



# Strategic Asset Allocation Review 2023

## Dyfed Pension Fund

August 2023

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## Introduction

The purpose of this 2023 review is to evaluate the strategic asset allocation (“SAA”) of the Dyfed Pension Fund (the “Fund”) and propose potential alternative portfolios that optimise risk and return. The assessment has been based on a number of principles, consistent with the approach taken in the last SAA exercise.

The expected risk and return of different asset classes has been based on “long-term capital market assumptions” (“LTCMA”) over 10+ years. Following 2022’s correction, **return prospects have improved for many asset classes, particularly in fixed income (including illiquid strategies like Private Credit)**, which now offer significantly higher prospective returns than in prior years. Private markets valuations have also mostly repriced, albeit with a lag, driven by the impact of higher interest rates. Amongst these, real estate has been the most affected, while infrastructure has been more resilient. The backdrop of high inflation, rising interest rates, volatile energy prices, the war in Ukraine, political uncertainties in the UK and a possible recession is therefore a challenging one. As a result, **the risk (volatility) expectations for a number of asset classes has also increased.**

The Committee has a preference for a relatively simple SAA, using traditional asset class allocations, rather than complex investments (e.g. hedge funds). This reduces the governance burden and controls costs.

The Fund is a long term investor, and, as such, is prepared to accept higher volatility, in exchange for better long term returns. However, it does not want ever to be forced to sell assets at short notice, in order to meet its obligations. **Cashflow requirements are therefore a key consideration** in determining an appropriate asset allocation. Like most Local Government Pension Scheme (“LGPS”) funds, the Fund is gradually maturing, and, assuming the current funding strategy, the **Fund’s net cashflow** from “dealing with members”, while modest now, **is expected to become increasingly negative** in the years ahead<sup>1</sup>. So a key consideration of the SAA is to **ensure that the Fund generates sufficient usable income from investments** to meet obligations without having to resort to forced asset sales. We have, again, assumed the principle that income from equities plays a critical role in generating the growth, and should be reinvested. Therefore, “usable” income is that derived from fixed income or alternative assets.

We have taken the required return to be the discount rate used by the Fund’s Actuary at the 31 March 2022 valuation. This was modelled as 10-year CPI plus 1.45%, implying a **required rate of return of at least 4.55%**. While the Fund is currently nearly fully funded on technical provisions, targeting an investment return above that assumed by the Actuary should build in an extra element of prudence and increases the probability that the Fund will retain a surplus of assets over current liabilities in the long term.

Based on the LTCMA, we believe **the Fund can continue to target an investment return well above the required rate**. Whilst this can be achieved by the existing SAA, we have illustrated for consideration several **alternative portfolios** which could achieve an **expected return only marginally lower than the existing SAA, but with a material reduction in expected risk and/or increase in usable investment income.**

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<sup>1</sup> This is covered in more detail later in the report, in the section entitled “Cashflow Position Analysis”.

## Executive Summary

In this report, we propose five alternative portfolios to the Pensions Committee, which are summarised in Table 1 on the next page.

- All portfolios would de-risk the Fund, providing greater diversification and improved cashflow characteristics, but with slightly lower expected returns relative to the existing SAA. Notably, all new asset classes introduced in these portfolios are offered by the Welsh Pension Partnership (“WPP”), therefore requiring no change in the percentage of pooled assets since the equities funding the changes are within the WPP.
- Options 1A and 2A (including Private Credit “PC”) increase the allocation to illiquid assets and largely maintain the Fund’s inflation sensitivity while improving income generation capabilities, once invested.
- Options 1B and 1C both retain liquidity and enhance usable income. Option 1C (Credit) offers slightly better income but higher credit risk, while option 1B (Government Bonds) adds diversification, given the Fund currently has no allocation to long duration bonds.
- Options 2A and 2B boost usable income and further de-risk the portfolio, crystallising profits on a larger portion (10%) of the Fund’s equity holdings. However, these options result in lower expected returns.

### Recommendation

Based on our analysis, **our recommendation is to follow Option 1A (a 5% allocation shift from Equity to Private Credit)** for the following reasons:

- Maintains similar level of expected return to current SAA, while reducing the concentration of equity risk.
- Offers another strong source of income, which will start to produce cashflows particularly from year 3 onwards, when it is likely to be needed to replace the declining income from Partners Group.
- Retains some inflation sensitivity, serving as a longer-term sensitivity, like the Equities it replaces, although not a true inflation hedge (like index-linked gilts).
- It does, however somewhat reduce the liquidity of the portfolio.
- The recommended switch from Equity to other asset classes is shown as coming from Global Equity for convenience. The actual decision as to which Equity portfolio should be used to fund the new allocation will be made at the time of the funding call.

Should the Committee be less concerned about inflation risk and more concerned about the potential for a recession, leading to increased default rates and possibly lower interest rates, which would favour long Government Bonds, **Option 1B (a 5% allocation shift from Equity to Government Bonds)** should be considered.

We also **recommend that the existing Global Credit investment is switched from reinvesting to distributing the income**, based on our findings from the forecast cashflow position analysis.

**Table 1: Summary of Current SAA and Portfolio Options**

	Current Portfolio	Current SAA	Recommendation	Options for Consideration		Other Options for Illustration	
			Option 1A	Option 1B	Option 1C	Option 2A	Option 2B
<b>Global Equities*</b>	56.8%	50%	45%	45%	45%	40%	40%
<b>UK Equities</b>	18%	15%	15%	15%	15%	15%	15%
<b>World Government Bonds</b>				5%			5%
<b>UK Index-Linked Gilts</b>	0.3%						
<b>Global Credit</b>	7.2%	10%	10%	10%	15%	15%	15%
<b>European Real Estate</b>	13.1%	15%	15%	15%	15%	15%	15%
<b>Global Infrastructure</b>	0%	5%	5%	5%	5%	5%	5%
<b>SAIF</b>	3.9%	5%	5%	5%	5%	5%	5%
<b>Private Credit</b>			5%			5%	
<b>Cash</b>	0.6%						

Source: Apex, Dyfed Pension Fund

\* The recommended switch from Equity to other asset classes is shown as coming from Global Equity for convenience. The actual decision as to which Equity portfolio should be used to fund the new allocation will be made at the time of the funding call.

**Table 2: Summary of Portfolio Options and Key Factors**

	Current SAA	Recommendation	Options for Consideration		Other Options for Illustration	
		Option 1A	Option 1B	Option 1C	Option 2A	Option 2B
<b>Portfolio Change</b>	-	-5% Equities +5% PC	-5% Equities +5% Gov Bonds	-5% Equities +5% Credit	-10% Equities +5% PC +5% Credit	-10% Equities +5% Gov Bonds +5% Credit
<b>Expected Return</b>	6.7%	6.7%	6.5%	6.6%	6.6%	6.4%
<b>Expected Risk</b>	9.8%	9.2%	9.1%	9.2%	8.7%	8.6%
<b>Forecast Usable Income (£m)*</b>	39.3	48.6	42.7	44.8	54.1	48.2
<b>Forecast Usable Income vs Current SAA</b>	-	Increase	Slight Increase	Increase	Large Increase	Increase
<b>Long-Term Inflation Sensitivity vs SAA</b>	-	Slight Decrease	Decrease	Decrease	Decrease	Large Decrease
<b>Portfolio Liquidity**</b>	75%	70%	75%	75%	70%	75%
<b>Liquidity vs SAA</b>	-	Decrease	-	-	Decrease	-

Source: Bloomberg, Apex

PC: Private Credit, Credit: Public Global Credit (Hedged), Gov Bonds: World Government Bonds (Hedged)

\*Usable income is income forecast from all asset classes except Equities. Maturity is assumed as year 4 (2026/27) when private markets investments have been invested and producing income, if relevant.

