new CSRD (Corporate Sustainability Reporting Directive) in EU which requires companies to report on additional ESG data effectively after 2024. Expectations for companies, the promised EU ESG data hub or the new International Sustainability Standards Board (ISSB) couldn’t therefore be higher. But it is not only in the EU that regulators are advancing their agenda. Also in the US, with new focus and leadership after the 2020 election, the SEC took up the task to enquire for potential ESG reporting standards of investors. Quite recently, the SEC released a proposal regarding mandatory climate risk disclosures for public companies. If enacted, this may oblige companies in periodic statements such as in 10-K to disclose assured greenhouse gas emissions and information about climate-related targets, risk management and governance processes. As well, the US Department of Labor (DOL) clarified that plan fiduciaries are allowed to consider ESG factors - per default - for their investment decisions and when exercising shareholder rights.

Results

1. Optimisation within the traditional asset allocation

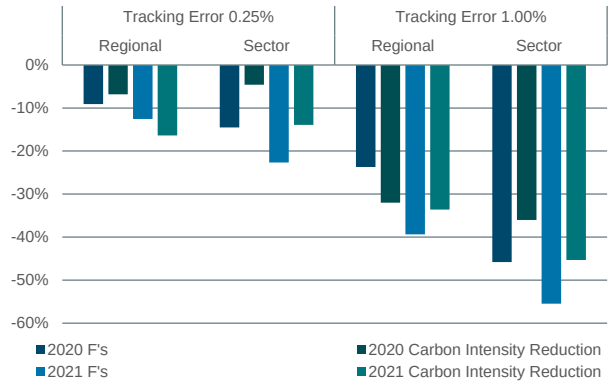
For comparison reasons we analyse all results on a like-for-like basis against the 2020 results thus excluding Alternatives in the first place. This means an unchanged 50/50 allocation of the equity/bond universe in the first step. We optimise the ESG benefit in each of our defined scenarios 1 to 8, depending on the respective tracking error restriction. The results show a high degree of stability against the previous results in many parts, but also reveal some interesting new facets.

Starting with optimization within the set of traditional instruments, the previous findings have shown that small optimizations within traditional regional or traditional sectoral instruments are possible. We optimise the ESG benefit in each defined scenario depending on the respective tracking error restriction. The ESG effects that can be achieved are limited but improve slightly against 2020. For instance, for TE's of 0.25% the reduction within regions for the share of the worst Carbon- and Norm-Violators (F-Ratings) can be as high as 12% which compares to 9% previously (Scenario 1). The carbon footprint reduction could be as high as 16% for the same TE budget. This compares with 7% previously. For the sector optimisation and the same TE budget of 0.25%, a reduction of F-Ratings and of the carbon intensity can be as high as 23% and 14% respectively. This is again a small improvement against the previous results. The changes in the allocation, the ESG scores and distributions explain this small benefit on relative basis.

The picture holds as well for higher tracking error allowances. The carbon intensity reductions for TE's of 1% could be within traditional regions as high as 34% and for traditional sectors up to 45%. For investors who do not want to use ESG indices already and are willing to invest with higher TE's, optimising within the set of traditional vehicles could be still a first step to improve the ESG profile of portfolios. A similar picture can be observed for all our other scenarios. But as Figure 14 shows, the potential improvements for higher tracking errors remain limited.

In nearly all cases, the regional and sector optimisation are, not surprisingly, inferior from an ESG performance perspective against the ESG indices for our optimised indicators. However, there is one exception to mention. The optimisation within traditional sectors can be slightly superior for increasing the SDG revenue or EU Taxonomy aligned revenue share against existing ESG indices (Figure 13). For all other positive and negative indicators, the combined optimisations are in every case and scenario superior ESG-wise.

FIGURE 3. RELATIVE ESG-IMPROVEMENTS FOR REGIONAL AND SECTOR OPTIMISATION FOR TRACKING ERRORS 0.25% AND 1.00% SCENARIO 1



Source: DWS Investments GmbH. Data as of 30 December 2021

2. Replacement of traditional indices with ESG indices

Building on our study from the previous year, we analyse, in this section, the effect on ESG benefit and tracking error when the SAA is completely replaced by ESG instruments while holding the traditional weights constant[5].

We determine an average tracking error of 0.88% with a complete switch to ESG instruments but unchanged weighting of the SAA. The implementation TE fluctuates in the back-tested period between 0.4% and 1.4%.

FIGURE 4. ROLLING 12M TRACKING ERROR OF ESG IMPLEMENTATION VERSUS TRADITIONAL ASSET ALLOCATION

Source: DWS Investments UK Limited. Data from 30 April 2014 to 28 February 2022

During 2021 we observe an elevated active portfolio risk driven, to a large extent, by the increase of the TE of ESG equity indices. For example, the US ESG Indices TE increases, against our previous analysis, from 1.7% to 1.9%. The ESG implementation of emerging market equities even increased by 0.6% to 3.3%. Style and sector rotations within equities are factors that impact the active performance and risk of ESG vis-à-vis traditional indices. Please also refer to Figure 15 in the appendix.

[5] In this section, regional indices are used for the traditional SAA and the ESG implementation.

Still, the ESG benefit achieved is quite remarkable for this level of tracking error. The proportion of F-ratings can be reduced relatively by 78% (up from 70% in 2020) compared to the traditional SAA. The CO2 intensity can be reduced by 55% (up from 44% in 2020). The share of solutions providers (SDG A and B-rated securities) improves by 20% relative. These positive effects when switching to ESG instruments are comparable e.g. for the SBTi share or the Water Intensity. There is one notable exemption for the Waste Intensity, were for our default allocation and instruments, the ESG implementation is slightly inferior at the non-optimised level. We also point however to Figure 8, where you see the optimisation potential for this figure in dependency of TE.

