

The Future of Money – *Central Bank Digital Currency*

Te Moni Anamata – *Aparangi ā Te Pūtea Matua*

An issues paper inviting public feedback
before 6 December 2021

ISSUES PAPER

Navigating this issues paper

Sections 1-3 provides background material to the issues discussed in this paper and to enable readers to engage fully with the rest of the paper. It includes descriptions of key terms used in the paper and our thinking on whether a CBDC would support our role as steward of money and cash, particularly in a digital future.

- Introduction
- What is a CBDC
- Motivation and process for considering a CBDC

Sections 4-7 outlines some of the opportunities presented by the CBDC, as well as challenges and risks posed. It then proposes a set of high-level CBDC design principles.

Consultation questions are listed in Section 8.

- Opportunities of a CBDC
- Challenges and risks of a CBDC
- Developing CBDC design principles
- Conclusion and next steps
- Have your say

The Appendices provide additional materials, including a primer on the current state of our payment system, a discussion on the features from different design choices, and the impact of CBDC on our bank balance sheet.

- A primer on the inefficiencies in New Zealand's payment system
- Account-based vs token-based digital money
- Reserve Bank balance sheet
- Wholesale CBDC

September 2021
 futureofmoney@rbnz.govt.nz
 Money and Cash Department – Tari Moni Whai Take

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Executive summary

At the Reserve Bank of New Zealand – Te Pūtea Matua (the Reserve Bank) we characterise our mandates, roles and responsibilities in terms of the Tāne Mahuta narrative (depicted in the following Introduction). In this metaphor, central bank money forms part of te Toto, the sap of the tree representing our financial system (Tāne Mahuta). We have a role in ensuring that te Toto is healthy and resilient, thereby supporting the rest of the Reserve Bank’s strategic roles and mandates as represented by other parts of Tāne and his ecosystem.

As kaitiaki o te toto – the steward of money and cash in New Zealand – we aim to ensure that central bank money contributes to a sound and dynamic monetary and financial system by being:

1. A stable anchor of value and confidence and convertibility in our money.
2. A fair and equal way to pay and save in our modern and inclusive economy.¹

This objective reflects the fact that central bank money (whether in physical or digital form) plays an underpinning role in ensuring that all prices are set in New Zealand dollars and that people can confidently expect to be able to make payments and settle debts in New Zealand dollars now and into the future.

Trends in cash use and innovation in money present an opportunity for the Reserve Bank to consider broadening central bank money to include a widely available digital form, and so continue to meet the needs of New Zealanders. The declining use, acceptance and availability of cash in New Zealand, and emerging innovations in private money, namely stablecoins, make this an opportune time to consider a central bank digital currency (CBDC).

The Reserve Bank’s initial CBDC considerations are focused on the public policy case for, or against, a CBDC that would be available to all individuals, communities and businesses. We refer to this as a ‘general-purpose’ CBDC, which we will shorten to CBDC in this paper.

Following on from *Future of Money – Stewardship* paper, this issues paper sets out the Reserve Bank’s view of the high-level policy opportunities and challenges that a CBDC may confer. In this sense it can be thought of as a discussion on the in-principle case for a CBDC. In practice the exact costs and benefits of a CBDC will depend very much on specific design details that we are not yet at the point of considering. Instead, this paper is intended to explain to the public how we see the abstract advantages and disadvantages, costs and benefits, and risks and opportunities that a CBDC might offer. It is intended as the starting point for a conversation with stakeholders on the potential role of a CBDC for New Zealand.

Developing a CBDC would require long lead times given the inherent complexities, multiple design choices and policy choices to be made. This means we will need to take a multi-stage approach to policy development, with this Issues paper being the first of many should we confirm our position on the case for a CBDC.

The Reserve Bank’s overall belief is that a CBDC would be a useful development for central bank money, because it would both support the value anchor role of central bank money, and support the ability of central bank money to act as a fair and equal way to pay and save.

¹ See *The Future of Money - Stewardship issues paper* (September 2021)

A CBDC directly supports the role of central bank money as a value anchor by:

- Providing individuals and businesses with the option of converting privately issued money into a digital form of central bank money (ensuring the long-term convertibility of private money into central bank money).
- Improving the technological form of central bank money to ensure it remains relevant in a digital future.
- Providing an additional monetary policy tool (by it being either issued to provide monetary stimulus, or interest bearing).

A CBDC both directly and indirectly provides a fair and equal way to pay and save by:

- Directly providing a basic form of paying and saving to all at a low cost, and acting as a gateway to the formal financial sector.
- Supporting wider financial inclusion and wellbeing efforts, including through partnering with government programmes.
- Providing individuals with freedom and autonomy in saving and paying by giving them greater choice, and providing a personal back-up in times of uncertainty.

Finally, a CBDC and its ecosystem (including the distribution model) have the potential to act as a catalyst for innovation and competition in the wider money and payments ecosystem. This could bring improvements to domestic payments' efficiency and resilience, as well as enable New Zealand to take part in global initiatives that use CBDCs to improve cross-border payments.

However, a CBDC is not without challenges:

1. How a CBDC may affect the banking sector requires careful consideration.
2. As with other forms of digital money, a CBDC must be operationally resilient to outages and cyber security risks, maintain data privacy, and it would need to comply with all relevant regulation.
3. Similarly, while a CBDC has the potential to act as a catalyst for innovation and competition in the wider money and payment ecosystem, we will have to consider the potential for it to crowd out innovation.

Given its assessment of policy issues, the Issues paper proposes a set of high-level design principles that would need to be incorporated in a CBDC issued to all. The Reserve Bank invites your feedback on the CBDC policy analysis and design principles.