\*\*Percentage of portfolio assumed to be ordinarily realisable in 10 days.

## Portfolio Optimisation Analysis

### Model

The portfolio optimisation was performed using our proprietary mean variance optimisation (“MVO”) model, allowing us to consider the level of uncertainty (expected volatility) and identify portfolios with the highest expected returns for a given level of volatility. However, the model does not explicitly consider sources of risk (e.g. country, sector, rates) or liquidity risk. Additional information on MVO can be found in Appendix 4.

### Assumptions

Our assumptions are based on JP Morgan’s 2023 LTCMA, reflecting **long-term expected returns, volatilities, and correlations** for asset classes (over 10 to 15 years), as at 30 September 2022. We have also considered other capital market assumptions providers and market developments since then. Following robust testing, we have for clarity of audit trail. These assumptions are detailed in Appendix 3.

For the BlackRock SAIF investment, we have modelled this based on the underlying asset class exposures through information provided by the manager.

It is important to note that the assumptions are based on **benchmark level returns** for listed asset classes and **median manager** performance for alternative asset classes. Therefore, the assumptions do not include an allowance for active managers to generate any targeted outperformance.

### Constraints

Our understanding is that the Fund has a long-term investment horizon and is thereby prepared to accept short-term volatility and some illiquidity to achieve higher investment returns. The Pensions Committee believes that, over the long term, equities are expected to outperform other liquid assets. We recognise this view and as such, we introduced a **minimum level equities allocation of 55%** into the model.

We note the Fund has regional equities investments (UK, Emerging Markets, Japan) in addition to global equities investments which results in a different geographical breakdown for the Fund’s Equities relative to the broad global equities benchmark we model (see Appendix 2). The key difference is the significant UK overweight, so we have modelled UK and Global Equities as separate asset classes. However, we have limited **UK equities to a maximum of 15%** of total Fund assets to ensure equities are well diversified geographically, and due to UK equities being relatively concentrated in a number of large single stocks which results in greater idiosyncratic risk than desirable.

In addition, we are cognisant of the Fund’s desire to set a **maximum level for illiquid investments**, and we have set this **at 30%**. From the existing SAA, UK Real Estate, Global Infrastructure and SAIF are illiquid, as are the new potential asset classes of Private Credit and Private Equity. Given that it takes material time to invest new capital or adjust allocations, we have **not allowed the weights of existing illiquid asset classes to be reduced from current levels**.

For UK Real Estate we have fixed the allocation at 15%, as we know it would be undesirable to reduce this allocation in the current market, and we would not intend to increase it, due to the desire for a well-diversified portfolio. Based on the above, the existing SAA has a 25% allocation to illiquid asset classes, which only allows the model to allocate up an additional 5% to illiquid investments.

These constraints are summarised in the table below.

**Table 3: Modelling Constraints for Efficient Frontier**

Group	Asset Class	Min %	Max %	Group Min %	Group Max %	Constraint Details
Equities	All Country World Equity	55%	100%	n/a	n/a	To reflect the minimum equity exposure the Fund wishes to retain.
	Real Estate	15%	15%			To reflect the maximum individual and combined illiquid assets exposure the Fund could have.
	Infrastructure	5%	n/a			
Illiquid Assets	SAIF	5%	n/a	0%	30%	Minimums in Real Estate, Infrastructure and SAIF reflect the current investments which are not possible to reduce. The maximum real estate constraint reflects the desire for diversification of alternative assets and the current outlook for the real estate market.
	Private Credit	0%	n/a			
	Private Equity	0%	n/a			

Source: Apex

The total fixed constraints sum to 80%, which leaves 20% for the model to optimise between the included asset classes. Limiting the majority of the portfolio in this manner helps reduce the potential transaction costs and disruption of any changes as well as ensuring sufficient diversification. Based on this we have modelled multiple scenarios and our approach has resulted in several potential portfolios options.



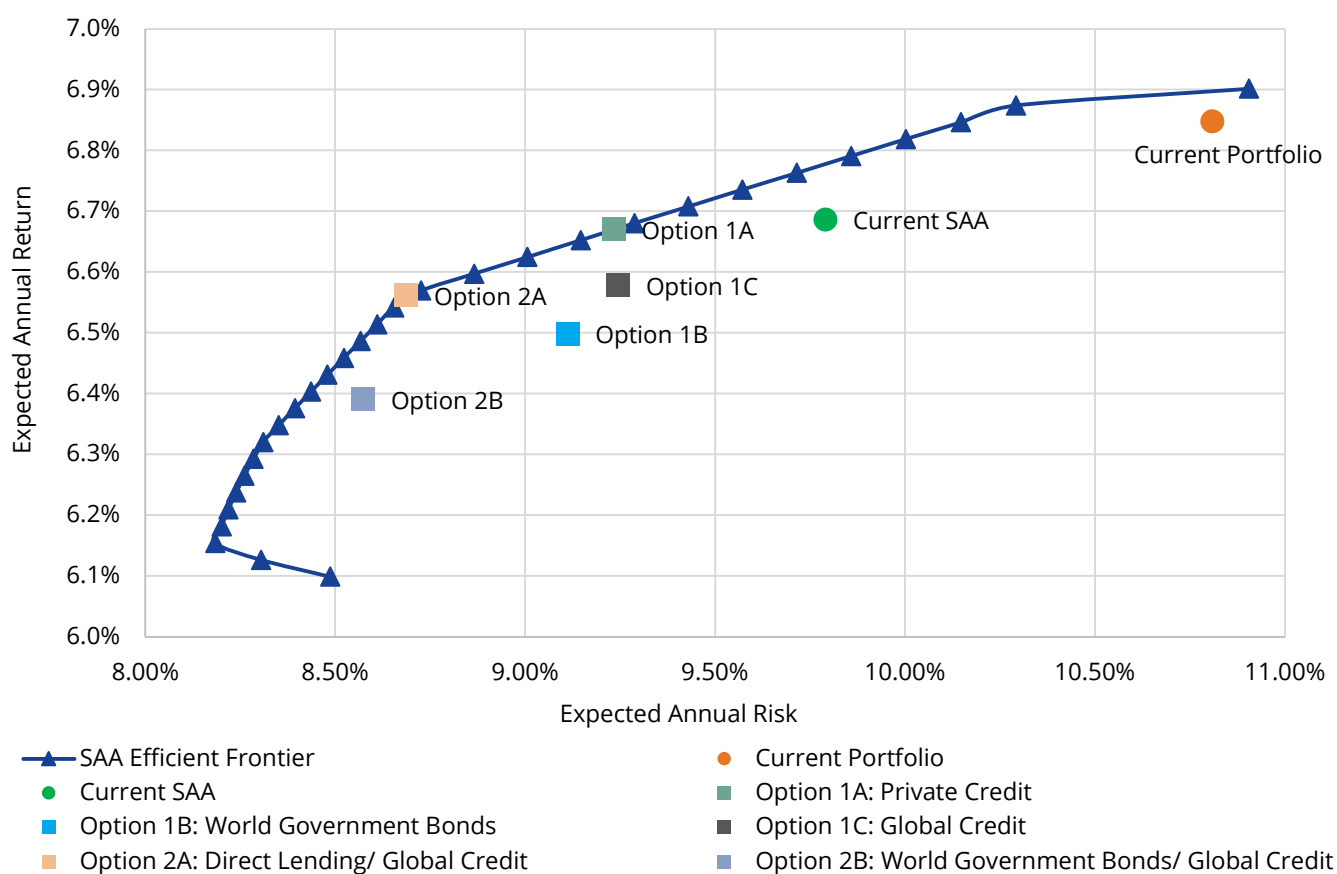
## Model Results

Figure 1 below shows 30 modelled portfolios (dark blue triangles) forming an **efficient frontier**, representing the most efficient portfolios in terms of risk and return, based on the assumptions and constraints.