FIGURE 5. COMPARISON OF ESG DATA FOR ESG IMPLEMENTATION AND TRADITIONAL ASSET ALLOCATION

Share	ESG Implementation	Traditional SAA
Controversial Sectors	0.4%	3.0%
F Ratings	1.2%	3.5%
E Ratings	10.6%	18.1%
SDG AB	34.7%	28.8%
SBTi Share	16.4%	13.8%
Water Intensity	14514.4	21398.3
Waste Intensity	12.0	11.2
Carbon Intensity	104.7	231.7
Carbon Intensity (adjusted)	963.1	1086.1

Source: DWS Investments UK Limited. Data as of 31 December 2021

As many investors are interested, at least in hindsight, how such ESG-optimised vehicles would have performed we are adding this analysis. For the analysed time horizon, which was constrained by data availability, the empirical Sharpe Ratio of the ESG SAA was even slightly higher compared to the Traditional SAA this culminates into an IR of 0.56. DWS, many other market participants and academia have researched extensively on the ESG–CFP relation. While this outcome for the analysed horizon may not come as a surprise for most investors, it is important to add, that this positive relation cannot be extrapolated blindly as capital markets and companies are swift in adapting to the new normal and markets may mean-revert if valuations of “ESG stocks” should be unjustified. However, there are also fair chances that positive ESG alphas may persist, as such exposed companies historically have shown better long-term growth or more dividend resilience and may do so for the future (see e.g. DWS Long View, The Green Decade, February 2021 or Figure 17 in the Appendix). It is, in any case, prudent to assume that such IR’s will not persist in perpetuity and historical returns may be biased by additional factor exposures not related to ESG.

FIGURE 6. EMPIRICAL RISK AND RETURN STATISTICS FOR ESG IMPLEMENTATION AND TRADITIONAL ASSET ALLOCATION

30 Apr. 2014 – 28 Feb. 2022	ESG Implementation	Traditional SAA
Compounded Annual Growth	8.3%	7.8%
Annualised Monthly Volatility	7.7%	7.7%
Sharpe Ratio	1.11	1.05
Worst drawdown	-20.7%	-20.9%
Median monthly return	0.9%	0.9%
Best monthly return	6.5%	6.5%
Worst monthly return	-8.4%	-9.0%
% of months with gains	70.2%	70.2%
Correlation	0.99	
Ann. Monthly Tracking Error	0.9%	
Information Ratio	0.56	

Source: DWS Investments UK Limited. Data from April 30 2014 to February 28 2022

The focus of this analysis is however not the alpha debate, but the optimisation of the combined ESG utility while controlling the TE. This ESG risk mitigation while contributing to overall societal goals at the potentially lowest deviation to traditional universe is at the heart of our combined optimisation.

As the TE of the ESG instruments varies over time like pictured in Figure 4, we determine, for our combined optimization, an allocation-based TE. The additional TE caused by the implementation via ESG indices loses its impact on total TE the higher the allocation-based TE. Our analysis shows, that for allocation-based TE’s of 1.00% and higher the additional impact of the implementation-based TE could be nearly neglected.

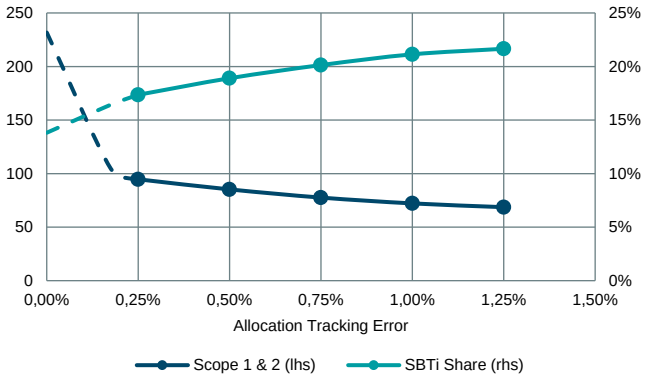
3. Integration of Alternatives & combined optimisation

We start our combined optimisation by studying the effects on a like-for-like basis excluding alternatives and checking for the impact of our new scenarios.

The following charts highlight that we are able to control the additional ESG facets in the newly added scenarios. Figure 7 demonstrates the ability to optimise the CO2 intensity and the SBTi share in scenario 5. The SBTi commitment of investment companies could improve from ~14% in the traditional SAA to 21.7% - or more than 50% on relative basis. This is accompanied by significantly reduced carbon intensity (scope 1 and 2) that shrinks from 232t to 69t per mln USD revenues at an allocation TE of 1.25%. From a top-down perspective, NZAM path modelling, including various additional ESG facets, appears therefore plausible to us. This should be ideally accompanied by an effective bottom-up engagement strategy with firms, sovereigns or project

owners to really reduce real world carbon emissions for the investments. Blind faith in the sole effect of capital allocation can be short-sighted.

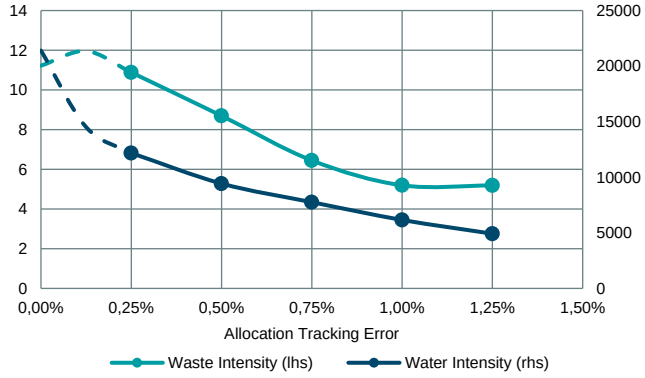
FIGURE 7. IMROVEMENT OF ESG FACETS SCENARIO 5



Source: DWS Investments GmbH. Data as of 30 December 2021

Figure 8 shows the significant reduction of water and waste intensity in scenario 6 for increasing TE's. This optimisation potential is particularly noteworthy, as most likely none of the standard market indices has yet been optimised in this respect. The improvements for the share of EU Taxonomy aligned revenues (scenario S7) are however less pronounced. This is due to the fact that still very little companies report relevant green revenue, green CapEx or green OpEx data. We use initial estimates from our research service providers for our analysis, but do not yet consider these data to be ready for detailed reporting in this study.