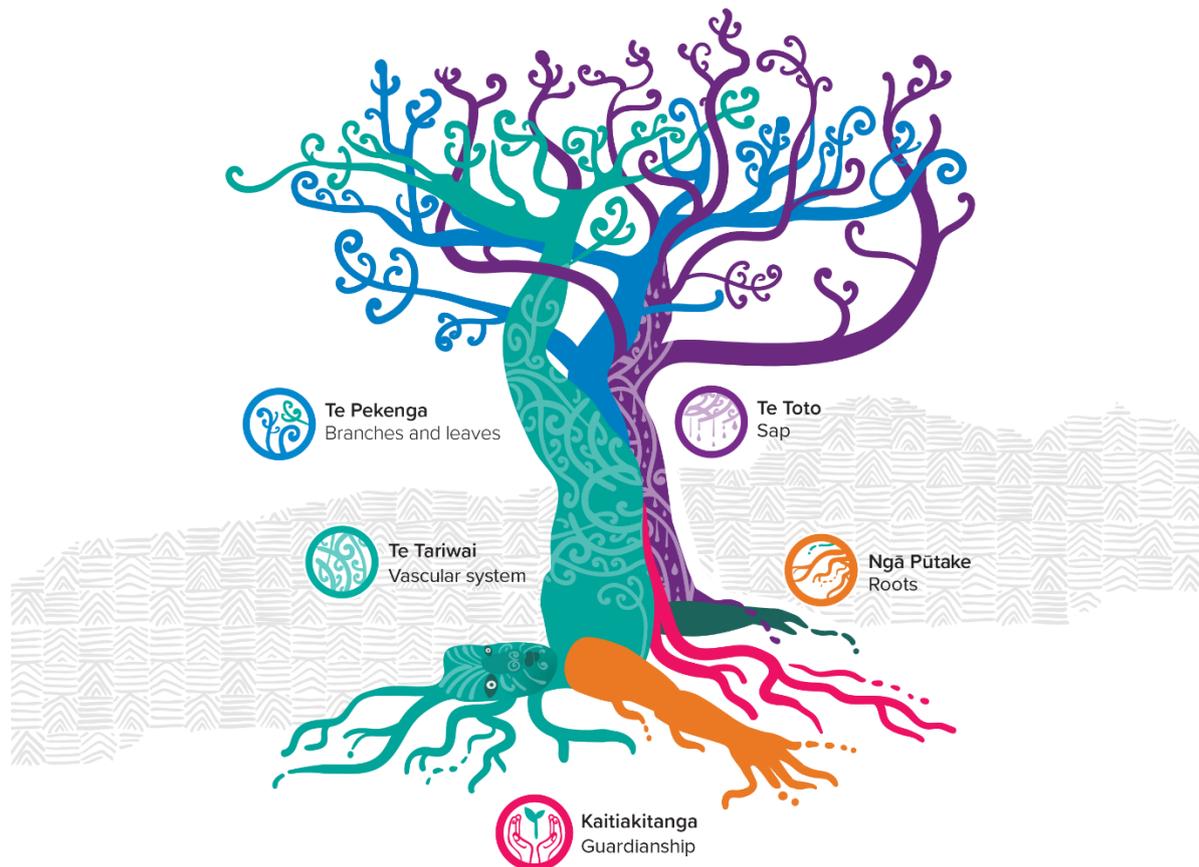
1. Introduction

The vast majority of money and payments in New Zealand are digital. New Zealanders overwhelmingly prefer to pay and save using digital forms of money. At the same time, private innovations in digital money are emerging domestically and globally, and many central banks are actively considering central bank digital currencies (CBDCs) of various forms.

Cash is the main form of central bank money in New Zealand.² In New Zealand, as is the case in many other countries, there is a 'cash paradox' where the amount of cash in circulation continues to grow but it is used proportionately less for transactions by most people (although some people are wholly or largely reliant on cash to transact).³

The importance of cash can be traced back to its role as central bank money that is available to everyone. In fact, central bank money can be considered systemic in all societal domains – it underpins people's financial, economic, environmental, social and cultural wellbeing. The Reserve Bank of New Zealand's (the Reserve Bank's) holistic stewardship of money and cash reflects the underpinning role of central bank money.⁴

Figure 1: The Reserve Bank's strategic elements represented in Tāne Mahuta



² The Reserve Bank also issues digital money to commercial banks in its Exchange Settlement Accounts. See <https://www.rbnz.govt.nz/markets-and-payments/nzclear/the-reserve-bank-in-the-payments-system-its-roles-and-responsibilities>

³ RBNZ (2021a)

⁴ See The Future of Money - Stewardship Issues Paper (September 2021)

The interactions between our new role as steward of money and cash and our purpose to support economic prosperity and wellbeing can be understood using our Tāne Mahuta narrative. The Reserve Bank is the guardian of our financial system, as represented by the total health of Tāne Mahuta. This includes acting as guardian or kaitiaki of its key elements: te Toto (money, cash and our foreign reserves), te Tariwai (payment and settlement systems), te Pekenga (regulated entities) and ngā Pūtake (our legislative mandate). We are kaitiaki o te toto, the lifeblood of Tāne Mahuta, which underpins the Reserve Bank's functions and the financial institutions we regulate.

As steward of money and cash, the Reserve Bank is considering the public policy case for a New Zealand CBDC. That is, a digital representation of New Zealand's central bank money issued to everyone. As a CBDC is still an abstract concept, this Issues paper considers the high-level opportunities for and challenges of a CBDC. It proposes basic CBDC design criteria that reflect our stewardship objectives to guide further work. We are seeking your views on the opportunities and challenges a CBDC may present and whether the design principles adequately capture all considerations.

We are considering a CBDC now because as steward we must be forward looking and prepared for future money and cash needs, and not because we intend to issue a CBDC in the immediate future. Any decision to issue a CBDC will follow a thorough assessment of a policy case that weights all considerations appropriately. We expect that any assessment will require designing CBDC prototypes, experiments and testing, and extensive stakeholder engagement. Further legislative powers may be required.

The rest of the paper is as follows. Section 2 defines CBDC and central bank money. Section 3 describes the motivation and process for considering a CBDC. Section 4 describes the opportunities presented by a CBDC and Section 5 explores the challenges and risks of implementing a CBDC. Section 6 summarises the high-level design principles that would need to be considered in future work on a CBDC. Section 7 concludes and Section 8 asks for your feedback.

Box A: The history of money – private money versus central bank money

Central bank money is government backed and issued by the central bank. To understand the role of central bank money, it is worth exploring how the monetary system came to be what it is today, and the role of the Reserve Bank in providing, stewarding and stabilising money.

