

Sustainable management of central banks' foreign exchange (FX) reserves

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Summary

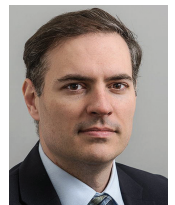
Central banks are playing an increasingly active role in promoting the move towards a sustainable global economy. One key motivation is the need to mobilise funds for the large-scale public sector investment required to reach the goals of the Paris Agreement on climate change. This paper explores the role central banks' foreign exchange (FX) reserves portfolios can play in this context.

Central banks' frameworks for managing FX reserves have traditionally balanced a triad of objectives: liquidity, safety and return. Incorporating sustainability requires expanding this usual triad into a *tetrad*. This can be achieved either explicitly, by introducing new economic uses of reserves, or implicitly, by recognising the ways in which sustainability affects existing policy objectives – or through a combination of both approaches. Pursuing sustainability, however, may give rise to trade-offs over and above the usual tensions between liquidity and safety and return.

This paper explores sustainability-enhanced reserve management in the context of these trade-offs and outlines 12 different channels (classified into four different types) that reserve managers can use to 'green' their operations. Each of these channels comes with its own advantages and limitations, so – given the constraints faced at the individual reserve manager's level – choosing the right channels is key.



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This paper is part of a toolbox designed to support central bankers and financial supervisors in calibrating monetary, prudential and other instruments in accordance with sustainability goals, as they address the ramifications of climate change and other environmental challenges. The papers have been written and peer-reviewed by leading experts from academia, think tanks and central banks and are based on cutting-edge research, drawing from best practice in central banking and supervision.



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1. Introduction

Sustainability has become an increasingly relevant consideration for central banks, and foreign exchange reserve managers ('reserve managers') are not exempt from this trend.¹ Broadly speaking, the interest in sustainability reflects at least two perspectives: 'risk', whereby sustainability-related risks may call into question a central bank's ability to achieve its objectives; and 'impact', which relates to the intentional design of central banks' activities to help promote the transition to a more sustainable world. The motivation for incorporating sustainability considerations into reserve management practices may reflect either of these angles or a combination of them. Indeed, it is possible that there may be significant overlap between measures taken under each of these perspectives. But fundamentally, the perspective favoured by a given institution will depend on, and be constrained by, that institution's mandate.

Institutions may view sustainability from different perspectives or focus on certain aspects of it (as they relate to any of the 17 UN Sustainable Development Goals, for example), so this paper allows for a broad interpretation of sustainability. We use related terminology, such as Environmental, Social and Governance (ESG), Socially Responsible Investing (SRI) and Responsible Investment (RI) when a given context requires it, and, for the purposes of this paper, consider these terms synonymous with sustainability. However, central banks are likely to be more targeted in their emphasis, with many choosing to focus specifically on environmental considerations and, in particular, those related to climate change. Managers of central bank assets may have particular reason for such an emphasis, given that the physical and transition risks stemming from climate change can alter the expected risk and return properties of their portfolios, including any reputational risks arising in this context.²

Traditionally, reserve managers – who are collectively responsible for around US\$13 trillion in assets (as of the end of 2021)³ – have managed their portfolios with the objectives of liquidity, safety and return, with the first two holding the highest priority. As physical risks from climate change, such as adverse weather patterns affecting the economic prospects of certain economies, have the power to alter the outlook for asset prices, climate-related risks may also be considered relevant, at least indirectly. Meanwhile, transition risks from climate change, namely resource reallocations away from sectors with higher carbon emissions or intensities to those with lower ones,⁴ can affect the expected relative prices of associated financial assets.

Managing these risks would be consistent with managing central bank assets with the standard safety and, possibly, return objectives in mind. Whether to create broader impact in the sustainable transition, however, may raise questions as to whether it is within the reserve manager's mandate. But regardless of which perspective (risk or impact) is emphasised, central banks are well positioned to lead by example. They can, for instance, integrate sustainability considerations into their own activities, support the development of market standards (e.g. through the development of taxonomies) and conduct their own disclosures.

This paper is organised as follows. Section 2 reviews the traditional approach to foreign exchange reserve management. Section 3 discusses the sustainability-enhanced approach, including how sustainability can be explicitly or implicitly integrated into reserve management. It also discusses the various channels through which sustainability can be integrated and the limitations of the various approaches. Section 4 explores the central bank experience to date, including examples of sustainability-enhanced approaches. Section 5 summarises and outlines the way forward.

“Managers of central bank assets may emphasise the environmental aspect of sustainability, given that the physical and transition risks stemming from climate change can alter the expected risk and return properties of their portfolios.”

¹In this paper, we focus solely on the management of foreign exchange reserves that are primarily held for policy purposes. We explicitly avoid a focus on 'own funds' portfolios, which may have a greater emphasis on return. For further discussion on this, see Hysrke et al. (2022).