FIGURE 8. IMROVEMENT OF ESG FACETS SCENARIO 6



Source: DWS Investments GmbH. Data as of 30 December 2021

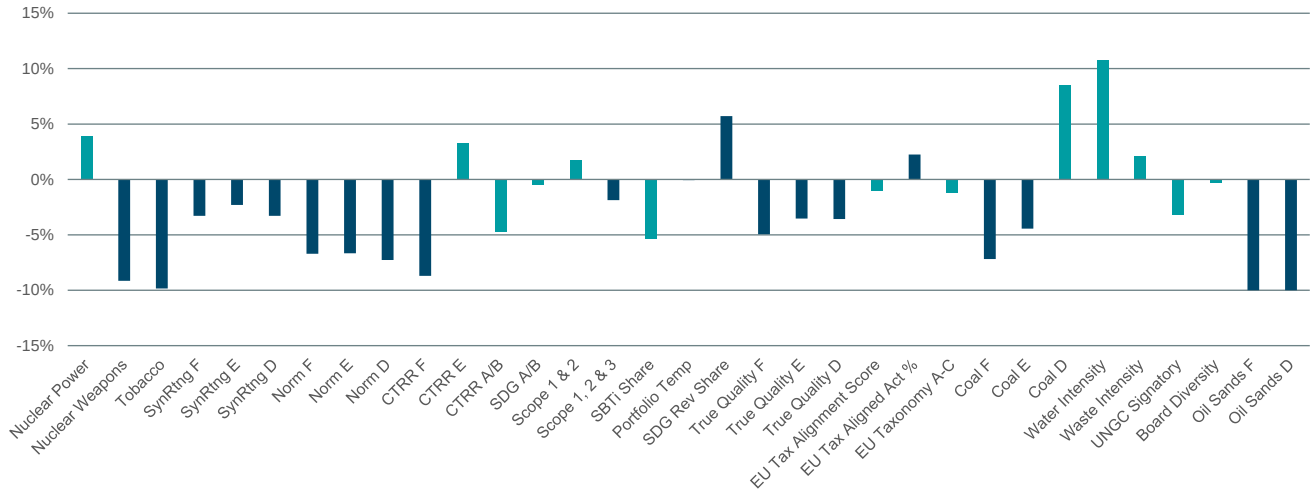
We continue the analysis with the incorporation of liquid Alternatives and its impact. Various sub-asset classes and strategies can be categorized as alternative investments. In this study we analysed the integration of infrastructure equities & debt, private debt and REITs. We first review how the allocation changes from an ESG perspective, if we blend it with a 10% allocation in alternatives. It needs to be pointed out, that because of limited availability yet, we do not use any ESG-optimised liquid alternative vehicles/indices for the ESG optimisation, meaning that we apply only ESG-optimised vehicles for the equity and bond universe.

A comparison of the exposures to the various ESG facets of the default reference allocation with and without alternatives provides first insights of this natural extension towards a broader investment opportunity set. Figure 9 highlights that the ESG exposures of the traditional SAA including alternatives are similar if not on average - across the full spectrum of ESG facets – slightly better against the SAA excluding alternatives. The blue (petrol) indicators highlight where alternatives are context-specific proportionally better (weaker) against the excluding alternatives universe.

The universe including alternatives reduces, for instance, proportionately all controversial indicators where Infrastructure, REITs or alternative debt naturally have only low - if any - exposures like in tobacco, weapons, coal or oil sands. The share of weak ESG ratings and weak Norm ratings are as well reduced. On the other hand, i.e. the carbon scope 2 intensity slightly increases[6] and the waste and water intensity rise.

[6] Scope 3 intensity including avoided emissions however slightly decreases because of a marginally higher share in renewables. The carbon intensity incl. Alternatives is marginally higher for scope 1 and 2 emissions but slightly lower for scope 3 including avoided emissions. We calculate 236t CO2 / mln USD revenues against 232t and 1066t CO2 / mln USD revenues vs 1086t / CO2 / mln USD revenues.

FIGURE 9. RELATIVE CHANGES OF TRADITIONAL SAA IF BLENDING IN A 10% WEIGHT IN ALTERNATIVES

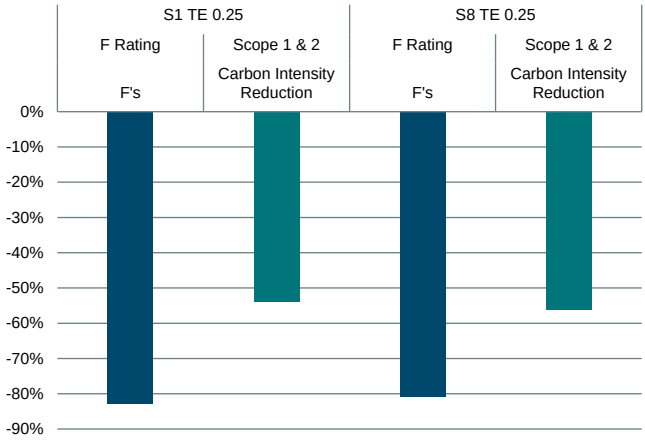


Source: DWS Investments GmbH. Data as of 30 December 2021

As in the case of traditional asset classes, our framework enables us to further improve the ESG profile with this extended asset class universe in the various scenarios.

Depending on the scenario, for allocation TE's of 0.25% in the combined optimisation, the carbon intensity reduction varies from -54% (S1) to -56% (S8) and the share of the worst norm violators is reduced by more than 80% (S1 & S8) as shown in Figure 10.