Most definitions of money focus on what it does – that it provides a single unit of account in which to set prices, a commonly accepted medium of exchange, and a store of value. However, beyond its practical functions money is a social institution that depends on trust.⁵ As a social institution, money represents the credit an individual enjoys with all of society by virtue of its acceptance as a form of payment for future goods and services. It's also a mechanism for settling obligations or the extension of credit by others.⁶

Over time, various institutions and mechanisms have been used to build trust in money with varying degrees of success. Two mechanisms have proven resilient throughout history: 1) commodity-backed money, where trust is based on underlying assets such as precious metals and 2) 'fiat' money, where trust is based on legal and political institutions

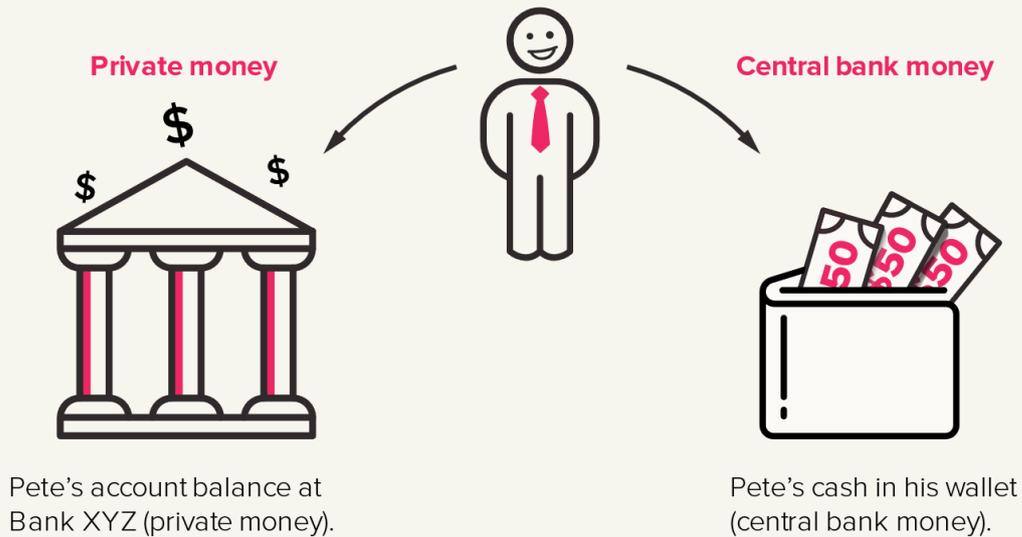
⁵ See Martin (2014) and Gianni (2011) for a detailed analysis of money and its history.

⁶ Carstens, A (2018).

and anti-counterfeiting mechanisms. In New Zealand, all central bank money is fiat money.

Over time, central bank money has proven more robust than commodity-backed money.⁷ However, governments without trustworthy and stable institutions have been unable to maintain stable forms of money and fallen back to commodity-backed money, bartering or taken on the money systems of other (larger) countries.⁸

Figure 1: Pete has private and central bank money



In New Zealand, most transactions are made using privately issued money. However, these forms of money leverage off the stability provided by central bank money to the broader money system. By and large, individuals and businesses have confidence in commercial bank deposits because they can be exchanged for Reserve Bank money in the form of cash. In turn, confidence in Reserve Bank-issued money (cash and wholesale) draws on the fact that it represents a claim on the Reserve Bank, the independence of the Reserve Bank from the New Zealand government (to ensure the government cannot issue money to raise revenue), parliamentary controls (such as on government expenditure) and the ability of the government to raise revenue.

As shown in our Tāne Mahuta narrative, other functions of the Reserve Bank also contribute to the stability of our money: monetary policy ensures that prices are stable; market operations ensure sufficient liquidity and provide a safe and liquid portfolio of foreign currencies to support the New Zealand dollar (NZD); and financial regulation and supervision work to ensure that the financial system, including banks and payments, are sound and efficient.

⁷ In contrast, commodity-backed money has two downsides: it is expensive to produce and generates additional opportunity costs as commodity resources must be acquired, and if the supply of the commodity is not sufficiently flexible to keep up with demand it can result in deflationary pressure.

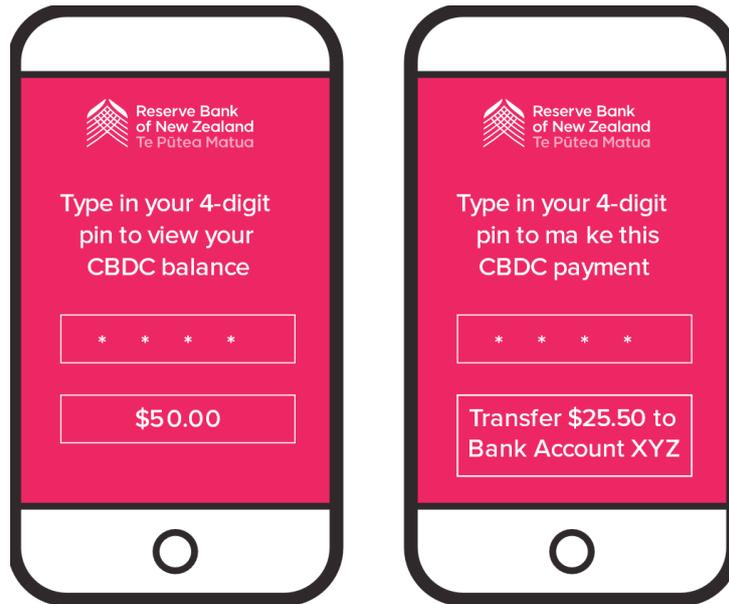
⁸ In early historical examples, trust in money was provided by a common knowledge of each person's creditworthiness among close-knit community members (such as Yap Island). However, these systems can break down as they grow or as the issuers of credit become more removed from the borrowers. Martin, F (2014) and Gianni, C (2011).

2. What is a CBDC?

To understand a CBDC, it is worth first refreshing our understanding of money itself.

Money is defined as a store of value (useful for holding wealth), a unit of account (prices are set in it) and a medium of exchange (useful for payments). Central bank money (introduced in Box A and further explained in Box B) comes in two forms – physical (cash) or digital (held on an electronic ledger). A CBDC can be defined simply as digital money issued by a central bank.

A CBDC is digital money issued by a central bank that represents a legal claim on that central bank.



Like cash, a CBDC represents a legal claim on the central bank, and its ultimate value is based on trust in the government and its institutions. This is what makes a CBDC different from other types of digital money, such as commercial bank transaction accounts (transaction accounts). Transaction accounts represent a claim on the issuing bank and are backed by the capital reserves and prudent operation of the bank to ensure they can fulfil their promise of 1:1 convertibility with cash (Figure 3).

From a user perspective, many forms of digital money are already accessed and used by similar 'payment instruments'. For example, we use cards, mobile applications and online platforms to check balances and spend our digital money.