²Carney (2015) defines physical risks as 'the impacts today on insurance liabilities and the value of financial assets that arise from climate- and weather-related events, such as floods and storms that damage property or disrupt trade' and transition risks as 'the financial risks which could result from the process of adjustment towards a lower-carbon economy.'

³According to data from the IMF's Currency Composition of Official Foreign Exchange Reserves (COFER).

⁴The Intergovernmental Panel on Climate Change (IPCC) defines carbon intensity as 'the amount of emissions of carbon dioxide (CO₂) released per unit of another variable such as gross domestic product, output energy use or transport' (IPCC, 2022).

2. Conventional reserve management

Central banks' balance sheets can be expressed in terms of a variety of asset portfolios, with each of these serving a distinct purpose. In general, three types of portfolios can be distinguished: policy portfolios, own funds portfolios and pension fund portfolios (see Figure 1). Of these, policy portfolios make up the largest share of overall central bank holdings (see e.g. Markets Committee, 2019). Given the overall size of central bank balance sheets and the resources required to reach the goals of the Paris Agreement on climate change (an estimated US\$3.3 trillion annually until 2030 is needed to achieve net zero by 2050 [Georgieva, 2022]), it could be argued that some of these funds could be used for sustainable investment purposes.

“Not all central bank portfolios are easily channelled towards greening the financial system.”

Figure 1. Representation of a central bank's balance sheet

	Assets	Liabilities and Equity
Policy portfolios	FX Reserves	Liabilities
	Asset Purchase Programmes	
	Other Monetary Policy Portfolios	
	Pension Fund	Equity
	Own Funds	

Note: Boxes are not intended to represent the size or relative proportions of balance sheets.

Source: Authors.

However, depending on their stated objectives, not all central bank portfolios are easily channelled towards greening the financial system. The debate on monetary policy portfolios, for example, continues to develop (see e.g. Boneva et al., 2021), while some central banks have already started to integrate sustainability considerations into the management of FX reserves (see Fender et al., 2019). Before addressing this issue in more detail, we will first look at what reserve management is and how it has conventionally been conducted.

Reserve management is a process that ensures that adequate official public sector foreign assets are readily available to, and controlled by, the authorities for meeting a defined range of objectives at the country or currency union level (Borio et al., 2008; IMF, 2013). This ready availability is also known as *liquidity* and, along with *safety* and *return*, is part of what is generally called the 'triad' of conventional reserve management objectives. In their daily operations, reserve managers strive to maintain a portfolio characterised, to different degrees, by all three of these objectives.

Here is an example to illustrate. The staff of a central bank are exploring the appropriateness of including US corporate bonds in the investment universe of FX reserves.⁵ In doing so, they ask themselves, and subsequently their governing board,⁶ the following questions:

⁵This investment universe has traditionally included: developed market government bonds; supranational and agency bonds; money market instruments; and gold. Some central banks also hold so-called 'less traditional' instruments such as corporate bonds, equities, real estate and commodities other than gold. See a rich set of examples in BIS (2019a).

⁶The internal governance arrangements of central banks tend to dictate a sequential decision-making process. For a detailed explanation, see Klingebiel et al. (2021).

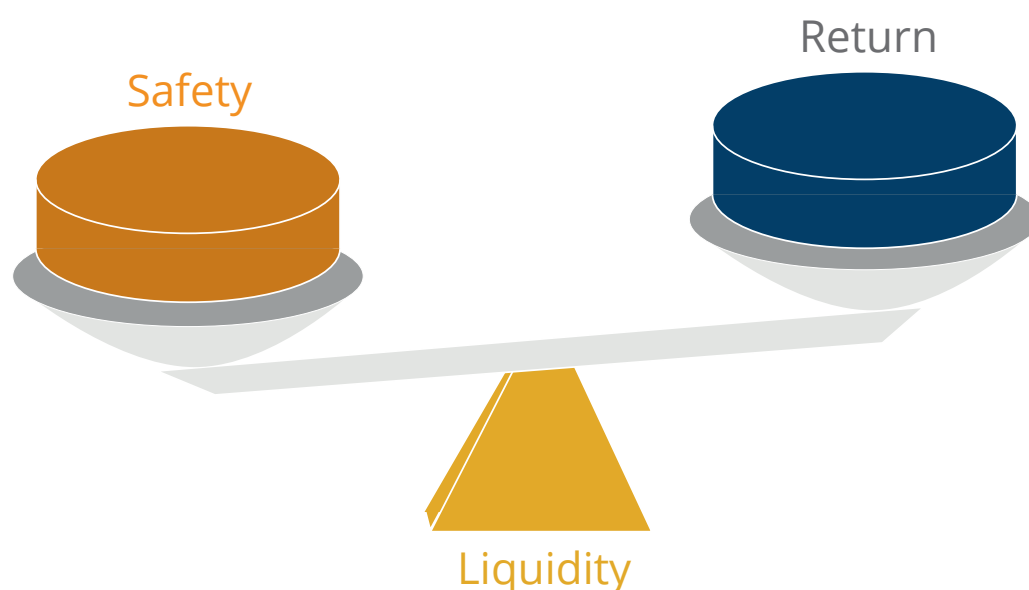
- a) How easy would it be to trade and/or liquidate these instruments in times of stress?
- b) Do they bear any new (or higher) risks compared with other eligible securities?
- c) Is their yield expected to provide the portfolio with higher income?