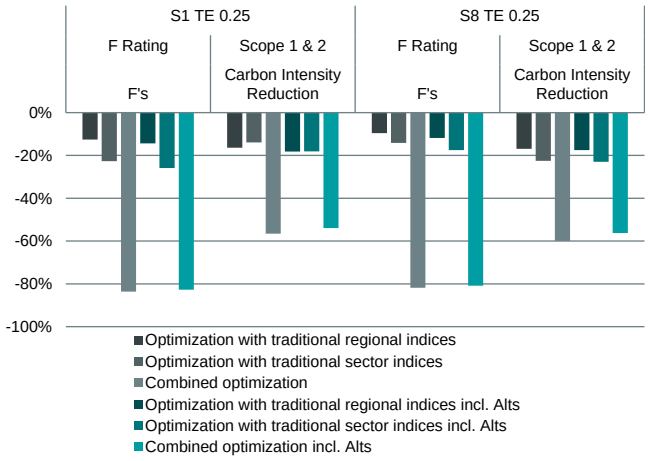
FIGURE 10. COMBINED OPTIMISATION IMPROVEMENT AT TE OF 0.25% (S1 and S8)



Source: DWS Investments GmbH. Data as of 30 December 2021

Figure 11 shows that in the optimisation with traditional regional and sector indices, the integration of alternatives also leads to a relative improvement of the share of F-rated securities and carbon intensity at an allocation TE of 0.25%. However, we observe that the results of the combined optimisation incl. alternatives exhibit negligible disadvantages vis-à-vis the excl. alternatives optimisation.

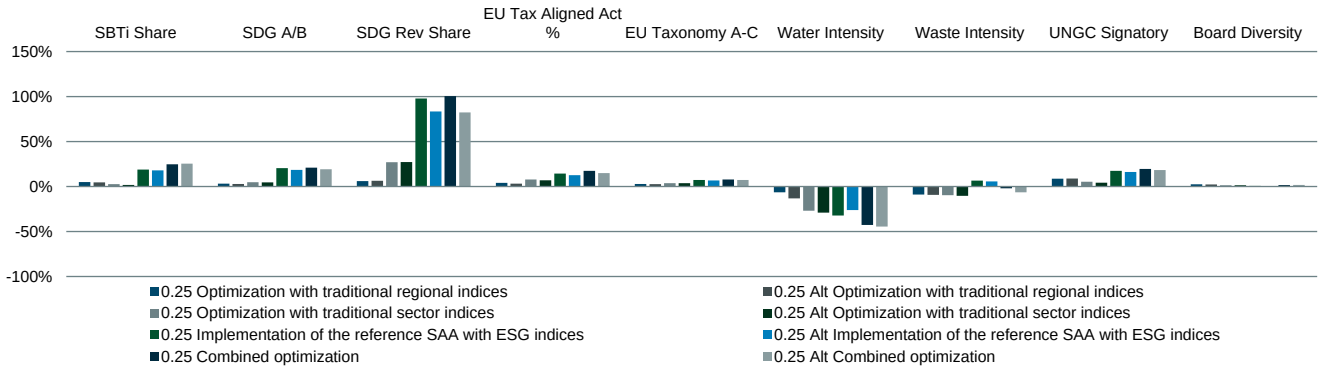
FIGURE 11. INCLUDING ALTERNATIVES - IMPROVEMENT OF F RATINGS AND CARBON INTENSITY (TE 0.25) (S1 and S8)



Source: DWS Investments GmbH. Data as of 30 December 2021

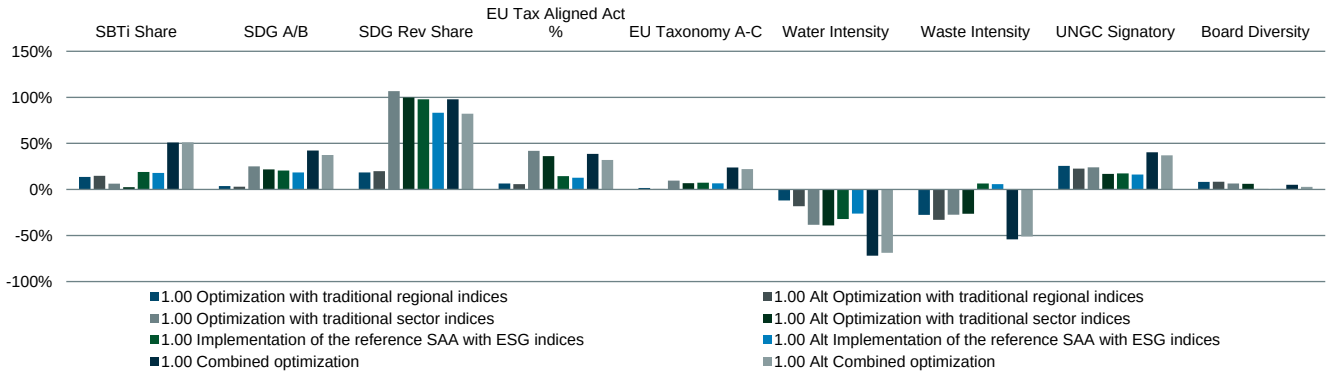
To some extent this small disadvantage for the combined optimisation is explained by the setup of this study: While we use ESG indices for the traditional asset classes, we rely on the available standard alternative indices, that do not follow a dedicated ESG strategy.

FIGURE 12. INCLUDING ALTERNATIVES – IMPROVEMENT OF POSITIVE CRITERIA (TE 0.25, S8)



Source: DWS Investments GmbH. Data as of 30 December 2021

FIGURE 13. INCLUDING ALTERNATIVES – IMPROVEMENT OF POSITIVE CRITERIA (TE 1.00, S8)



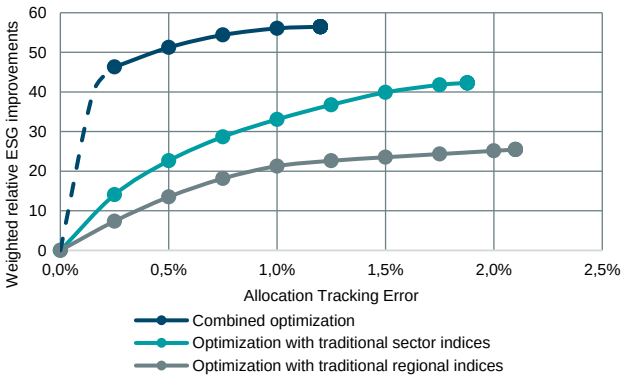
Source: DWS Investments GmbH. Data as of 30 December 2021

Thus, we would expect the results may improve if sustainable alternative indices become available. However, as our analysis shows the traditional versions may be a good starting point.