Most forms of digital money in New Zealand can be exchanged 1:1 with each other.⁹ This 1:1 relationship between different forms of digital money (i.e. between private money issued by different banks, credit unions and non-bank deposit takers) and cash means that most people do not realise there are differences in the forms of digital money that they hold and use.^{10 11} This reflects the fact that we have an effective single unit of account in New Zealand (*the NZD*).

⁹ Transaction accounts have 1:1 convertibility with cash and therefore with each other. Other forms of money, such as private reward schemes, might not make this promise. See Wadsworth (2018a) for more details on different forms of digital money.

¹⁰ In particular, that money issued by private firms or banks is not free from the risk of being lost if those firms or banks fail.

¹¹ Non-bank deposit takers include finance companies that raise funds from the public, as well as most building societies and credit unions. A full definition is provided in the Non-Bank Deposit Takers Act 2013.

Figure 2: Pete would have two options for central bank money if there was a CBDC

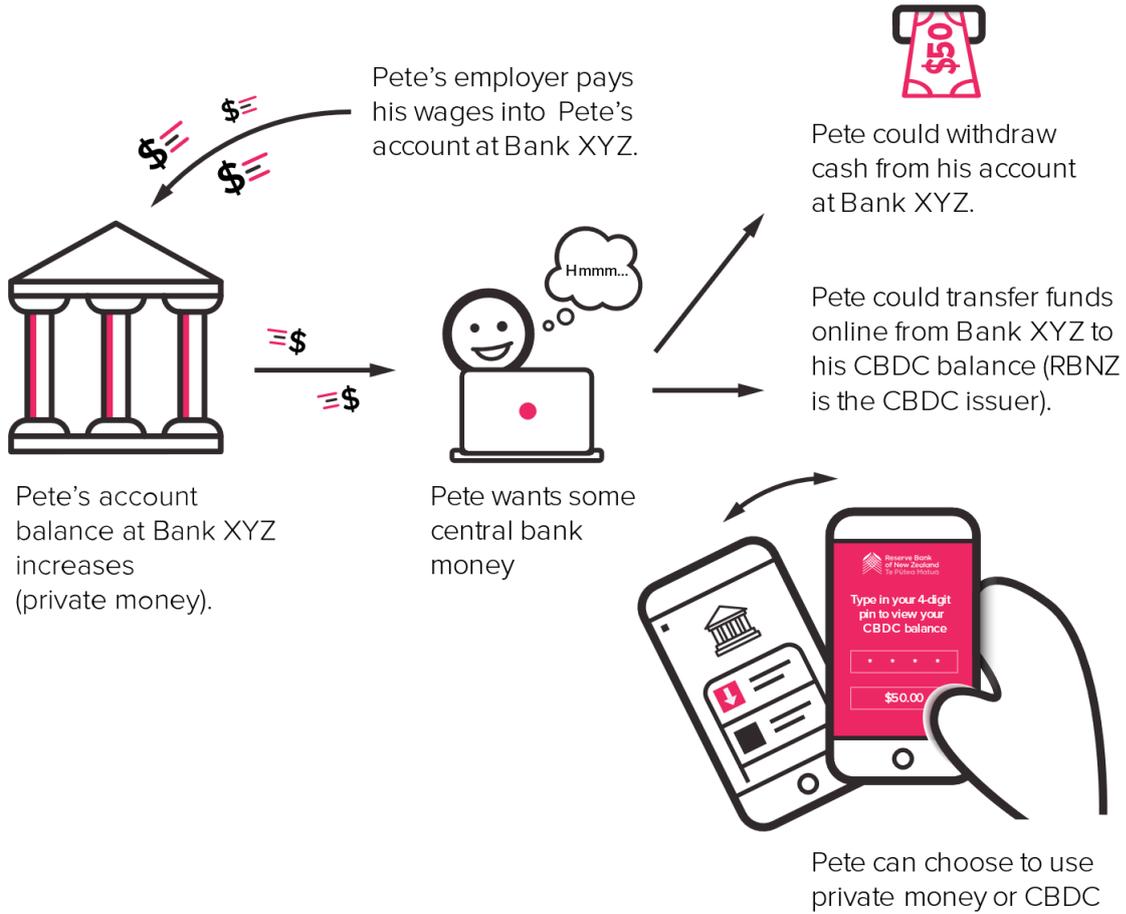
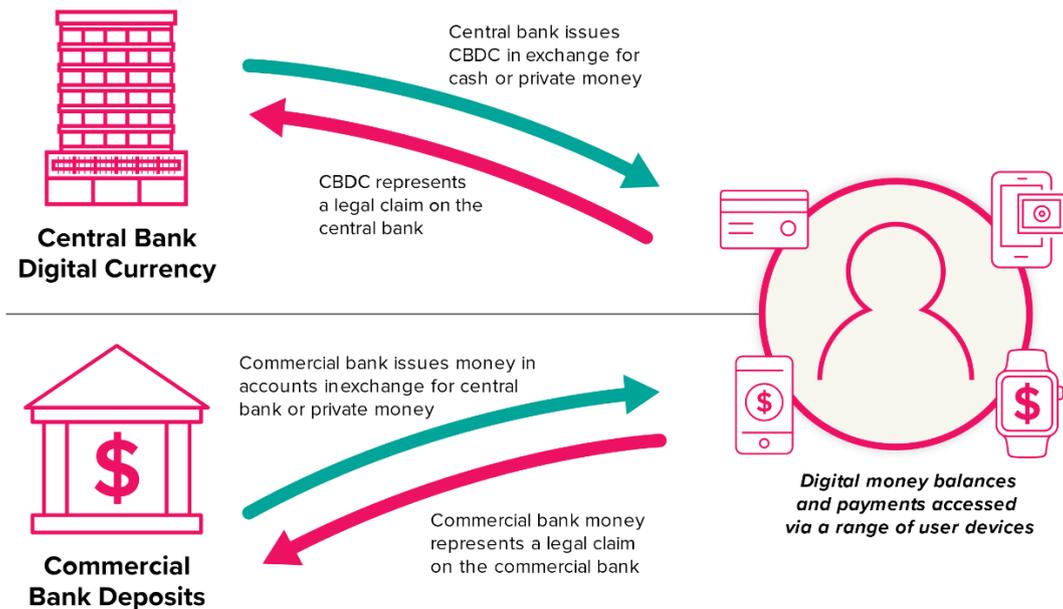