If we left the SAA model totally unconstrained it produces results which, whilst academically interesting, are not relevant to the Fund, as the model takes no consideration of diversification by asset class, portfolio income or liquidity. However, what is noticeable is that unconstrained models skew away from equities due to their historically higher volatility and relatively high correlations with alternative investments, which offer a more attractive risk/return payoff. This leads the modelling to favour asset classes such as government bonds, global credit, and private credit, at the expense of equities.

The orange circle represents the Fund's current asset allocation, while the green circle represents the existing SAA. We have illustrated five portfolio options (coloured squares), which all offer moderately lower risk with a similar expected return compared to the SAA, and marginally lower returns than the current portfolio.

**Figure 1: Efficient Frontier**



Source: Apex

## Portfolio Options

The table below sets out a summary of the portfolios' asset allocations, along with their risk/ return statistics.

**Table 4: Portfolio Options**

	Current Portfolio	Current SAA	Proposed	Options for Consideration		Other Options for Illustration	
			Option 1A	Option 1B	Option 1C	Option 2A	Option 2B
Global Equities*	56.8%	50%	45%	45%	45%	40%	40%
UK Equities	18%	15%	15%	15%	15%	15%	15%
Gov. Bonds				5%			5%
UK IL Gilts	0.3%						
Global Credit	7.2%	10%	10%	10%	15%	15%	15%
UK Real Estate	13.1%	15%	15%	15%	15%	15%	15%
Global Infra	0%	5%	5%	5%	5%	5%	5%
SAIF	3.9%	5%	5%	5%	5%	5%	5%
Private Credit			5%			5%	
Cash	0.6%						
Exp. Return	6.9%	6.7%	6.7%	6.5%	6.6%	6.6%	6.4%
Exp. Risk	10.8%	9.8%	9.2%	9.1%	9.2%	8.7%	8.6%
Exp. Sharpe	0.43	0.46	0.48	0.47	0.47	0.50	0.49
95% VaR	£682m	£653m	£616m	£615m	£618m	£581m	£581m

Source: Apex

\* The recommended switch from Equity to other asset classes is shown as coming from Global Equity for convenience. The actual decision as to which Equity portfolio should be used to fund the new allocation will be made at the time of the funding call.

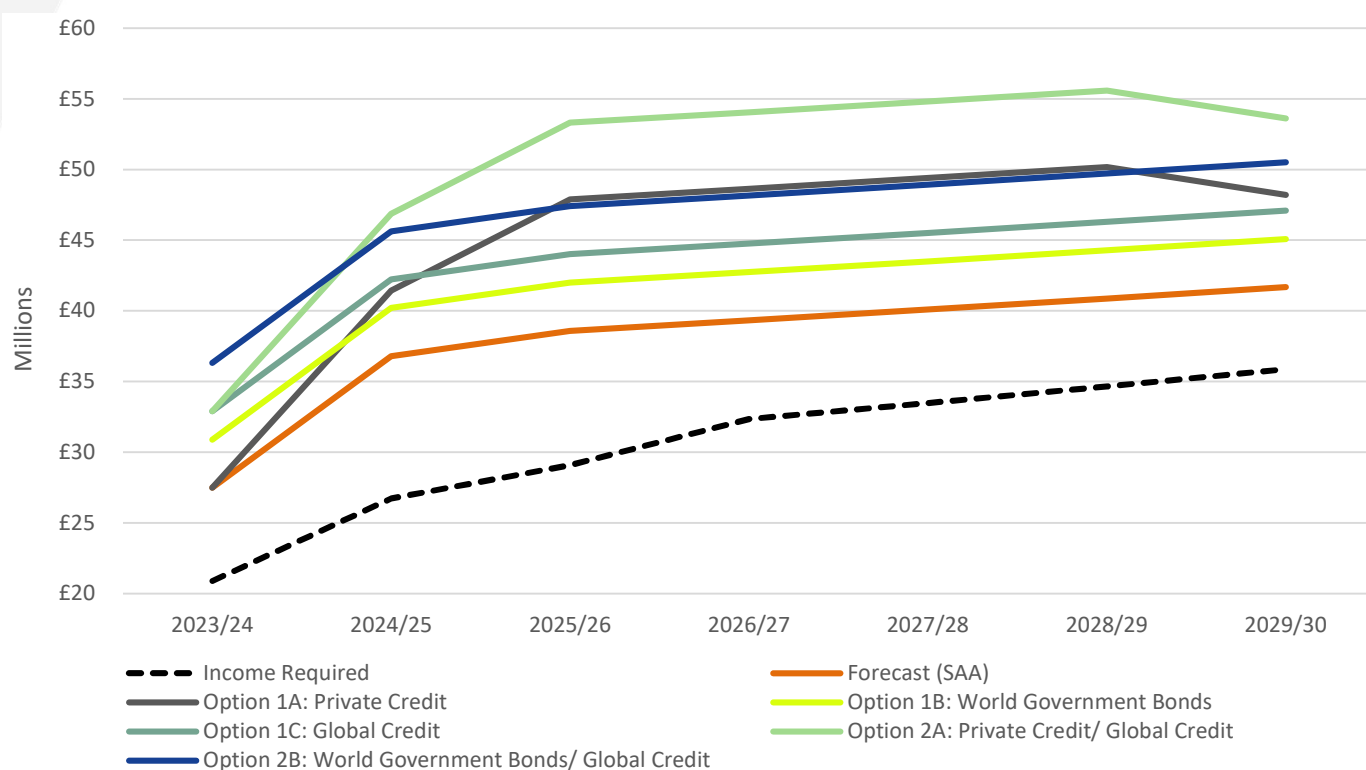
Due to the significant increase in interest rates over the last year, fixed income asset classes now offer comparable expected returns to equities. Reducing the equity allocation in favour of fixed income assets results in minimal loss of return potential. **All modelled portfolios comfortably exceed the Fund's target investment return (4.55%) and improve the risk and improve the risk-adjusted return (Sharpe ratio).** Shifting away from equities is likely to **enhance diversification** and boost the overall portfolio resilience. The correlation matrix in Appendix 3 shows that Government Bonds (1B) offer the most diversification, followed by Private Credit (1A) and Global Credit (1C). Opting to switch 10% rather than 5% from Equities is expected to yield lower long-term returns, but with more diversification and lower overall portfolio volatility (and hence the best Sharpe ratios). However, considering the **limited differences in return expectations, we suggest the decision between these options hinges on consideration of other key factors, namely: investment income generation, interest rate and credit risk, liquidity, and inflation sensitivity.**

## Portfolio Considerations

### Investment Income Generation/ Cashflow Analysis

An important consideration for the Fund is the ability to provide investment income to help meet future cashflow requirements. Figure 2 illustrates the expected “usable” cash income (income from all investments other than Equities) generated by each option : each SAA Option modelled should generate usable income comfortably above the required amount. Notably, we assume that the new SAA is fully implemented for the 23/24 year, except that it takes two years to invest capital in the Private Credit fund, after which it generates substantial investment income from 2025/26 onwards.