The ESG quality within the broad category of alternatives may also differ significantly. For example, in the combined optimisation at TE's of 1.0% the weight of infrastructure investments, both equity and debt, is reduced by ~75% such that we observe a shift towards private debt and REITs (across scenarios and settings). Sector, norm and climate transition risk exposure are just some exemplary ESG facets in which infrastructure equities & debt score bad vis-à-vis those other alternative asset classes. However, we need to emphasise again that traditional alternative indices are considered in this analysis. Dedicated ESG infrastructure strategies provide an opportunity for investors to gain exposure to this market segment while additionally improving the ESG profile of the portfolio.

In the various scenarios, we can reconfirm our 2020 study and improve the ESG profile on a relative basis against the respective starting allocation with a modest tracking error – in this year's edition incl. alternatives. Figure 14 shows the weighted improvements in the S8 Multi Facet Scenario in comparison to the optimisation potential of traditional indices. In particular for small expected asset allocation TE's the relative difference is impressive.

FIGURE 14. CHANGE OF THE WEIGHTED RELATIVE ESG IMPROVEMENTS IN DEPENDENCY OF TRACKING ERROR (S8)



Source: DWS Investments GmbH. Data as of 30 December 2021

Using ESG indices (whenever available) in conjunction with the overall portfolio optimisation leads to sizeable improvements of the portfolio ESG profile against a traditional SAA.

Conclusion

The field of ESG continues to develop at light speed - not only from the regulatory side, but also in terms of investor sophistication. Therefore, regular updates of our data and knowledge on the integrability of different ESG facets, such as for the strategic asset allocation, are necessary. Our 2022 analysis features some evolutions. The most important **additions for this year's analysis** are the **integration of liquid Alternatives** and the extension for additional ESG data and **optimisation scenarios such as Net Zero or the EU PAI**. The most important findings:

_ The integration of a **carbon optimisation** in the SAA against traditional indices is feasible, surprisingly, still with relatively minor expected tracking error budgets. That also means that pockets of the traditional indices are still relatively carbon-intense, making it the more relevant to rethink if investors should tolerate a traditional index universe. With the current elevated levels for many fossil fuels and robust levels for carbon allowances in most jurisdictions the low-carbon transformation receives a natural tailwind. A rudimentary carbon intensity optimisation can already be performed within traditional sectors or even on a regional basis (although less efficient). The potential for a carbon intensity reduction can be as high 23% (45%) for e.g. expected TE's of 0.25% (1.00%) for optimising the sector allocation with traditional instruments. This rises further for a combined optimisation approach which optimises the asset allocation and uses ESG instruments. Typically, an EU PAB level **carbon reduction (-50%) is achievable with an estimated allocation TE of around 0.25%**. A positive side-effect: such carbon reduction potential comes in parallel with better ESG performance across other ESG facets. That means a **NZAM path modelling does most likely not compromise other ESG facets**.

_ As it is increasingly relevant for many institutional investors to not be limited just to equities and bonds, we studied if the **integration of liquid Alternatives** is possible without diluting the ESG profile or risk-adjusted returns. Integrating liquid Alternatives appears beneficial, even that dedicated ESG indices are currently hardly available. Many liquid Alternatives come with a natural ESG tilt. The **ESG profile and performance of our SAA including such Alternatives improves slightly**.

_ While the debate among practitioners on the **performance effect** of ESG factors in traditional asset classes and regions seems as thought-provoking as ever, our backward-looking analysis reveals for a 50/50 global equities/bonds allocation with ESG instruments an attractive **historic information ratio** against traditional instruments of 0.56 since 2014. Every investor should be however prudent to not extrapolate blindly and incorporate potential mean-reversion that should be expected for most factors over time.

_ We study new ESG facets like the **Waste and Water intensity** or the **UNGC signatoryship** as part of the **EU Principle Adverse Impact analysis**. Across all TE profiles, improvements in these aspects are possible, but often at higher TE budgets. For example, at a TE of 1.00% the water intensity could be reduced by 69%, the waste intensity by 51% and the UNGC signatoryship improved by 37%.

_ But we also find potential **blind spots in existing ESG indices** that transpose into our combined optimisations. At least in Europe, the comprehensive **consideration of the EU PAI** is limited by general data availability (like for biodiversity or gender pay gaps) but also by the lack of consideration in the current ESG index constructions & ETF's. Thus, we cannot detect noteworthy optimisation potential in our calculations for factors like **Board Diversity** where data is already available. It will be interesting to track the evolution of data availability and consideration of the EU PAI in global indices over time.

_ Last but not least, our combined optimisation of the asset allocation in parallel with the implementation via ESG instruments are superior for close to all facets of analyses and TE's. A small area of exemption is determined **for the SDG revenue** share at higher TE's (>1.00%) where **traditional sector indices** could be slightly superior compared to ESG tilted indices/optimisations. All else, our combined optimisations beat at anytime the one-to-one index replacements. This demonstrates the usefulness of our combined optimisations against the simple 1:1 replacements of instruments.

_ As always, and as implication of our flexible approach, the **optimal trade-off between ESG and TE** depends on the investors' **utility function** in terms of ESG impact and risk budget to determine the investor-specific optimum. Allocation tracking error averse investors could already achieve **high ESG impacts at 25bps**. For investors most interested in ESG impact, **TE's of around 100bps**, are associated with the most **optimal combined ESG improvements** for our reference allocation.