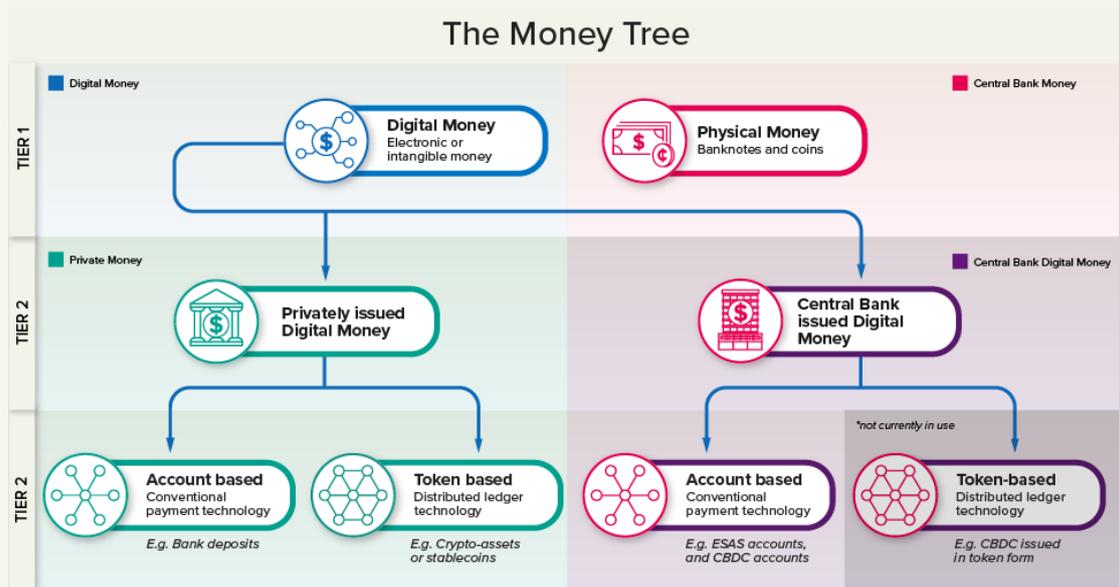
Figure 3: Conceptual difference between a CBDC and transaction accounts



Box B: Types of money

Cash is currently the only type of central bank money available to anyone. Cash is also the only physical money available in New Zealand. All private money exists digitally (as an electronic record). The chart below shows the different types of money that exists – or could exist – in New Zealand. The brown boxes relate to possible types of central bank money. The pink boxes are private money.

Figure 4: The money tree taxonomy



Source: Updated from Wadsworth (2018), using Kahn and Roberds' (2009) token – and account-based money distinction. ESAS is the Reserve Bank of New Zealand's Exchange Settlement Account System (ESAS) which is used by banks and other approved financial institutions to settle their obligations on a Real-Time Gross Settlement (RTGS) basis.

- The first tier of the money tree describes money as either physical or digital. Since the Reserve Bank has the monopoly right to issue banknotes and coins, there is only one form of physical money and that is cash.¹²
- The second tier separates digital money by whether it is issued by the private sector or by the Reserve Bank.
- The final tier of the money tree distinguishes money by its technological forms (account based or 'token based').¹³ This distinguishes between different types of private money. For example, transaction accounts are account based, while 'crypto assets' like Bitcoins and stablecoins are token based. It also allows a consideration of two possible forms of CBDC: those that are account based i.e. wholesale settlement

¹² Cheques are privately issued instruments that represent an order to transfer money held in a bank account. For this reason they do not meet the definition of money.

¹³ Some have rightly pointed out that the terms 'token' and 'account' may be misleading, as crypto-assets can employ account structures at a fundamental level. However, the distinction still holds from the user experience and its implications. See Kahn, C and W Roberds (2009), Garrat, R, Lee, M, Malone, B and A Martin (2020) and Kahn, C (2020) for a review of the token- versus account-based money terminology. This paper takes the approach of Wadsworth (2018c) and classifies digital currencies as using either account-based conventional infrastructure or token-based, distributed-ledger technology infrastructure.

accounts at the central bank¹⁴ or new accounts at the central bank, and those that involve a new type of token-based money.¹⁵

The distinction between account-based and token-based money can be summarised by considering the features offered to the end user (see Annex B). One important distinction relates to ownership: the ownership of money held in accounts is proven by identity, whereas the ownership of token-based money is proven by possession.

3 Motivation and process for considering a CBDC

The Reserve Bank is investigating whether a CBDC would support our role as steward of money and cash, particularly in a digital future. As steward we aim to ensure that central bank money contributes to a sound and dynamic monetary and financial system by being:

1. A stable anchor of value and confidence, and convertibility in our money.
2. A fair and equal way to pay and save in our modern and inclusive economy.

This objective reflects the fact that central bank money in both physical and digital forms plays an underpinning role in ensuring that all prices are set in NZD and that people can confidently expect to be able to make payments and settle debts in NZD now and into the future.

To be clear, the Reserve Bank is not considering replacing cash with a CBDC. The Future of Cash review¹⁶ revealed that cash has unique features and benefits that New Zealanders continue to value. A CBDC is not intended to replace these benefits; instead, we are considering whether a CBDC is an opportunity to provide these (and other) benefits digitally. This would provide New Zealanders with a choice of central bank money in physical and digital forms.

More broadly, the Reserve Bank is considering whether a CBDC is needed to ensure that central bank money is resilient and fit for the future. There are two overarching trends that have motivated our CBDC considerations.