**Figure 2: Forecast Usable Income by Portfolio Option vs Income Required**



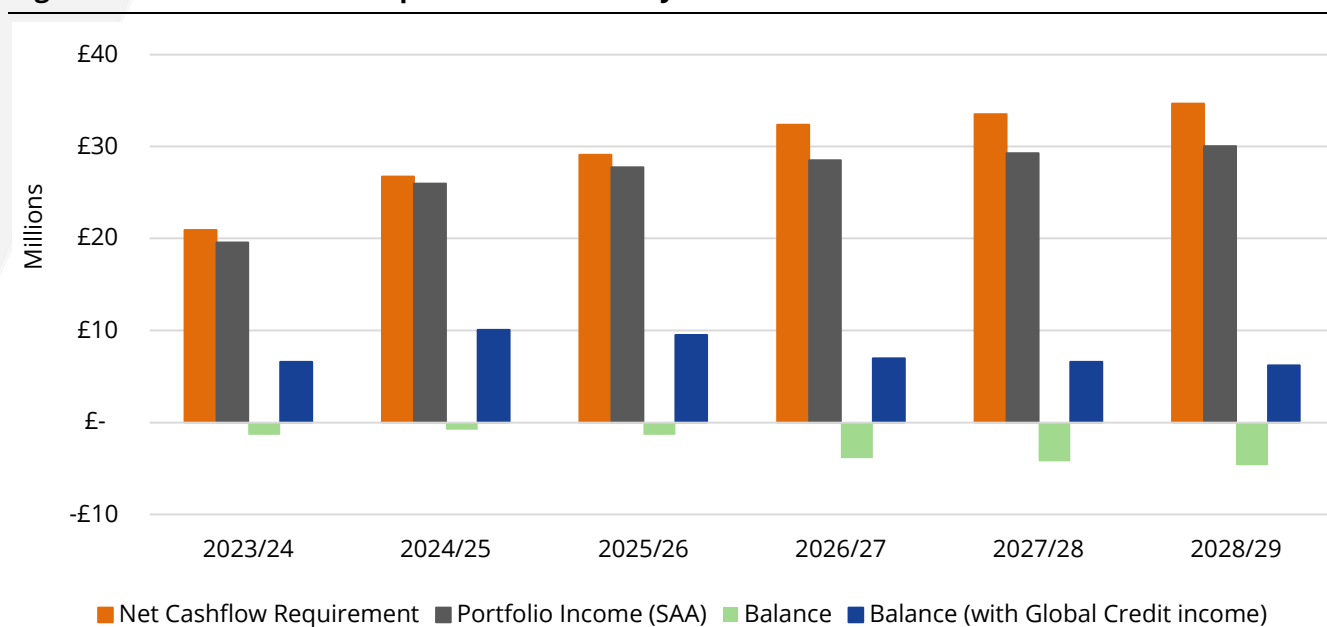
Source: Schroders, Partners Group, Bloomberg, Dyfed Pension Fund, Apex

However, we advise only to withdraw sufficient income from the portfolio to meet cashflow needs and to reinvest any excess. For the **cashflow analysis**, we have assumed that the **Fund continues using only the income generated from Real Estate** (£1m per year from Partners Group, plus income from Schroders), **SAIF, Index-Linked Gilts and Infrastructure** (in due course). We have modelled the forecast income received from **Global Credit** assuming this is switched to a distributing vehicle, while income from Global Equities is reinvested. Regarding new asset classes, we have assumed **income from Private Credit will be distributed** to the Fund (generally it is not possible to re-invest distributions in private markets, although

some private credit funds may have an initial recycling period). For **World Government Bonds** we have assumed income will be reinvested.

Figure 3 displays the expected income required from the Fund and our forecast of the cash distributed from the above investments, year by year. The green bars ('Balance') illustrate that if Global Credit is left as accumulating then there is forecast to be a cashflow shortfall through the forecast period. If Global Credit is switched to distributing, as we recommend, then the overall portfolio income is forecast to be above the level required based on forecast pension expenses.

**Figure 3: Forecast Income Required/ Generated by Current SAA**



Source: Schroders, Partners Group, Bloomberg, Dyfed Pension Fund, Apex  
 Note Partners Group income is assumed as £1m per annum.

We have also modelled the sensitivity of this cashflow analysis should inflation remain high, leading to increased pension expenses. Under the assumption that pensions paid increase by 8% per annum for 2024/25 to 2026/27 (vs. 6% and 5% in the base case), and with all else left unchanged, the Fund is still projected to have positive net cashflow, provided that Global Credit is switched to a distributing vehicle.

Cashflow considerations alone, therefore, do not necessitate a change in the current SAA, but result in a **recommendation to switch the existing Global Credit portfolio from an accumulating to distributing share class**. However, consideration of the other risks to which the Fund is exposed (below), suggests the Committee should consider alternative SAAs.

### Interest Rate and Credit Risk

The sharp rise in interest rates over the past year has resulted in significant price declines for "long duration" assets like long government bonds (down approximately -30% in the year to March 2023) and growth

equities. In contrast, shorter duration bonds (such as credit) experienced much milder declines (around -6%), while private credit, with a substantial proportion of floating rate loans, has remained relatively unaffected. Although interest rates are unlikely to return to the exceptionally low levels of recent years, **a gradual decline over time could benefit longer duration fixed income asset classes, such as World Government Bonds**. Additionally, as the Fund matures, it becomes more desirable to have increased exposure to these type of assets, as the cost of pension benefits behaves similarly to long duration bonds.

Similarly, as the economy potentially heads for a recession, credit spreads (the additional return bondholders demand to compensate for default risk) may widen, leading to bond price declines. While spreads are currently close to their long-term average levels, **the economic uncertainties driven by the rise in rates which has already occurred, may suggest a preference for more secure “investment grade” Global Credit (1C) or even Government Bonds (1B) over the riskier Private Credit (1A)**.

### Inflation

As the Fund is well aware, inflation has increased dramatically in the UK and many other major economies since early 2021. As the Fund’s pensions are fully indexed to CPI inflation, the March ’22 Actuarial Valuation discount rate is linked to inflation, and set at 1.45% above the CPI expectation of 3.1%. Although inflation has exceeded 3.1% since late 2021, the expected rates of *long-term* inflation have actually reduced marginally as at the date of this analysis. Therefore, **we are comfortable to continue to use the Valuation discount rate of 4.55%** as the required minimum rate of return for the Fund.

Table 5 shows a schematic representation of the sensitivity to both inflation and interest rates for the different asset classes currently held by the Fund, as well as those included in the Options presented earlier. So while inflation remains a key risk to the Fund, the Fund currently maintains a good level of exposure to inflation sensitive asset classes.

**Table 5: Asset Classes and Sensitivity to Interest Rates and Inflation**

	Short Duration Asset Classes (Low Interest Rate Sensitivity)	Long Duration Asset Classes (High Interest Rate Sensitivity)
High Inflation Sensitivity	Infrastructure/SAIF (10%) Real Estate (15%) Value Equity Private Credit (5%, Option 1A)	Index-Linked Gilts (<5%) Equities (60%) Growth Equity
Low Inflation Sensitivity	Corporate Bonds 10% + (5%, Option 1C) Cash	Government Bonds (5%, Option 1B)

Source: Apex

## Liquidity

Liquidity refers to the ease with which an investment can readily be bought or sold. Private market investments, including Real Estate, SAIF and Infrastructure (currently held), as well as **Private Credit in Option 1A are considered illiquid**. This means that they cannot readily be bought, sold or rebalanced (up or down) and it typically takes 2-3 years fully to invest these assets. Investors typically demand a return premium to compensate for the lack of liquidity. As a long-term investor, the Fund can generally tolerate this illiquidity risk, given it's well balanced cashflows. However, the Fund's SAA's allocation to illiquids currently stands at 25%, and with cashflows gradually becoming more negative, it is advisable not to let this proportion of illiquid assets to rise too much. While all publicly traded asset classes are generally liquid and can be easily rebalanced, **Global Credit (Option 1C) will be less liquid under some circumstances compared to the Equities used to fund the switch, or World Government Bonds (Option 1B)**.