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Appendix

Methodology

Our methodology for ESG SAA constructions features the following steps:

1. **Define the subset of appropriate asset classes and ESG indices on which to construct ESG SAAs**. ESG implementation can take on a variety of different characteristics. Therefore, for the purposes of transparency, investability, and liquidity of our ESG SAAs, we chose the list of indices highlighted in the following section on which to run our analysis.
2. **Define and quantify ESG metrics**. In order to properly account for various ESG metrics, we utilize a step-by-step optimisation of which each step incorporates an additional ESG metric on which to optimise our SAAs. In addition, we illustrate how investors can increase the impact across ESG metrics if they have increased flexibility in their mandates in terms of tracking error.
3. **Establish risk parameters** for initial optimisations. Maximum deviations of regions/sectors/sub-asset classes of maximum 4x weight/minimum 1/4 weight of the traditional SAA. Absolute portfolio risk is controlled to match the volatility of the reference allocation of 50/50 Equity/Fixed Income or 45/45/10 Equity/Fixed Income/Alternatives.
4. **Define our target scenarios** based on ESG metrics and risk parameters. See Figure 2.
5. **Run the optimisations** for every scenario S1 to S8 for traditional indices, sector indices, and ESG indices for tracking errors ranging from 25bps to 300bps in 25bps increments. In each of the scenarios, we maximize the ESG composite score[7] subject to the risk constraints.

For our methodology, we ran each of the three following iterations in order to compare results across different initial approaches:

1. Optimisation within traditional regions/sectors/asset classes
2. Replacement of traditional regions/asset classes with ESG version
3. Combined optimisations (main results section)

Defining the index universe

ESG investing can take many forms, through either active or index-based investing, through liquid public markets or through illiquid private investments, through exclusion criteria or via impact scores. For the purpose of this analysis which details DWS' approach to creating liquid global strategic asset allocations, our empirical studies leverage a set of ESG market indices that are: investible, liquid, and transparent.

FIGURE 15. EMPIRICAL RISK, RETURN, AND TRACKING ERROR OF ESG INDICES

Index	Compound Annual Growth	Annualised Monthly Volatility	TE of ESG vs. standard index
MSCI USA ESG	15.6%	14.2%	1.9%
MSCI USA	16.0%	14.2%	
MSCI Europe ESG	7.0%	13.7%	1.9%
MSCI Europe	6.3%	13.9%	
MSCI Japan ESG	9.8%	13.6%	1.8%
MSCI Japan	9.5%	13.2%	
MSCI EM ESG	9.3%	14.4%	3.3%
MSCI EM	7.3%	14.2%	
Euro Govt ESG	2.4%	4.2%	0.0%
Euro Govt	2.4%	4.2%	
US Treasury ESG	0.7%	3.8%	0.0%
US Treasury	0.7%	3.8%	
Euro Corp ESG	1.7%	3.7%	0.2%
Euro Corp	1.8%	3.9%	
US Corp ESG	4.1%	6.3%	1.2%
US Corp	2.1%	5.5%	
Euro HY ESG	3.1%	6.6%	0.5%
Euro HY	3.4%	6.9%	
US HY ESG	7.8%	8.6%	1.0%
US HY	7.7%	8.6%	
EM Sovereign ESG	6.5%	8.4%	2.2%
EM Sovereign	5.8%	8.8%	
Private Debt	6.8%	8.5%	
REITs	10.2%	16.2%	
Equity Infrastructure	8.5%	12.9%	
Infrastructure Debt	1.9%	4.0%	

Source: DWS Investments UK Limited. Data from April 30 2014 to February 28 2022

[7] For the indices of the asset class universe the quantified ESG scores (step 2) are joined in an ESG raw data matrix. By using the median[7] score of each metric and by using the weights of a reference allocation (benchmark), the raw data is normalized to ensure comparability. A scenario-specific scaling vector (step 4) is then applied to the normalized ESG score matrix in order to assign the relative importance to each metric in the corresponding scenario. Finally, the *ESG Composite Score* is defined as weighted average of this normalized and scaled ESG score matrix and a portfolio allocation.
By comparing the ESG Composite Score of two different allocations, a higher ESG Composite Score indicates a better ESG profile in the specific scenario (and vice versa). The optimisation process aims to find the allocation that yields the maximum ESG Composite Score, i.e. the best ESG profile in the corresponding scenario.

The reference universes for the analysis are the MSCI AC World for equities and the Barclays Global Multiverse for bonds. The default allocation is determined by the current weights of regions, sectors or sub-asset classes in these indices. The equity/bond allocation is set at a static 50/50 ratio. We have also calculated all scenarios with a dynamic equity/bond weighting. However, since the ESG effect is, in this case, potentially distorted by allocation shifts, we apply a static asset class weighting. The ESG optimisation is performed separately within the equity and fixed income components. In the new analysis, we also include alternative indices from S&P for leveraged loans and REITs as well as Dow Jones and Markit iBoxx for infrastructure. In this case, the allocation of equities/fixed income/alternatives is set to a ratio of 45/45/10. No ESG version is applied for alternative indices.

On the equity side, the MSCI ESG Leaders indexes were identified as ensuring good ESG characteristics while at the same time keeping the tracking error to the original/non-ESG indexes within a reasonable range. For these indexes, the top 50% of companies in the ESG distribution are selected. Furthermore, when looking at the exclusions and UN norms alignment embedded into these indexes, we found a good degree of homogeneity with the DWS ESG assessments.

On the FI corporate (European IG) side, we chose the Bloomberg Barclays MSCI Euro Sustainable and SRI TR, and the Bloomberg Barclays MSCI US Liquid Corp Sustainable Index for the US IG Corporates asset class.

In conjunction with these indices, DWS offers a broad set of best-in-class passive ESG solutions that can be used to practically construct these SAAs with relative ease.