Because the need for reserves may arise suddenly, liquidity is often the primary consideration. Question (a) captures this need. Yet, the staff may find that, at least by some metrics (e.g. market size and trading volume), debt issued by corporations is less liquid than US Treasury bills and notes (see US Department of the Treasury, n.d.). Furthermore, without guarantee from any government on coupon and principal payments, resulting exposures would be flagged as bearing default risk, which may not yet be present in the FX reserve portfolio. For this reason, in terms of safety – with reference to question (b) – holding sizeable amounts of these assets could be ill-advised, and may give rise to portfolio limits. Nonetheless, in answering question (c), the staff may find that higher risk-adjusted returns from corporate bonds could prove attractive over the chosen projection horizon. This is why many reserve managers have added eligible asset classes over the past couple of years, against a backdrop of compressed or even negative yield levels on more traditional reserve assets (see e.g. OMFIF, 2021; Mendez-Barreira, 2022).

In the above example, the reserve manager runs into a potential trade-off between liquidity and safety against return. This may mean giving up part of the share invested in US Treasuries to make room for corporate bonds. The question is: by how much? In practice, liquidity is rarely compromised – especially when overall reserve size is not considered abundant.⁷ Often, liquidity requirements are satisfied before a balance between safety and return is attempted. As such, the process by which reserve managers meet the triad of objectives can be illustrated with Figure 2. On the weighing scale, liquidity is an axis over which safety and return are traded off against each other. The weight of safety relative to return on the scale – a metaphor of their relative importance – is something that varies over time.

“Liquidity, safety and return are generally called the ‘triad’ of conventional reserve management objectives.”

Figure 2. Balancing the triad of reserve management objectives



Source: Authors.

⁷Abundance relates to the concept of reserve adequacy, as measured by metrics such as the IMF's so-called 'ARA' measure; see, e.g. IMF (2015).

Table 1. Possible tranches of a model reserve portfolio

	Description	Importance of objective		
		Liquidity	Safety	Return
Working capital tranche	Used to fulfil short-term payment obligations (daily to monthly).	High	High	Low
Liquidity tranche	Designed to fulfil short-term obligations. If present, used to fund the working capital tranche.	High	High	Low
Investment tranche	Used to achieve longer-term financial needs. Only drawn from if liquidity tranche is exhausted.	Low to Medium	Medium	Medium

Source: Authors.

The strategic asset allocation frameworks of reserve managers capture this trade-off (see e.g. Cardon and Coche, 2004). We observe that, when allocating assets, liquidity requirements commonly materialise as one or two dedicated sub-portfolios or 'tranches' within the FX reserves (Ito and McCauley, 2019). Table 1 builds on this concept. It shows the three tranches that an FX reserve portfolio tends to be split into: two parts to serve liquidity requirements (the working capital and liquidity tranches) and one to prioritise return generation (the investment tranche).

'Tranching' can be thought of as happening sequentially. First, reserve managers determine expected liquidity requirements over the short and medium term, typically in nominal terms. They then set aside two separate amounts: one for the working capital tranche and another for the liquidity tranche. These are put, respectively, into the investments of maturities that are consistent with the horizon over which potential reserve needs are evaluated.⁸ Next, the remainder of the portfolio is invested with longer-term objectives in mind. This opens the door to riskier investment opportunities, which may include non-reserve currency bonds, spread products and equities. But given that the investment tranche still serves the fundamental policy purpose, such as replenishing the liquidity tranche when necessary, these are still managed by keeping the safety objective in mind.⁹

The presence (and number) of tranches varies from one reserve manager to another.¹⁰ Nonetheless, it is safe to assume that the triad of objectives permeates through this and other parts of the asset selection and allocation processes. This includes, for example, the restrictions that are applied to any portfolio optimisation exercise.

Ultimately, the importance of each of these objectives for public investors is a function of their economic uses of reserves (e.g. Borio et al., 2008). Of course, the trade-offs between the various objectives are not equally weighted, and the economic uses of reserves are not mutually exclusive. Therefore, central banks will look across several objectives, as specified in their mandates, to set liquidity, safety and return requirements accordingly.