## Carbon Footprint

This report has not looked at Carbon emissions specifically, primarily because the carbon intensity data across asset classes is not readily comparable, making this a **more appropriate consideration when looking at the specific investment within the asset class** (i.e. portfolio construction), rather than at the asset allocation stage. The Committee will look at the impact on carbon footprint at the time any specific investment decisions are made in implementing this asset allocation, with a view to ensuring our investments demonstrate a good and/or improving carbon footprint.

## Conclusion

In this report, we have conducted an SAA modelling exercise considering the Fund's beliefs, potential investment universe, liquidity, cashflow requirements, and reasonable constraints. Using long-term capital market assumptions, we have presented several alternative SAA options for the Fund to consider, whilst bearing in mind the existing illiquid investments still being deployed. The alternative portfolios offer various options to enhance the Fund's ability to generate usable investment income and meet its growing cashflow requirements as it matures.

**We recommend that the Fund switch the Global Credit investment from reinvesting to distributing the income** in order to meet the forecast cashflow shortfall. This should be the only change required to meet cashflow requirements and can be reassessed upon the next valuation/ SAA date in 2025/26.

Given then, that the Fund has sufficient cash generation, the Committee does not need to worry overly about volatility (the traditional interpretation of "investment risk"). The Fund is a long term investor, and has the ability to ride out market cycles. The risks it does need to worry about, however, are the cumulative ones (**inflation and expected returns**), which are critical in determining its ability to pay pension obligations in 10-15 years, and, perhaps, the **opportunity cost of illiquidity** (being unable to adjust to changes in market conditions or investment opportunities).

The choice of which option therefore boils down to a trade-off between these. Appendix 1 lays out the Pros and Cons of each option, but our recommendation is to pursue **Option 1A (a 5% allocation shift from Equity to Private Credit)** for the following reasons:

- Maintains similar level of expected return to current SAA, while reducing the concentration of equity risk.
- Offers another strong source of income, which will start to produce cashflows particularly from year 3 onwards, when it is likely to be needed to replace the declining income from Partners Group.
- Retains some inflation sensitivity, serving as a longer-term sensitivity, like the Equities it replaces, although not a true inflation hedge (like index-linked gilts).
- It does, however somewhat reduce the liquidity of the portfolio.
- The recommended switch from Equity to other asset classes is shown as coming from Global Equity for convenience. The actual decision as to which Equity portfolio should be used to fund the new allocation will be made at the time of the funding call.

Should the Committee be less concerned about inflation risk and more concerned about the potential for a recession, leading to increased default rates and possibly lower interest rates (which would favour the longer duration Government Bonds) **Option 1B (a 5% allocation shift from Equity to Government Bonds)** should be considered.

It does not seem necessary, from a cashflow or diversification perspective, to switch a further 5% out of equities (i.e. Options 2). However, the Committee should **rebalance the current Equity overweight by enough to correct the underweight in Global Credit**.

## Appendix 1 – Consideration of Portfolio Options

	Pros	Cons
<b>Current SAA</b>	<p>Expected return is above the actuarial discount rate.</p> <p>Expected cash yield above the expected income required over medium-term.</p> <p>Only a moderate level of illiquid assets exposure (25%).</p> <p>Overall has a moderate long-term inflation sensitivity, due to large allocations to Equities and real assets (Infrastructure, SAIF, Real Estate) which we view as being moderate to strong inflation protection respectively.</p> <p>Good alignment with the pooling (85%) and levelling up initiatives (5% in UK private assets through SAIF and 13% in UK Real Estate).</p>	<p>Large exposure to equity market risk, which can result in volatile performance.</p> <p>Overall expected risk is high given the funding position.</p>
<b>Option 1A (Private Credit)</b>	<p>Improves expected risk-adjusted return (by lowering risk with similar expected return), and is above the actuarial discount rate.</p> <p>Tactically an interesting time to invest, as tightening credit conditions offer the possibility of above average returns for the vintages which are invested over the next 2-3 years.</p> <p>Underlying loans are typically floating rate, and so yields are expected to rise with base rates and thereby provide a degree of indirect inflation protection.</p> <p>High cash yield expectation, following the initial period assumed as 1-2 years to invest cash.</p> <p>Typically private or smaller cap borrowers, so it provides diversification vs listed credit.</p> <p>A pooled solution is offered through WPP which could enable the Fund to make this allocation whilst continuing its alignment with pooling.</p>	<p>Illiquid asset class, with fund terms typically of 8-10 years before majority of capital is returned (noting potential for capital losses), and the allocation cannot easily be adjusted.</p> <p>Whilst our assumptions for Private Credit are set at a general level, there are many strategies offering a wide range of capital structure and geography exposures, for the Fund's consideration. Given the stage in the economic cycle, a relatively low risk strategy (e.g. no fund leverage, and investments in senior secured loans) would be appropriate.</p> <p>Subject to the exact agreements and manager, Private Credit is often considered a relatively more expensive asset class in terms of managers fees. Managers typically charge a per annum fee and a performance fee above a hurdle rate.</p>
<b>Option 1B (Gov Bonds)</b>	<p>Reasonable cash yield potential if required for future cashflow needs, and income would be paid immediately (no investment period).</p> <p>Government bonds, particularly developed markets, are considered a fair recession hedge given tendency for interest rates to fall in recessions and investors to turn to safe assets.</p> <p>Enables the Fund to maintain alignment with the pooling initiative by investing in the World Government Bonds WPP pooling vehicle.</p> <p>The asset class is liquid, allowing relatively fast access to cash (subject to extreme stress events) and ease of re-balancing the portfolio.</p>	<p>Lower expected return than the existing SAA, although with lower expected risk resulting in a marginal improvement in Sharpe ratio, and is above the actuarial discount rate.</p> <p>We view the asset class as a poor inflation hedge, as the loans are fixed rate and both coupons and principal are not adjusted with inflation.</p>