Defining and quantifying ESG metrics

For our analysis, we find that the above subset of ESG indices can be used to establish a deep, impactful approach that is consistent with our firm wide policy, which places significant focus on the climate change and engagement topics along the lines of the UN Sustainable Development Goals (SDGs). Certain exclusions are also enforced across these indices and, by consequence, our ESG SAAs (e.g. controversial weapons exclusion “CCW”).

We recognize that our findings are based on parameters we’ve established as meaningful but not absolute levels of ESG compliance; therefore, investors can toggle the ESG goals we’re using as they deem fit. For our purposes, we define the below three methods of application for our ESG SAAs.

Establishing risk parameters

As with ESG metrics, we recognize that investors can toggle their relative and absolute risk criteria based on desired outcomes. In combination with ESG metrics, utilizing our optimisation framework, one should be able to establish the trade-off between risk and ESG efficacy.

For the purposes of our analysis, we establish a simple set of relative risk parameters. First, we limit the maximum deviations of the regions, sectors, and asset classes at a maximum of 4 times and minimum of ¼ times the weight of the traditional reference SAA. Absolute portfolio risk is made equivalent to the reference allocation of a static 50/50 traditional equity/fixed income or 45/45/10 traditional equity/fixed income/alternatives allocation. We control the relative portfolio risk - the expected tracking error of the optimised vs. reference allocation - to not exceed the defined TE limits.

Defining the target scenarios based on ESG metrics and risk parameters

Once we’ve established the appropriate index universe, the ESG proper metrics, and clear parameters around relative SAA risk, we define our target scenarios around those definitions as shown in Figure 2.

We concentrate in the presentation of the results section on scenario 1 – the basic optimisation – and scenario 4. Scenario 4, as the most comprehensive ESG optimisation, includes minimizing the carbon footprint, controversial activities, and further weak ESG-rated securities and also optimises positive criteria such as the share of solution providers.

For the calculation of the ESG utility in the various scenarios we normalize the respective ESG values. For the presentation of the partial ESG utility (e.g. the share in F-ratings, CO2 intensity) and the total ESG utility (improvements across different ESG criteria) we show the weighted overall improvements in percentages.

This analysis is three-fold. First, assessing the ESG quality of the unconstrained asset allocation along standard ESG parameters, the level of carbon risks and compliance with the UN Global Compact norms. This analysis is carried out on a look-through basis across the incorporated index holdings.

As a second step, we perform a trim-and-fill analysis where we underweight asset classes or regions with insufficient ESG performance. We fill the allocation gaps pro rata with the remaining assets classes/regions. We also assess relative overweights and underweights against the traditional 50/50 and the new 45/45/10 allocation based on various constraints.

Third, we remodel our standard asset allocation based on ESG-index solutions, while considering implementation requirements such as sufficient liquidity. The overall goal is to design an ESG-aware asset allocation, which represents a relative optimum of tracking error (compared to the default SAA) while at the same time maximizing the ESG quality. We outline different scenarios and trade-offs.

The first scenario/optimisation framework taken into consideration targets the minimization of exposures to controversial sectors and F-rated UN Global Compact companies (according to the DWS ESG Engine methodology). In the second scenario, the minimization of such F-rated (DWS Overall ESG Score) names is also sought. The third iteration consists of also minimizing the carbon intensity of the resulting portfolio and seeking max SDGs and climate solutions (positive) impact. The final and most restrictive framework additionally includes constraints around minimizing E-rated companies and controversial sectors across the board. The new set of scenarios first includes optimisation with respect to Paris alignment metrics. Then, the following framework aims at optimising a selection of Principle Adverse Impact related indicators. In line with the previous focus, a scenario targeting the EU taxonomy is implemented. The last scenario is a combination of minimizing E-rated companies and controversial sectors while maximizing EU taxonomy companies.

Running the optimisations

The central optimisation parameter is the maximization of the combined ESG Composite Score in the respective scenario, subject to the tracking error restriction. We finally run the optimisations for every scenario S1 to S8, first using the traditional regional indices we highlighted, then using sector indices, and finally using the ESG indices we had earlier defined. We then maximize the aforementioned “ESG Composite Score” on asset allocation tracking error allowances ranging from 25bps to 300bps, run in 25bps increments (i.e. 25bps, 50bps, 75bps, etc…).

Our analysis is based on various utility functions[8] of the composite ESG score and the TE. Asset allocation tracking error averse investors could already achieve **high ESG impacts at 25bps**. For investors potentially most interesting areas **for TE / ESG Utility would be TE’s of around 100bps**, as with this higher ESG improvements can be achieved. Historic simulations support that at these levels, the Information Ratio and Sharpe Ratio are relatively comparable to the unconstrained SAA. Tracking error allowances beyond 250bps could not only produce large risk/return deviations, but even may reduce the relative ESG impact.

Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

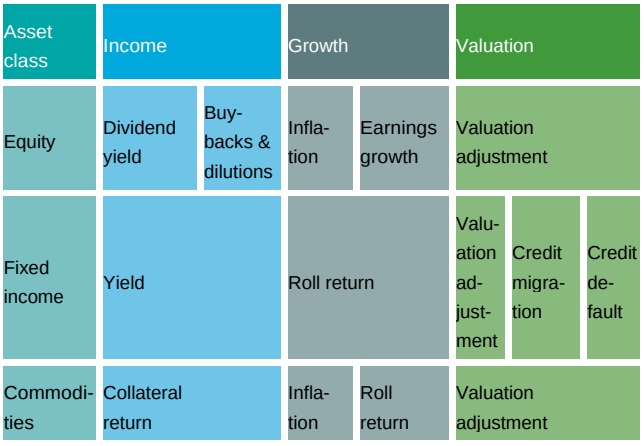
[8] **Combined Utility Function:** In the optimisation process the ESG Composite Score is maximized for various tracking error budgets. The result of the optimisation is the allocation that yields the best possible ESG profile for the given tracking error limit. If an investor faces the choice between two allocations with the same tracking error, it is assumed that the allocation with the higher ESG Composite Score is preferred. At the same time, we assume that an investor is averse to taking active portfolio risk: ceteris paribus, a higher tracking error will decrease the investor’s utility. This preference structure is described by a combined utility function that uses the two parameters ESG Composite Score and tracking error. Both preferences are linked by an individual active risk aversion coefficient. It thereby describes the trade-off an active-risk averse investor faces upon deviating from a reference allocation in order to improve the ESG profile.