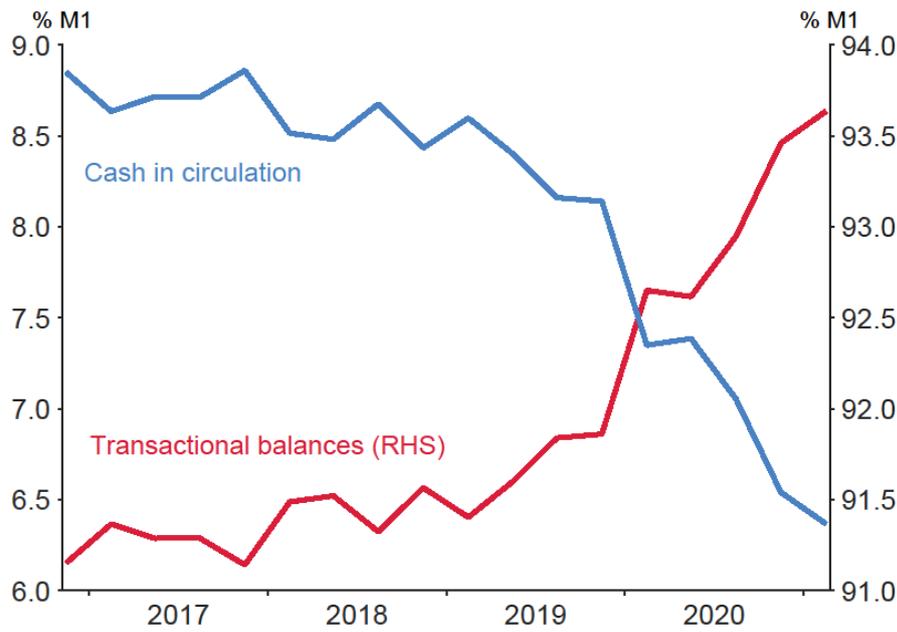
First, most people in New Zealand prefer to pay and save in digital money rather than physical money. Electronic transaction accounts (which hold digital money issued by commercial banks) make up over 90 percent of outstanding liquid (M1) money balances (Figure 5). Meanwhile, the use of contactless card payments has been increasing (Figure 6), and our 2020 cash use survey found that contactless card payment was the most preferred payment method (36 percent of New Zealanders). The COVID-19 pandemic accelerated these trends towards digital money and payments, with lockdowns and social distancing requiring a greater use of e-commerce, remote and contactless payments and internet banking.

¹⁴ ESAS is the Reserve Bank of New Zealand's Exchange Settlement Account System (ESAS) which is used by banks and other approved financial institutions to settle their obligations on a Real-Time Gross Settlement (RTGS) basis.

¹⁵ Bascand, G (2018) and Wadsworth, A (2018c). A group of central banks define CBDC as a "digital payment instrument, denominated in the national unit of account, that is a direct liability of the central bank" and that therefore carries neutrality and liquidity benefits. Bank of Canada et al. (2020). Central bank money is neutral and highly liquid relative to private money. The CPMI and MC (2018) and Boar & Wehrli (2021) exclude existing balances in reserve or settlement accounts from the definition of CBDC due to their long establishment within money systems.

¹⁶ RBNZ (2019).

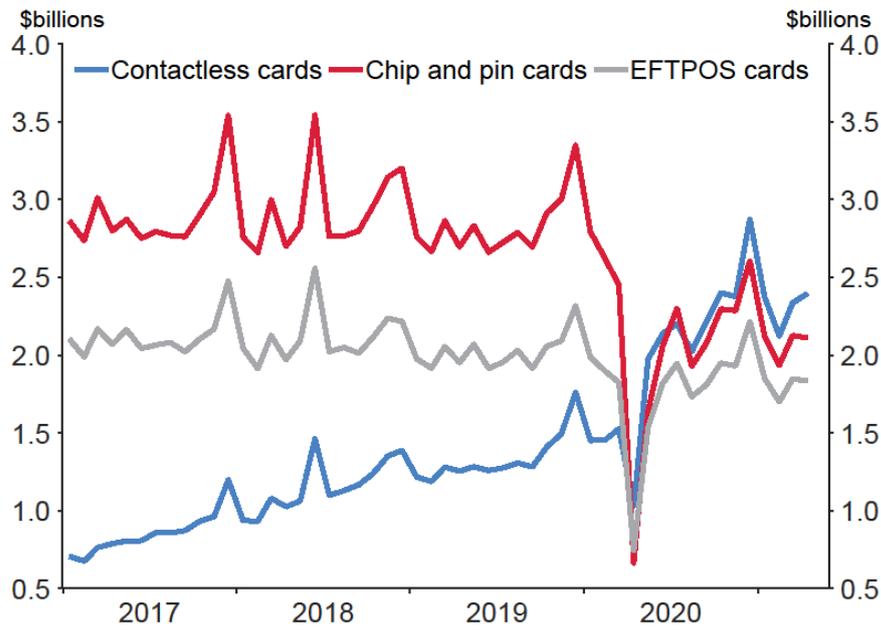
Figure 5 Cash in circulation and transactional balances as a share of M1 money



Source: Haver Analytics

Figure 6: The rise of contactless card payments in New Zealand

Monthly value of transactions.



Note: This chart shows card transactions by instrument technology rather than by whether they are debit or credit cards.
Source: Payments New Zealand

Cash appears to be useful to people as a store of value, particularly in times of uncertainty. Cash in circulation in New Zealand increased by approximately \$800 million at the beginning of the pandemic. However, in 2020 only nine percent of New Zealanders preferred to use cash as their main way of paying (down from 12 percent in 2019), and its distribution model is becoming more fragmented.¹⁷

The important point here is that in order for a value anchor to be effective it has to have transactional relevance.¹⁸ As cash becomes harder to obtain and use, its scarcity negatively affects the value anchor aspects of central bank money.

Secondly, private innovations in new forms of money are emerging globally. Some of these new forms of money might sit outside current financial sector regulations or be denominated in new units of account (i.e. not NZD). Notably, large technology companies have proposed issuing global stablecoins. These instruments promise more efficient and innovative means of paying and might obtain rapid global adoption due to the market power of their issuers. Central banks and regulators around the world have responded to the prospect of global stablecoins by making clear their potential risks,¹⁹ issuing statements requesting that these risks be managed and investigating the potential for CBDCs as alternatives.

If a global stablecoin were issued successfully in New Zealand, the Reserve Bank could face a scenario where a potentially large number of transactions and savings would be conducted outside NZD and offshore. This could limit our ability to use monetary policy to influence interest rates and therefore inflation and employment targets, which would mean a loss of monetary sovereignty for New Zealand.

These two trends motivate us to consider ways for central bank money to also innovate to better meet the future needs of New Zealanders. In considering a CBDC, we are motivated primarily by our stewardship mandate and broader role as caretaker of New Zealand's monetary system, payments system and financial institutions.

The Reserve Bank is not alone in its investigations – an increasing number of central banks are researching CBDC²⁰ (Figure 7). The specific motivations for this research differ by country. Broadly, central banks in advanced economies are motivated by monetary sovereignty objectives due to emerging innovations in private digital monies (such as global stablecoins) and declines in the use of cash. They are also motivated by opportunities for increased payment safety and efficiency, including for cross-border payments.