	Pros	Cons
<b>Option 1C (Credit)</b>	<p>Improves expected risk-adjusted return (by lowering risk with similar expected return), and is above the actuarial discount rate.</p> <p>High cash yield potential if required for future cashflow needs, and income would be paid immediately (no investment period).</p> <p>Enables the Fund to maintain alignment with the pooling initiative by investing in the current Global Credit WPP pooling vehicle.</p> <p>The asset class is liquid, allowing relatively fast access to cash (subject to extreme stress events) and ease of re-balancing the portfolio.</p>	<p>We view the asset class as a poor inflation hedge, as the loans are fixed rate and both coupons and principal are not adjusted with inflation.</p> <p>An additional 5% allocation increases the allocation to the WPP strategy to 15%. While this is not at a worrying level, particularly given the strategy is a multi-manager construction, it does represent an increased level of manager concentration.</p>
<b>Option 2A (Private Credit and Credit)</b>	<p>Further reduces equity risk, following strong performance relative to bonds, bringing it more in line with LGPS average, while maintaining a similar level of expected return to the higher equity options (Options 1A-D).</p> <p>Provides diversified exposure to credit including element of inflation sensitivity. Further bolsters Fund's ability to generate usable investment income, and takes it a step further down the road it will need to follow as it matures.</p> <p>High cash yield expectation, following 1-2 years to invest cash for Private Credit (and with no expected income to be received for Global Credit)</p>	<p>Some reduction in liquidity of the Fund, and of flexibility, as compared with the passive equity funding the transition.</p> <p>Higher costs due to the increased private markets allocation.</p>
<b>Option 2B (Gov Bonds and Credit)</b>	<p>Good cash yield potential, although both assets would assume to be invested into accumulating vehicles. This could easily be adjusted if required in future years.</p> <p>Liquidity remains high in these asset classes, allowing relatively fast access to cash (subject to extreme stress events) and ease of re-balancing the portfolio.</p> <p>Enables the Fund to maintain alignment with the pooling initiative.</p>	<p>Expected return is somewhat lower (though risk-adjusted return increases due to much lower risk), although it is above the actuarial discount rate.</p>

## Appendix 2 – Current Portfolio

### Overall Portfolio Valuation

As at 31 March 2023, the Fund's assets had a valuation of £3.13bn, which was invested across five pools/managers: BlackRock (Regional and Global Equities, and Index-Linked Gilts), WPP Growth Equity, WPP Global Credit, Schroders (Real Estate), and Partners Group (Real Estate).

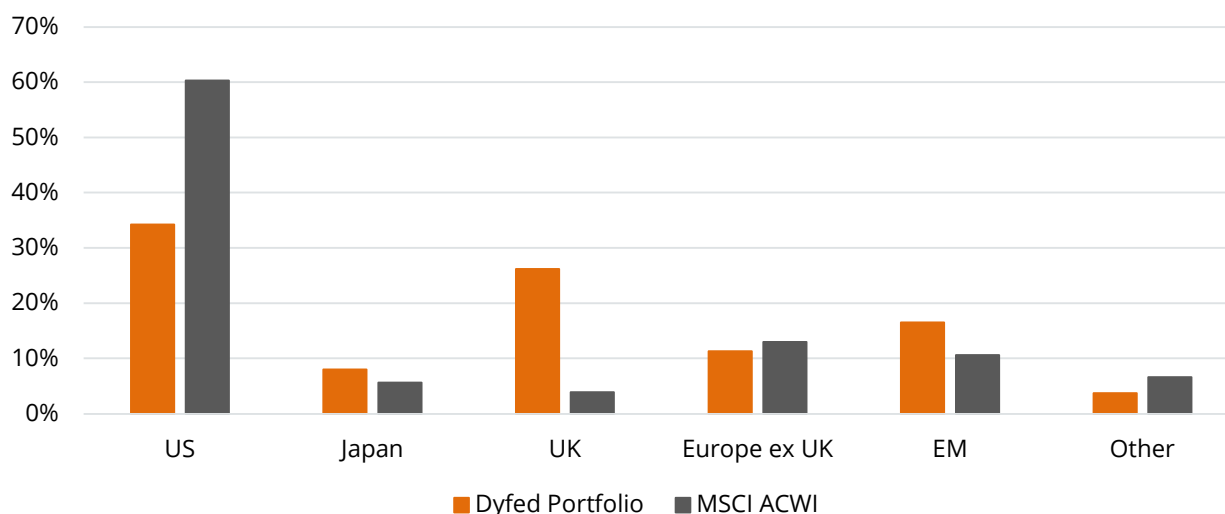
**Table 6: Fund Allocation as at 31 March 2023**

Fund	Asset Class	Valuation	% of Total Portfolio
BlackRock UK Equity	UK Equities	£562,034,000	18.0%
BlackRock Global Equity (Regional Funds and Global Low Carbon Fund)	Global Equities	£799,740,000	25.6%
WPP Global Equity	Global Equities	£978,714,000	31.3%
BlackRock Index Linked Gilts	Index Linked Gilts	£10,781,000	0.3%
WPP Global Credit	Global Corporate Bonds	£226,700,000	7.2%
BlackRock SAIF	Multi Asset	£121,102,000	3.9%
Schroders	Real Estate	£361,168,000	11.5%
Partners Group	Real Estate	£49,539,000	1.6%
Cash	Cash	£20,111,000	0.6%
<b>Total</b>		<b>£3,129,889,000</b>	

Source: Dyfed Pension Fund, Apex

Note: Figures may not add to 100% due to rounding

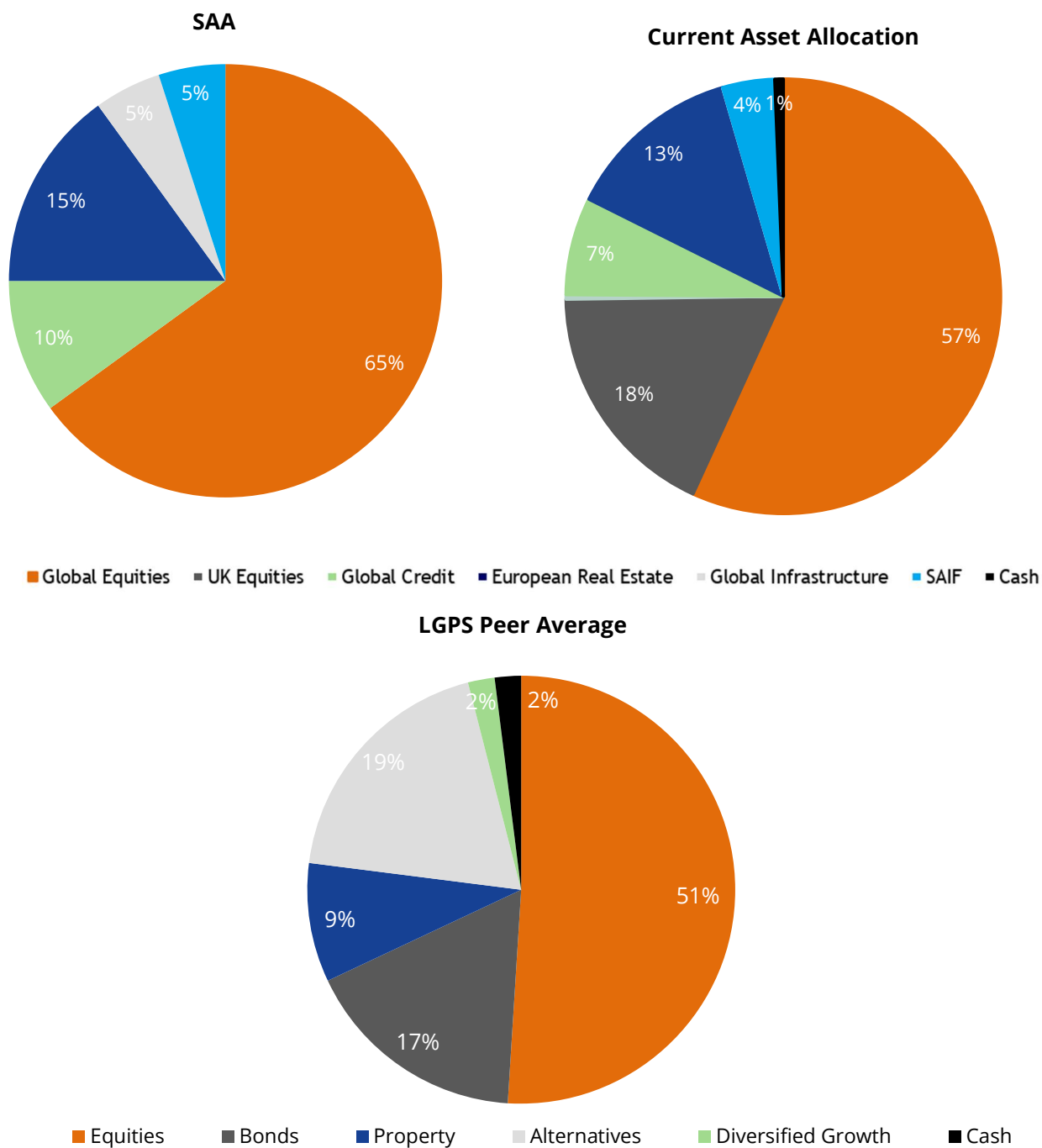
**Figure 4: Dyfed Equities Weight by Region vs MSCI ACWI**