The Long View: ESG Forecasts

The financial metrics previously illustrated are empirical calculations of our ESG-optimised scenarios. As with all financial analysis, empirical data is only helpful insofar as baseline expectations can be anchored in historical observation. As the landscape for both traditional and ESG investing continues to shift dramatically, forward looking expectations of risk and return that properly account for the financial impact of ESG are tantamount to optimal portfolio construction. Look-through ESG metrics are more likely to be stable, although investors should consider the ESG impact of potential broad shifts in capital allocation behaviours.

To construct strategic asset allocations, DWS relies heavily on the DWS Long View, our firm-wide methodology for forecasting strategic, 10-year returns, correlations, and volatilities across a breadth of public and private investment universes. The DWS Long View leverages a consistent and transparent building block approach that aggregates fundamental return drivers across three pillars: income, growth, and valuation. Figure 16 illustrates our building blocks across traditional asset classes.

FIGURE 16. PILLAR DECOMPOSITION FOR TRADITIONAL ASSET CLASSES IN DWS LONG VIEW



Source: DWS Investments UK Limited.

In 2021, the Long View annual publication introduced our initial set of 10-year forecasts for a subset of traditional ESG asset classes. These forecasts utilize the same three -pillar approach we use for traditional asset classes. The persistence of ESG as a risk or return factor is not considered for these forecasts. These 10-year return forecasts for ESG and traditional indices are shown in Figure 17.

FIGURE 17. 10Y RETURN FORECASTS P.A. IN LOCAL CURRENCY

	ESG	Traditional
Equity		
ACWI Equities	4.6%	4.5%
World Equities	4.6%	4.4%
EM Equities	4.9%	5.5%
US Equities	5.2%	4.4%
Europe Equities	4.4%	4.0%
Japan Equities	2.7%	3.2%
Fixed Income		
EUR Treasury	-0.2%	-0.2%
EUR Corporate	0.5%	0.5%
EUR High Yield	1.9%	2.4%
US Corporate	1.9%	1.8%
US High Yield	3.1%	3.0%
EM USD Sovereign	3.2%	4.5%
EM USD Corporate	2.6%	4.2%

Source: DWS Investments GmbH. Data as of 30 December 2021

Notes
We used standard market indices for the traditional indices as well on the ESG side. All indices are representative, investible via ETF's, liquid, and transparent. Depending on the instruments and underlying indices the ESG data could be even further improved via SRI-versions instead of the ESG-versions of the indices. For US sovereigns we apply a conservative approach and do not replace this portfolio share for the ESG optimisation. For climate-concerned investors or investors applying other ESG exclusion criteria this large portfolio bucket might be however critical. According to the current assessment of i.e. Climate Action Tracker the US is currently seen on a warming glide path of above 4° degree Celsius. This is however not incorporating any potential changes in the US climate policy. On an index/ETF level, US sovereigns might therefore be replaced by USD-denominated foreign sovereigns, USD-denominated Investment Grade Corporate bonds, or ideally by USD-denominated Supranationals. The latter would come closest in terms of the classical bond rating profile. It would also significantly uplift the ESG and SDG performance and reduce norm controversies while ensuring comparable yield, rating, and currency exposure. Switching to other SRI/ESG ETF's for equities and corporate bonds may further improve the ESG data and carbon efficiency of the overall allocation.

Controversial sectors. Definitions of controversial sectors are fluent and context dependent. For this analysis we included Nuclear Power, Nuclear Weapons and Tobacco.

Rating F. This represents the share of the worst ESG performers and aggregates all F Ratings (Scale A-F) for Climate Transition Risks ("CTR"), the UN Global Compact ("UNGC") Norm Ratings as well as all F-rated securities based on the DWS ESG Overall Rating.

Rating E. This represents the share of the second worst ESG performers and aggregates all E Ratings (Scale A-F) for Climate Transition Risks ("CTR"), the UN Global Compact ("UNGC") Norm Ratings as well as all E-rated securities based on the DWS ESG Overall Rating.

Rating AB's. This contains the aggregated share of potential solutions provider. It represents the share of A- and B-rated securities for the DWS SDG-Rating and the DWS CTR-Rating.

Carbon Intensity/Carbon Intensity (adj). A company's carbon intensity is its total carbon emissions divided by the total revenues (tons CO2 per mn USD revenue). For a portfolio of company holdings we calculate the weighted average of these intensities. We calculate the carbon emissions intensity as 1) a basic intensity of Scope 1 and 2 emissions like also suggested by The Institutional Investors Group on Climate Change (IIGCC) and 2) as an impact adjusted footprint, which also incorporates Scope 3 Emissions and avoided emissions.

Carbon reductions above 30% are potentially aligned with the EU Carbon Transitions Benchmark (CTB). Reductions above 50% would be potentially considered EU Paris COP Agreement aligned (PAB). Provided that the reference universes matches the asset allocation of investors and the other EU Carbon benchmark criteria are fulfilled (continuous carbon intensity reduction of 7% p.a., ratio of green versus brown revenues, Do-No-Significant-Harm Principle) some optimisations would therefore be EU carbon benchmark aligned. However, to increase data consistency we used the revenue intensity instead of the EU EV-apportioning factor for the carbon footprint. Moreover, we adjust the Scope 3 emissions additionally by avoided emissions. Individual carbon reduction targets of companies like their participation in the Science Based Targets initiative are not assessed due to the still insufficient data coverage.

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