3. Sustainability-enhanced reserve management

Given the importance of liquidity, safety and return to FX reserve portfolios, is there space to introduce sustainability? Reserve managers seem to think that there is, at least in principle. A survey of central bank reserve managers by Fender et al. (2020) found

"68% of central bank reserve managers agree that sustainability could be included as a fourth objective (Fender et al., 2020)."

⁸If the reserve portfolio is the sum of three tranches, $x_1, x_2, x_3 \geq 0$, then reserve managers first determine $x_1 > 0$ as well as $x_2 > 0$ based on their liquidity needs, and the remainder of the portfolio $x_3 = (1 - x_1 - x_2)$ is invested with longer-term objectives in mind. As such, $x_1 + x_2 + x_3 = 100\%$.

⁹See Fender et al. (2020) for an explanation of the two most commonly applied hierarchical approaches to reserve management.

¹⁰Tranching tends to be more common for assets from economies or governments that are more frequently in need of deployment (e.g. emerging markets).

that two-thirds (68%) of respondents agreed that sustainability could be included as a fourth reserve management objective. Another survey of central bank reserve managers found that over 50% reported that sustainability is 'somewhat' or 'highly' relevant for their asset allocation (Bank of International Settlements [BIS], 2021).

There are two key ways in which central banks can integrate sustainability objectives:

- **Explicit integration.** This entails setting out new economic uses for foreign reserves; for example, *explicitly* stating that one of the objectives of the FX reserves is to strengthen the country's attainment of the UN's Sustainable Development Goals (SDGs) or to promote the transition to a net zero economy. In practice, most central bank mandates do not explicitly reference sustainability (Dikau and Volz, 2019). For explicit integration to happen, governments and central banks must work towards changing key governance documents to legally enable them to target sustainability. This method is more associated with the impact angle, and involves a partial rethinking of the purposes of holding FX reserves.
- **Implicit integration.** This involves recognising the *implicit* ways in which sustainability (or the absence of it) affects current policy objectives. For example, central banks who use FX reserves to underpin investor confidence in their country may find the need to tilt their portfolios towards assets deemed less exposed to long-term losses arising from physical or transition risks. This method is about discovering how environmental (and perhaps also social and governance) headwinds may affect the traditional purposes of holding FX reserves. It may be associated with both the risk and impact angles.¹¹

Irrespective of the chosen approach, introducing sustainability into reserve management implies additional trade-offs. By revisiting the US corporate bond example from Section 2 we can see how the set of questions raised by central bank staff might be expanded. In addition to questions (a), (b) and (c) above:

- d) How do the ESG ratings of the firms to be included compare with those of the issuers already in the portfolio?
- e) How will the carbon footprint of the portfolio change with this new asset class?

Question (d) reflects the fact that investing in companies that rank lower in ESG terms will tend to expose reserve portfolios to additional risks.¹² A potential consequence could be to avoid certain investments, such as in bonds issued by firms involved in the extraction of fossil fuels. However, if these firms carried a lower default risk than those from technology companies, for example, their exclusion could lower the safety of the portfolio, leading to an opportunity cost.¹³ Question (e) addresses a closely related issue: reserve managers may want to underweight companies that are involved in the exploitation of the world's oil, gas and coal reserves, because these activities are tightly linked to the generation of greenhouse gas emissions. If it is believed that exposure to possible stranded assets compromises the long-term preservation of capital, it would become standard practice to lower or avoid exposures to climate-related risk. In turn, this could mean sacrificing any carbon risk premia (Duan et al., 2021; Xia and Zulaica, 2022) embedded in those assets – a trade-off between sustainability and return.

This example illustrates a few of the many channels that reserve managers have at their disposal for 'greening' their operations. Table 2 offers a non-exhaustive review of these channels, including examples of practical applications. It serves as a starting point for those who are considering adding sustainability as a fourth reserve management objective; note that these do not all need to be combined in practice.

“Investing in companies that rank lower in ESG terms will tend to expose reserve portfolios to additional risks.”

¹¹This path can be followed by reserve managers whose statutory frameworks are less flexible, however it does not exclude explicit integration as a method.

¹²An example of non-financial risks stemming from this are those of reputational nature. Climate groups have protested against government institutions such as central banks, as reported by Caswell (2021). Indeed, reputational risks have been shown to matter for central banks in their pursuit of sustainability objectives (see Fender et al. [2021], section 4).

¹³The probability of default is not directly observable, but it may be inferred from market prices or metrics such as credit ratings. In turn, reliance on the latter can bias the investment process if climate risk were to be underrepresented in these ratings. For a discussion on ESG risk underpricing and ratings, see Semet et al. (2021).