Source: Apex, MSCI

## Asset Allocation

**Figure 5: SAA, Current Asset Allocation and LGPS Peer Group Average (as at 31 March 2023)**



Source: Dyfed Pension Fund, PIRC Local Authority Fund Statistics, Apex

Note: Figures may not sum to 100% due to rounding.

### **SAA vs Current Asset Allocation**

When comparing the SAA to the current asset allocation (as at 31 March 2023) in Figure 5 the Fund is:

- 9.8% overweight to Global Equities (5% of which is to fund the Global Infrastructure commitment).
- 5.0% underweight to Global Infrastructure (as the fund has not yet invested capital).
- Broadly in line with the SAA for the other asset classes. The Committee has agreed a £50m (c. 1.6%) rebalance out of UK Equities into Global Credit, which occurred after 31 March, which will bring the SAA closer in line again.

### **SAA vs LGPS Peer Average**

We have also provided the average SAA of LGPS funds, as at 31 March 2023, to provide a comparison of the relative SAA positioning of the Fund compared to the peer group. However, it is important to bear in mind that each Fund should consider its own objectives, constraints, funding ratio and discount rates for setting an SAA. Notwithstanding this, the key differences are as follows:

- The Fund holds notably more Equities than peers (65% vs 51%), though it should be noted that some other LGPS funds also hold equity exposure through their diversified growth allocations or within their alternative allocations (e.g. hedge funds).
- The Fund holds fewer bonds than peers (10% vs 17%).
- The Fund holds a relatively similar weight in the diverse 'alternatives' category, which includes Real Estate (25% vs 28%).

The heavy weighting in equities has aided the Funds' performance over the longer term but introduces greater volatility.

## Appendix 3 – Key Assumptions

### Risk and Return Assumptions

**Table 7: Forward-Looking Annual Risk/Return Assumptions (Over 10 to 15 Years)**

Asset Class	Sub-Asset Class	Exp. Annual Return	Exp. Annual Volatility
Equities	All Country World Equity	7.3%	13.9%
	UK All Cap	7.6%	13.2%
Fixed Income	UK Inflation Linked Bonds	3.8%	10.7%
	Global Credit Hedged	5.1%	5.4%
	World Government Bonds Hedged	3.5%	3.7%
Cash	UK Cash	2.2%	0.7%
Real Estate	UK Core Real Estate	5.5%	13.0%
Alternatives	Global Core Infrastructure	5.4%	10.8%
	Private Equity	8.1%	17.5%
	Private Credit	6.9%	15.8%
	BlackRock SAIF	6.2%	8.6%

Source: JPM LTCMA 2023, Apex

### SAIF Allocation

The SAIF BlackRock portfolio invests in 5 asset classes in varying proportions, with a breakdown as at March 2023 shown in Table 8. We have elected to model the investment as a single asset class, and have created a single return and risk and set of correlations assumptions, based on the underlying asset classes.

**Table 8: SAIF Fund Breakdown as at March 2023**

Asset Class	SAIF Allocation %
Infrastructure Equity	18%
Infrastructure Debt	22%
Real Estate Equity	31%
Real Estate Debt	13%
Private Credit	16%

Source: BlackRock, Apex

Note: Figures may not add to 100% due to rounding

## Cash Yield Assumptions

The table below highlights the expected distribution yield for distributing investments. Illiquid asset classes have been forecast year by year, based on expected time frames to deploy capital and expected distributions, with the initial annual distribution highlighted in the table below.

**Table 9: Current Expected Yields**

Asset Class	Currently Income Producing	Valuation at March 2023 (£'000)	Expected Cash Yield	Estimated Income Amount (£'000)	Source
Global and UK Equities	No	£2,340,000	2.75%	n/a	Bloomberg Estimated Yield for Benchmark Index (Global and UK Equities blend), 30 June 2023.
Index Linked Gilts	Yes	£10,781	1.0%	£100	Bloomberg, Apex Assumptions.
Global Credit	No	£226,700	3.50%	n/a	Bloomberg Current Yield for Benchmark Index, 30 June 2023.
Schroders Real Estate	Yes	£361,168	3.5%	£12,500	Based on April 2023 distribution, annualised.
Partners Group Real Estate	Yes	£49,539	4.0%	£2,000	Forecast net cashflow per year provided by Manager.
SAIF	Yes	£121,102	5.0%	£6,055	Based on latest Manager update.
Global Infrastructure	No	£0	4.0%	n/a	Manager Forecast, Apex Assumptions.
World Gov Bonds	n/a	n/a	2.2%	n/a	Bloomberg Current Yield for Benchmark Index, 30 June 2023.
Private Credit	n/a	n/a	6.0%*	n/a	Apex Assumptions

Source: BlackRock, Partners Group, Bloomberg, MSCI, Apex

\*See comments in text following Table 10

**Private Credit** refers to a closed-ended strategy, which invests in untraded private market debt instruments (loans or bonds), typically direct with the underlying borrower (rather than via a bank), and typically with smaller/mid-cap companies (too small to issue bonds themselves). These instruments are typically floating rate and may be senior or subordinated (i.e. ranking behind secured debt). For this higher level of credit and liquidity risk, investors demand materially higher returns than investment-grade corporate credit, as above.

## Fund Net Cashflow Forecast

The table below illustrates our year by year forecast for cashflow required of, and produced by, the Fund. Our assumptions of the cashflows required of the fund, i.e. net pension expenses, are based on assumptions provided by Dyfed for the years 2023/24 to 2025/26, and for subsequent years is based on consistent growth rate assumptions of 3.5% across pensions paid, transfers, and contributions.

**Table 10: Detailed Cashflow Forecast by Year for Current SAA (£m)**

Year	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30
Pensions Assumptions	Dyfed	Dyfed	Dyfed	Apex	Apex	Apex	Apex
Pensions Paid	-79.0	-85.3	-90.4	-95.8	-99.2	-102.7	-106.3
Net Pension Transfers	-26.5	-28.5	-28.5	-29.5	-30.5	-31.6	-32.7
Contributions	95.1	98.4	101.9	105.4	109.1	112.9	116.9
CHAPS	-10.5	-11.4	-12.0	-12.5	-12.9	-13.3	-13.8
<b>Net Cashflow Requirement</b>	<b>20.9</b>	<b>26.7</b>	<b>29.1</b>	<b>32.4</b>	<b>33.5</b>	<b>34.7</b>	<b>35.9</b>
Real Estate: Schroders	12.5	14.8	14.8	15.2	15.7	16.2	16.7
Real Estate: Partners Group	1.0	1.0	1.0	1.0	1.0	1.0	1.0
SAIF	6.1	7.7	7.9	8.1	8.3	8.6	8.8
Infrastructure	-	2.4	4.0	4.1	4.2	4.3	4.4
<b>Portfolio Income (SAA)</b>	<b>19.6</b>	<b>25.9</b>	<b>27.7</b>	<b>28.5</b>	<b>29.2</b>	<b>30.0</b>	<b>30.8</b>
<b>Balance</b>	<b>-1.3</b>	<b>-0.8</b>	<b>-1.3</b>	<b>-3.9</b>	<b>-4.3</b>	<b>-4.6</b>	<b>-5.0</b>

Source: BlackRock, Partners Group, Schroders, Dyfed Pension Fund, Apex.  
Figures may not sum due to rounding.