For example, the Bank of England has established a CBDC Taskforce to explore a CBDC issued to households and businesses, citing a range of potential use cases for a CBDC and the fundamental benefits of providing central bank money digitally.²¹ The United States Federal Reserve Board has stated it is stepping up its public engagements and research on the potential benefits and risks of a CBDC, including one that is issued to households. It is motivated by developments in private digital money, the migration to digital payments from cash, plans to use a CBDC in cross-border payments, and financial exclusion.²² Sweden's central bank, the Riksbank, facing low cash use, has been actively investigating CBDC since 2017 as a complement to cash. It has released three reports

¹⁷ RBNZ (2021b).

¹⁸ See *The Future of Money – Stewardship* (2021) for a detailed explanation of the value anchor.

¹⁹ Group of seven working group on stablecoins (2019).

²⁰ Boar C and A Wehrli (2021) survey central banks on whether they are investigating CBDC, and Auer et al. (2020) categorise the central bank research on CBDC.

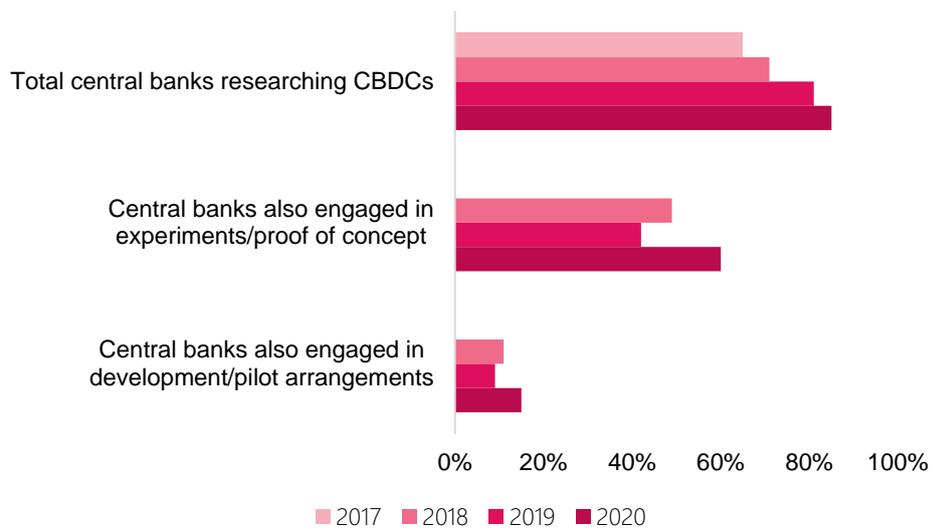
²¹ BoE (2021), Cunliffe, J (2021), Mutton, T (2021).

²² Brainard, L (2021).

on CBDC and is now engaged in testing CBDC prototypes.²³ Each of these central banks is clear that it does not intend to replace cash with a CBDC.

Meanwhile, central banks in emerging economies are considering the opportunities that CBDCs might provide to reduce high operation costs, increase payment safety and efficiency, and lead to greater financial inclusion. Research in these economies tends to be focused on testing pilots and prototypes. The People's Bank of China is testing CBDC pilots²⁴ while the Central Bank of The Bahamas has already issued a CBDC²⁵ and the National Bank of Cambodia has issued a 'quasi-CBDC' via a wholly owned subsidiary.²⁶

Figure 7: Central banks are investigating CBDCs



Note: A proof of concept usually refers to early-stage testing; a pilot is usually later-stage testing and more targeted at testing practical implementation. Source: Boar et al (2021)

²³ Riksbank (2021).

²⁴ pbc.gov.cn/en/3688110/3688172/4157443/4293696/2021071614584691871.pdf.

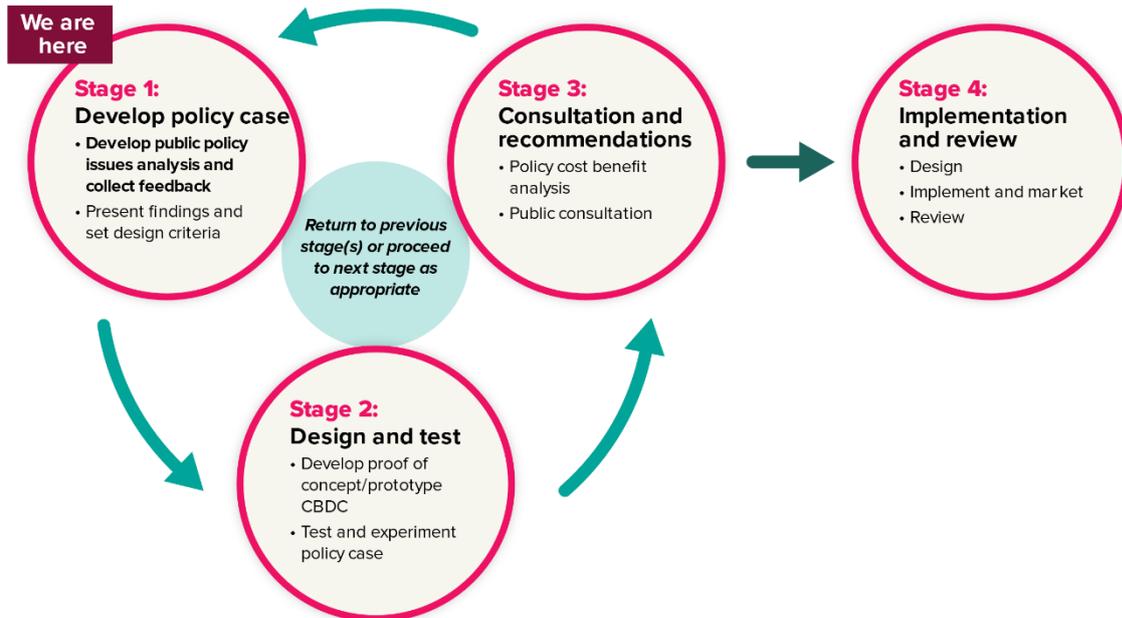
²⁵ Central Bank of The Bahamas (2021).

²⁶ Shen, A (2020).

3.1 Process and scope for our CBDC investigation

The Reserve Bank expects to take a multi-stage approach to considering and developing a CBDC that includes assessments of the policy opportunities, risks, use cases and design options as illustrated in Figure 8. Future stages of work are likely to involve designing a prototype, assessing the prototype, seeking feedback, redesigning if necessary and undertaking practical trials. Any decision to issue a CBDC would only be made following consultation with the Government, the public and other stakeholders.