Table 2. Channels for integrating sustainability into reserve management and their practical application

Channel	Examples of application	Limitations
Investing in sustainability-oriented markets		
1. Investing in instruments issued for sustainable purposes	<ul style="list-style-type: none"> Purchasing green, social, sustainable and/or sustainability-linked bonds. 	<ul style="list-style-type: none"> No impact on other assets held in the portfolio. Potential lack of transparency on impact (e.g. for green bonds without impact reporting).
2. Investing in funds with sustainable objectives	<ul style="list-style-type: none"> Purchasing funds or benchmarks with explicit sustainable targets. Onboarding externally managed mandates with tailored sustainable objectives. 	<ul style="list-style-type: none"> No impact on other assets held in the portfolio. Benchmarks and funds can vary in their degree of effectiveness.
Integrating sustainability criteria		
3. Performing negative screening	<ul style="list-style-type: none"> Excluding companies that do not fit specific principles (e.g. ethical) from the investment universe. Excluding companies with an ESG score below a specified threshold. 	<ul style="list-style-type: none"> No impact on composition of non-excluded firms. May be difficult to implement outside equities and corporates.
4. Using ESG metrics for investment decision-making	<ul style="list-style-type: none"> Prioritising instruments issued by companies with higher E, S and/or G ratings. Introducing ESG ratings as a criterion for performing security selection. 	<ul style="list-style-type: none"> ESG ratings can vary dramatically across providers, given differences in materiality assumptions, etc. More easily applied to equities and corporates.
Climate and environmental risk management		
5. Introducing notions of climate risk in the central bank's investment beliefs	<ul style="list-style-type: none"> Adjusting internal documentation to reflect the latest empirical evidence on risk premia (e.g. carbon risk). 	<ul style="list-style-type: none"> Needs to be applied with other channels to have impact.
6. Quantifying the environmental impact of the portfolio	<ul style="list-style-type: none"> Estimating the carbon footprint and/or intensity of overall reserve assets. Measuring and projecting the temperature alignment of investments. 	<ul style="list-style-type: none"> Requires technical decisions that may underestimate the impact, such as the emissions scope captured. Many metrics are not forward-looking. Only impactful if it affects decision-making.
7. Adjusting portfolio composition based on climate data	<ul style="list-style-type: none"> Exclusions (norm-based and sector-based). Sustainable growth investing (e.g. in low-carbon or climate-resilient private equity investments). 	<ul style="list-style-type: none"> 'Sustainable Growth' portfolio with more advanced SRI policies than overall portfolio.
8. Adopting asset and risk management tools that integrate environmental risks	<ul style="list-style-type: none"> Conducting climate scenario analysis or stress tests for the central bank's assets. Integrating physical and transition risks into the enterprise risk management framework. 	<ul style="list-style-type: none"> Heavy resources needed to support modelling. Results subject to many layers of uncertainty. May require analysis of the most likely climate outcomes and tolerance for climate risk.
9. Setting climate or other sustainability-related targets	<ul style="list-style-type: none"> Adjusting the portfolio composition over time such that the implied temperature path is consistent with the Paris Agreement. 	<ul style="list-style-type: none"> May only be practical for certain types of assets, such as equities and corporate bonds. All metrics have trade-offs, and targets on multiple metrics may lead to incoherence.
External engagement and disclosure		
10. Operating in a sustainability-aware network	<ul style="list-style-type: none"> Dealing with counterparties that commit to Sustainable Development Goals. Avoiding external managers that are not visible signatories of any sustainability commitments. 	<ul style="list-style-type: none"> Only relevant to externally managed portfolios. Some asset managers may be limited in their ability to integrate sustainability considerations into their portfolio management practices.
11. Active ownership	<ul style="list-style-type: none"> Seeking to actively influence corporate behaviour to ensure the invested companies are managed in a sustainable way. 	<ul style="list-style-type: none"> Only equity holders, who are part-owners of a corporation, can attend shareholder meetings.
12. Enhancing transparency (leading by example)	<ul style="list-style-type: none"> Adopting TCFD financial disclosure standards. Disclosing sustainable investment practices to the public. 	<ul style="list-style-type: none"> Needs to be applied with other channels to have impact.

Source: Authors.

A key takeaway from the list of channels is that, in the context of reserve management and investment management more broadly, sustainability is a multifaceted phenomenon. Pursuing sustainability objectives involves identifying new risks, revamping monitoring processes, updating investment guidelines, reviewing contracts, and more. And the implications could be far-reaching. As mentioned, reserve managers are responsible for assets worth a total of over US\$13 trillion and therefore have the potential to influence the setting of standards in their respective markets. In this way, if only some of the measures described in Table 2 were to become part of a broader trend – for instance, prioritising instruments issued by companies with higher ESG ratings – the impact on market prices could well be notable. Indeed, recent empirical evidence suggests that ESG markets have started to influence the allocation of economic resources by changing firms' funding costs (Scatigna et al., 2021).