Our assumptions of cashflow produced by asset class is:

*Real Estate:* based on a forecast from Partners Group, and for Schroders based on the latest distributions data. These figures have then been sense checked by Apex for reasonableness.

*SAIF:* based on the distributions received by the Fund, and from the latest available update from the Manager. We have assumed a 5% distribution yield, with the Fund at SAA weight after 1 year, and with a 2.5% annual growth in the income received thereafter.

*Infrastructure:* assumptions provided by Dyfed, with £2.4m received in 2023/24 and £4m in the following year; however we have assumed no income received in year 1. In the subsequent years we have then assumed 2.5% annual growth in the income received. We assume a long run/ stable cash yield of 4%.

*Private Credit:* we assume no distributions received in the first year, then half the rate of (i.e. 3%) in year 2, and then the full income (i.e. 6%) received from year 2 to year 6, then declining in year 7 to 70%, and in year 8 to 50%. We assume a conservative long run/ stable cash yield of 6%, which we view as achievable for commitments made over the forecast horizon and noting that current yields achievable may be considerably higher than this although the long term cash forecast is subject to the course of interest rates and credit losses, and fees charged by managers.

*Global Credit:* we assume income is reinvested by the Fund, but for the purposes of 'usable income' forecasts we assume cash income of 3.5%. This is based on an index current price and coupon as of 30 June 2023, providing a current yield of 3.5% and a yield to maturity of 5.1%. We note the total return forecast is 5.1% per annum. In reality income may be slightly higher than 3.5% depending on the course of interest rates over the forecast horizon. We assume a long run/ stable cash yield of 5%.

*World Government Bonds:* we assume income is reinvested by the Fund, but for the purposes of 'usable income' forecasts we assume cash income of 2.2%. This is based on an index current price and coupon as of 30 June 2023, providing a current yield of 2.2% and a yield to maturity of 3.2%. We note the total return forecast is 3.5% per annum, reflecting a small degree of interest rates falling (i.e. capital gains). In reality income may be higher than 2.2% depending on the course of interest rates over the forecast horizon. We assume a long run/ stable cash yield of 3%.



## Correlation Assumptions

**Table 11 : Expected Correlation Coefficient Matrix**

Asset Class		A	B	C	D	E	F	G	H	I	J	K
AC World Equity	A	1.00	0.85	0.31	0.45	0.05	0.23	0.12	0.18	0.18	-0.06	0.74
UK Large Cap Equity	B	0.85	1.00	0.15	0.32	-0.14	0.33	0.06	0.12	0.02	-0.12	0.68
UK Inflation Linked Bonds	C	0.31	0.15	1.00	0.58	0.61	-0.10	0.41	0.19	0.29	0.09	0.18
Global Credit Hedged	D	0.45	0.32	0.58	1.00	0.65	0.01	0.13	0.02	-0.02	0.14	0.26
World Government Bonds hedged	E	0.05	-0.14	0.61	0.65	1.00	-0.43	0.06	-0.03	0.18	0.32	-0.26
UK Core Real Estate	F	0.23	0.33	-0.10	0.01	-0.43	1.00	-0.02	0.17	-0.26	-0.35	0.29
Global Core Infrastructure	G	0.12	0.06	0.41	0.13	0.06	-0.02	1.00	0.27	0.20	-0.09	0.24
SAIF	H	0.18	0.12	0.19	0.02	-0.03	0.17	0.27	1.00	0.46	-0.11	0.24
Private Credit	I	0.18	0.02	0.29	-0.02	0.18	-0.26	0.20	0.46	1.00	0.02	0.21
UK Cash	J	-0.06	-0.12	0.09	0.14	0.32	-0.35	-0.09	-0.11	0.02	1.00	-0.12
Private Equity	K	0.74	0.68	0.18	0.26	-0.26	0.29	0.24	0.24	0.21	-0.12	1.00

Source: Apex, JPM LTCMA 2023

## Appendix 4 – Defined Terms and Methodologies

Portfolio optimisations have been conducted using LTCMA for each asset class. Constraints on asset class weights, sub-asset class weights and minimum required return were used for mean variance optimisation.

### Mean Variance Optimisation

Mean variance optimisation (MVO) seeks to obtain the optimal asset allocation that provides the minimum expected risk (volatility) for each given expected level of return based on the assumptions and constraints.

MVO is the most widely used approach to optimise portfolio allocations (following the work of Markowitz on modern portfolio theory). The inputs required, referred to as our LTCMA, are expected returns for the assets under consideration and the covariance matrix of those assets. The covariance matrix itself can also be estimated separately as correlations and variance of the assets, which help in formulating forward-looking views.

Key Benefits:

- This optimisation considers both risk and returns and from a pragmatic perspective, gives a good general framework for an SAA;
- The technique is comparatively fast-to-run, computationally, which is important when exploring different asset allocation scenarios;
- The output provides a range of optimised portfolios by expected returns and volatility, and the results are often intuitive.

Key Considerations:

- The model is very sensitive to the initial inputs/assumptions made for each asset. Differences in expected returns or volatilities can make a meaningful difference in the optimal portfolio generated. As such, it is important to choose assumptions on a reasonable basis and refine them when appropriate.
- The MVO technique only takes mean and variance into account and does not (by default) take into account other properties of the distribution of returns (such as skewness or kurtosis). These factors can be important for those strategies which exhibit elements of tail risk.
- MVO identifies whether a portfolio allocation is diversified across asset classes, but not necessarily diversified across the sources of risk/risk factors.

There are several ways to refine the approach. For instance, a stressed correlation matrix can be used, consisting of estimates of correlations during stressed environments, calculating Modified VaR to address the skew and kurtosis of the likely return distributions and other techniques and risk measure or scenario analysis can supplement the approach, such as expected shortfall (an average of losses in the extreme part of the distribution).

The portfolio optimisation methodology was an MVO, using long-term forward-looking assumptions across asset classes (assumptions are provided in the appendices in this report). The modelling was carried out using internal models built in Microsoft Excel.

### **Value at Risk (VaR) 95%**

The minimum expected loss of the portfolio with 95% level of confidence. The calculation method we used is the variance-covariance method, which is a parametric calculation that assumes normal return distribution.

$$VaR_p = \mu + z_p \sigma$$

Where:  $\mu$  is the expected asset return,  $z_p$  is the distance between  $\mu$  and the  $VaR_p$  in number of standard deviations. In other terms, number of standard deviations at  $(1-z_p)$  or  $-1.96$  with  $p = 95\%$  probability.  $\sigma$  is the standard deviation.

### **Sharpe Ratio**

Risk-adjusted returns, where the portfolio returns over the risk-free rate (taken as the yield on cash) are risk-adjusted.

$$\text{Sharpe Ratio} = \frac{\text{Portfolio Return} - \text{Risk Free Rate}}{\text{Volatility of Portfolio}}$$

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