It is important to recognise that there are limitations and constraints to this approach. One key question, which remains open, involves the extent to which sustainability needs to (or can) be traded off for liquidity, safety and return. A case in point is green bonds, which have so far been shown to have similar safety and return (at least at the benchmark index level), but inferior liquidity relative to other fixed income assets that have traditionally been part of foreign reserve portfolios (Fender et al., 2020). This suggests some scope for green bonds in reserve managers' investment tranches, while allocations in working capital and liquidity tranches will be more constrained, at least until the market has developed further.

A related constraint is investment horizons. While the achievement of global net zero emissions is a medium-term objective, reserve managers tend to operate on the basis of relatively short investment horizons, which will limit their ability to pursue sustainability objectives. This too is intrinsically tied to the sizes of liquidity and working capital tranches.¹⁴ Finally, the longer maturities and varying credit ratings of labelled bond instruments in particular may not match their guidelines, and availability of bonds in eligible currencies may be restricted. This means that choosing the right channels for integration, given the constraints faced at the individual reserve manager's level, is key.

Given that reserve managers – who tend to be associated with central banks and other policymaking institutions – have the power to lead by example, facing these limitations head-on is essential. In this sense, reserve management may be one of the building blocks towards greening the financial system, one portfolio at a time.¹⁵

4. Lessons learned to date

Progress in sustainable reserve management is underway, although there is still some way to go. A survey conducted in 2020 found that between 20% and 50% of central banks (depending on the region) had taken one or more of the measures listed in Table 2 to integrate sustainability in their reserve management practices (BIS, 2021). Other similar surveys reveal broadly consistent results: 26% of respondents to the World Bank's 2021 survey of central bank reserve managers reported having incorporated ESG factors into their investment activities (World Bank, 2021). A more recent survey found that a similar proportion (28%) practised ESG integration and/or negative screening (OMFIF, 2021). Recent public announcements from across the central bank community suggest that the share of central banks incorporating sustainability has grown further since then.

In addition, the number of central banks indicating that they had adopted SRI practices in their policy portfolios increased from 46% to 62% between 2019 and 2020 (NGFS, 2020). This compares with only 11% of reserve managers reporting that they had incorporated ESG factors into their investment framework in an earlier World Bank survey conducted in 2018.

“Pursuing sustainability objectives involves identifying new risks, revamping monitoring processes, updating investment guidelines, reviewing contracts, and more.”

¹⁴According to the World Bank (2021), the most likely investment horizon for the total portfolio of a reserve manager is 12 months, followed by between 12 and 36 months.

¹⁵See, for example, BIS (2019b), which highlights the promotion of green finance through sizeable climate-friendly investments and support for the adoption of best market practices to deepen the green bond market as key objectives for green bond investments by the reserve management community.

A natural first step for integrating sustainability into reserve management seems to be investments in labelled instruments, such as green bonds, which allow reserve managers to familiarise themselves with the relevant standards and market practices. Indeed, Fender et al. (2020) show that investing in instruments issued for sustainable purposes has attracted the most interest (over 70% of respondents), while the use of ESG metrics and defining sustainability-related investment beliefs drew the attention of a lower, but still notable, number of respondents (about 50%). By contrast, channels indicative of more sophisticated policy approaches, such as measuring the carbon footprint of portfolio holdings, have started to gain traction only very recently (although this may be more common in other portfolios, such as own funds or pension funds).¹⁶

“Progress in sustainable reserve management is underway, although there is still some way to go.”

Table 3 shows some of the specific steps disclosed by a non-exhaustive set of central banks, categorised by the channels outlined in Table 2. Survey evidence suggests that a far broader set of central banks has integrated one or more channel(s), but may not yet have disclosed the details publicly. For example, the NGFS’s Glasgow Declaration reflects the willingness of members to further their efforts. Additionally, some central banks published individual statements making reference to reserve management-related activities (see, e.g. statements by the Central Bank of Iceland [2021] and the National Bank of the Republic of North Macedonia [2021]).

¹⁶See, for example, the European Central Bank (2021). For a discussion on central banks’ pension and own funds portfolios, see Hyrske and Kyriakopoulou (2022).

Table 3. Selected examples of actions taken across channels

Central bank	Channels*	Notable actions
Bank of England**	6, 8, 12	<ul style="list-style-type: none"> • Measurement and disclosure of key carbon metrics and climate-related risks of carbon footprint of sovereign asset holdings, including the Bank’s own foreign currency holdings, as well as a comprehensive assessment of risks which include its carbon footprint, exposure to transitions risks via the estimated emissions paths, and exposure to physical risks. • The above is detailed in a comprehensive climate-related annual financial disclosure.
Central Bank of Brazil	1, 10, 12	<ul style="list-style-type: none"> • Inclusion of sustainability criteria for counterparty selection expected by December 2021. • Invests in green bonds. • Detailed approach to sustainability in its first report on ESG- and climate-related risks and opportunities in September 2021.
Hong Kong Monetary Authority	1, 2, 4, 5, 10, 11, 12	<ul style="list-style-type: none"> • Early investor in green, social and sustainability bonds (since 2015). • Invests in funds with sustainable objectives which use sustainability-oriented benchmarks, as well as private market investments with a sustainability focus. • Uses ESG metrics for investment decision-making. • Integrates climate risk into investment beliefs. • Incorporates ESG factors in the manager selection process. • Detailed disclosure of sustainable investment practices, and an explicit supporter of the TCFD.
Monetary Authority of Singapore	1, 2, 12	<ul style="list-style-type: none"> • Established a green investment programme for investments with a strong green focus. • Included is the placement of funds with external managers with commitments to deepening their green investment capabilities and investments in green bonds.
Reserve Bank of New Zealand	1, 6, 12	<ul style="list-style-type: none"> • Measurement and disclosure of the carbon footprint of sovereign bond holdings, including its foreign reserves. • Invested in green bonds. • Dedicated climate section in Annual Report.
Riksbank	6, 7, 12	<ul style="list-style-type: none"> • Consideration given to carbon emissions when determining the composition of foreign reserves, which has resulted in some assets being sold. • No particular consideration given to whether an asset is classified as green.
Swiss National Bank	3, 12	<ul style="list-style-type: none"> • Excludes companies involved in the mining of coal or the manufacturing of condemned weapons. • Clear disclosure of exclusion policy and public explanation that the central bank does not pursue broader sustainability policies in its investment activities, given the wishes of the constitutional and legislative authorities to keep its mandate focused.

Note: The measures listed are taken from central banks’ public disclosures and may not be comprehensive.

Source: Central bank websites.

*Refers to the channels outlined in Table 2.

** In reference to the Bank of England’s own foreign currency holdings, and not those managed on behalf of the UK Government.

While practices are still evolving, the dramatic growth and increasing breadth of sustainability considerations being applied allows us to note some lessons learned at this relatively early stage. These lessons can be categorised as either specific to reserve management or relevant to central banks' sustainability efforts more generally, as described below.

Lessons specific to reserve management:

- **The trade-offs are real.** Trade-offs between the traditional triad (safety, liquidity and return) and sustainability are not only theoretical but have practical implications. For example, central banks desiring to purchase large quantities of green bonds may end up lengthening portfolio duration and reducing the market liquidity of their fixed income portfolios, given the assets available in the market. The trade-offs may be even more evident when seeking to apply sustainability more comprehensively across reserve portfolios.
- **Reserve composition matters.** Many reserve managers have a very limited universe of assets eligible for investment and hold a large proportion of their reserves in sovereign securities. Furthermore, their currency compositions tend to reflect the policy purpose of the reserves and are constrained by other factors, such as numeraire choice. As a result, central banks seeking to alter their currency compositions based on sovereign ESG ratings risk holding insufficient levels of key reserve currencies and undesirable levels of alternative currencies, when examined from the traditional liquidity/safety/return perspective.
- **Reserve size matters.** Central banks with larger investment tranches and, therefore, larger 'excess' reserves tend to have more diversified portfolios, including assets classes to which sustainability considerations are more easily applied, such as corporate bonds and equities. Conversely, reserve managers that are more constrained in terms of their reserve adequacy are more likely to face the compositional constraints discussed above. The ease with which sustainability considerations can be integrated may therefore effectively be a function of overall reserve size relative to conventional adequacy metrics. That said, large reserve holders may be unable to target sizeable allocations to sustainability-related instruments (such as green bonds) as a percentage of their overall portfolio, given the relatively low level of supply of such instruments available to date.

"The dramatic growth and increasing breadth of sustainability considerations being applied allows us to note some lessons learned at this relatively early stage."

Realistically, central banks are unlikely to risk undermining the fundamental policy purposes for which FX reserves are held. This limits the degree to which reserve managers can emphasise sustainability, particularly those with simpler investment universes and relatively lower levels of reserve adequacy. It also helps explain why less invasive measures, such as buying green bonds in modest sizes, have caught on most quickly.

Lessons of a more general nature – but still relevant to reserve managers – include:

- **Mandates can be constraining.** Central banks must stay true to their mandates to maintain their institutional credibility and guard against threats to their independence. As noted earlier, motivations for incorporating sustainability into a certain activity can reflect both the risk and impact angles. Many central banks will be able to easily justify the risk angle, but mandates enabling the *promotion* of policies that have traditionally fallen outside the central bank's purview are likely to be much less common (see e.g. Fender et al., 2020).
- **Resources are likely to be limited.** Central bank staff are likely to hold skill sets more geared towards economics and finance than climate and sustainability. Implementing sustainability-enhanced approaches may require the use of

consultants, additional staff with the relevant expertise, time to train existing staff, and the procurement of carbon and/or ESG data. This can slow progress towards sustainability targets and may involve budget trade-offs with other activity areas, especially for smaller central banks.

- **Financial stability risks may arise.** One source of such risks are 'cliff-edge effects'¹⁷ in market prices and abrupt sector reallocations, particularly if the transition is 'disorderly' or 'too little too late' (as defined in NGFS, 2021). Furthermore, the dramatic recent growth in sustainability-oriented assets, including green bonds and funds attached to ESG- or SRI-related mandates, raises a different sort of risk. Imbalances could appear in such products if valuations become overstretched. This could present financial risks to central bank portfolios that hold these assets, including reserves portfolios, and highlights the importance of promoting standards and transparency (see BIS, 2021). Given the possibility of broader, system-level effects, managing this tension will be particularly important for central banks with an explicit financial stability mandate.
- **Additional compliance demands.** These can be raised as a result of the practice of greenwashing or 'ESG-washing' (which refers to misleading attributions of the ESG designation). Concerns around ESG-washing are stoked by the absence of universal taxonomies and standardised, mandatory disclosures, which may require reserve managers and other investors to take measures to protect themselves against related risks (see e.g. Schmittmann, 2021 and Vieira de Freitas Netto et al., 2020). In this context, understanding the impact of sustainability-related measures becomes a key goal, with practices such as impact reporting on green bond holdings serving important monitoring purposes. Central bank efforts to support the development of green finance markets can in turn help to counteract greenwashing and similar practices, particularly when it comes to disclosure standards and the development of taxonomies.

Central banks often look to what peers are doing when enhancing their various activities. Efforts to foster common awareness of the issues outlined above – such as those undertaken by the NGFS and international organisations like the Bank for International Settlements, International Monetary Fund, World Bank and Organisation for Economic Co-operation and Development – can therefore help to promote a virtuous cycle of learning and further integration.

5. The way forward

"In every wood in every spring there is a different green." This line from Tolkien's *Lord of the Rings* carries a relevant message for the reserve management community. First, environmental sustainability is an important policy goal, and it is clear from this paper (and the wider series of INSPIRE central banking toolbox papers)¹⁸ that central banks have a key role to play. While a future of greater central bank involvement in sustainability lies ahead, this process has only just begun. And, second, there is no single 'one-size-fits-all' path applicable to all (given the differences in central bank mandates, available resources and the size of reserve portfolios). However, the following three broad observations can guide the way forward for the reserve management community.

- i. **Reserve portfolios should not be seen in isolation.** Central banks' responses to environmental challenges will always begin with their mandates. It is those mandates that will guide any decision in terms of explicit or implicit integration, and the overall emphasis to be placed on environmental objectives. Once that decision has been taken, choices will have to be made from the variety of tools (and associated channels of integration, as per Table 2) that central banks have

"The question of coordination between fiscal, monetary and prudential policies is paramount to a successful transition."

¹⁷Cliff-edge or cliff effects refers to a situation where a sudden small change leads to big disruptions.

¹⁸Find the full collection of papers at the Grantham Research Institute on Climate Change and the Environment website: <https://www.lse.ac.uk/granthaminstitute/>

at their disposal. In effect, sustainable reserve management will quite naturally become part of an institution-wide approach that may include measures applied to other central bank portfolios and operational areas.

ii. In making these choices, central banks may want to adopt a 'stepwise' approach. In order to build expertise and to economise on the use of scarce analytical and system resources, it may be easier to start with other portfolios, such as the pension fund (given the broader set of asset classes to choose from), or with particular asset classes (e.g. green bonds) that may more easily lend themselves to implementation. Building on the associated experience, central banks can then progress into the sustainable management of other asset classes and portfolios, raising their expertise and ambition (e.g. in terms of outright net zero targets) simultaneously along the asset and portfolio spectrum (and across the associated channels).

iii. Central banks are ideally placed to lead by example and help to establish market standards and best practice that can generate positive externalities for the entire finance community. One way is formal standard-setting in areas where central banks have a voice, for example in the context of banking regulation and supervision. A more indirect but perhaps more practical way is through central bank portfolios, with demand by the central bank community helping to shape the behaviour of the issuer community as well as fellow investors, promoting the discovery and use of best practice in sustainability space (e.g. in the context of disclosures and impact reporting [BIS, 2022a]). Coordinated action across the reserve management community (see BIS, 2019b; 2022b) can be particularly powerful in this context, especially in the early stages of market formation. Central banks' usually quite extensive research activities can be a key input in this context, both in terms of the higher level macro-financial considerations (see e.g. Bolton et al., 2020) and in terms of technical solutions (see e.g. Jondeau et al., 2021 on carbon footprint-based investment benchmarks).

After all, Tolkien also wrote: "Warning? Warning against what? Against delay. Against the way that seems easier. Against refusal of the burden that is laid on me."

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