Figure 8: A multi-stage approach to CBDC



3.2 Focusing on a general-purpose CBDC

A CBDC can take many forms, but this issues paper focuses on a CBDC that would be issued to any individual or business that wants to use it. Such a 'general-purpose' CBDC²⁷ would be closer in function to cash and better placed to fulfil the role of central bank money than a 'wholesale' CBDC. The rest of this paper refers to CBDC and general-purpose CBDC interchangeably.

A general-purpose CBDC is digital money issued by a central bank that is available to any individual or business that chooses to use it.

Future work (outside the scope of this paper) will consider whether a new type of 'wholesale' CBDC is needed. The distinction here is that a general-purpose CBDC could be used by anyone in New Zealand, conceptually, whereas a wholesale CBDC would only be available to certain large financial institutions that deal directly with the Reserve Bank. For example, the reserves held in the Reserve Bank's Exchange Settlement Account System (ESAS) to settle interbank payments and implement monetary policy represent a conventional wholesale CBDC.²⁸ Future investigations can consider

²⁷ Also referred to as a 'retail CBDC'.

²⁸ This paper takes the approach of earlier Reserve Bank work and considers the funds currently issued by the Reserve Bank via Exchange Settlement Accounts as a conventional wholesale CBDC.

whether a new form of wholesale CBDC, such as one that is token based, could bring efficiency and resilience benefits to wholesale settlement (described further in Box B).

3.3 Taking a technology-agnostic approach

The policy discussion considers an abstract CBDC, which is simply digital money issued by the central bank to all, alongside cash. The Reserve Bank's intention is to let a policy discussion inform the technological design of a CBDC rather than the other way around.

Abstracting from the CBDC's form allows the Reserve Bank to develop high-level design principles that a CBDC should achieve to deliver its desired benefits and minimise its challenges. These principles are developed through the opportunities and challenges sections of this paper (Sections 4 and 5) and summarised in Section 6. Subsequent policy development and consultations would consider the use case for CBDC options and, therefore, important technological design features.

Box C: International principles for CBDC

A CBDC is an abstract concept. Internationally, a group of central banks with the Bank for International Settlements (BIS) released three foundational principles to guide CBDC considerations.²⁹ These are summarised as:

1. Do no harm to wider policy objectives.
2. Ensure coexistence and complementarity of public and private forms of money.
3. Promote innovation and efficiency.

These principles are then translated into 14 core features in three categories: instrument features, system features and institutional features.

This Issues paper takes a similar approach by building a set of CBDC design principles (summarised in Section 6) based on the Reserve Bank's purpose to support New Zealand's economic wellbeing and prosperity and given its financial stability, monetary policy and central bank objectives. The starting point for the Reserve Bank's policy analysis of a CBDC was its Future of Cash review and new role as steward of money and cash.

One key distinction of the Reserve Bank's CBDC design principles is that they are less detailed than the set of 14 core features. We have chosen a higher-level approach to ensure this can provide public insights into the scope and direction of its CBDC work, while allowing public feedback to inform the detailed elements of any future CBDC design, including details of the CBDC instrument, supporting system and legal structures.

²⁹ See Bank of Canada et al. (2020).

4. Opportunities of a CBDC

The opportunities of a CBDC can be understood by comparing the features of a CBDC to those of predominant existing forms of money, namely cash and transaction accounts.

At the most basic level, a CBDC appears to be a useful digital complement to cash. As both are forms of central bank money, CBDC and cash offer similar features. For example, they both have low credit risks and have legal protections for payments made in that money. In addition, a CBDC, by its digital nature, can also offer the features of other forms of digital money such as transaction accounts. For example, it can be scalable to high volumes, and payments would not be dependent on location.

Table 1 summarises the unique features of CBDC, cash and bank transaction accounts. It shows that a CBDC has features of cash and transaction accounts.

Table 1: Features of CBDC, cash and bank transaction accounts

	CBDC	Cash	Transaction accounts
Legal tender or legal finality (1)	Yes	Yes	No
Proof of ownership (2)	Holder or personal ID	Holder	Personal ID
Payment characteristics			
Instant and final settlement	Possible	Yes	Possible for within-bank transfers (3)
Peer to peer	Possible	Yes	No
Dependent on location	No	Yes	No
Scalable to high volumes	Yes	No	Yes
Savings characteristics			
Lowest credit risk	Yes	Yes	No
High storage and transport costs	No	Yes	No
High risk to physical safety	No	Yes	No
Cyber security risks	Yes	No	Yes
Easy to lose/misplace	Possible	Yes	No

Notes: (1) Legal tender is a tender of payment that, by law, cannot effectively be refused in the settlement of a debt denominated in the same currency. Legal finality relates to whether the payment legally cannot be reversed or unravelled after it has been made. (2) Relates to whether the money is bearer pays or requires proof of identity to be spent. (3) May be bank dependent.

This section describes how a CBDC that is issued to all generates benefits to our stewardship mandate and our overarching purpose to support the wellbeing and prosperity of New Zealand.

1. First, a CBDC (like cash) directly supports the role of central bank money as a monetary value anchor by providing a digital alternative to privately issued money.
2. Secondly, a CBDC directly provides a fair and equal way to pay (like cash) because it is central bank issued and would deliver benefits that have the attributes of public goods.³⁰ A CBDC also has the potential to indirectly support wider inclusion goals by addressing some barriers to both financial and digital inclusion through its design and implementation programme.
3. Thirdly, a CBDC and its ecosystem (including the distribution model) has the potential to act as a catalyst for innovation and competition in the wider money and payments ecosystem. This could bring improvements to domestic payments' efficiency and resilience. It may also enable the Reserve Bank to take part in global initiatives that use CBDCs to improve cross-border payments.

These opportunities are discussed in more detail in the following sections.

4.1 Monetary anchor

A CBDC can support the value anchor role of central bank money into a digital future by ensuring that the NZD remains our single unifying unit of account and medium of exchange. How it does this is explored in more detail below.

(a) A CBDC supports the continued use of NZD as our unit of account

The NZD is currently the 'single unit of account' in New Zealand. That means all prices are denominated in NZD. The concept and acceptance of the NZD as our single unit of account is something that many take for granted, or do without even thinking about it. It works because of people's trust in the value and stability of the NZD, and the convertibility of that value across the different forms the NZD can take – banknotes and coins, transaction accounts, and ESAS accounts at the central bank.

The 1:1 convertibility of central bank money to private money is primarily enabled by prudential regulations and liquidity support through market operations, and also by the ability to convert private money into central bank money, confidence in the price stability of central bank money and the fiscal position of the government.

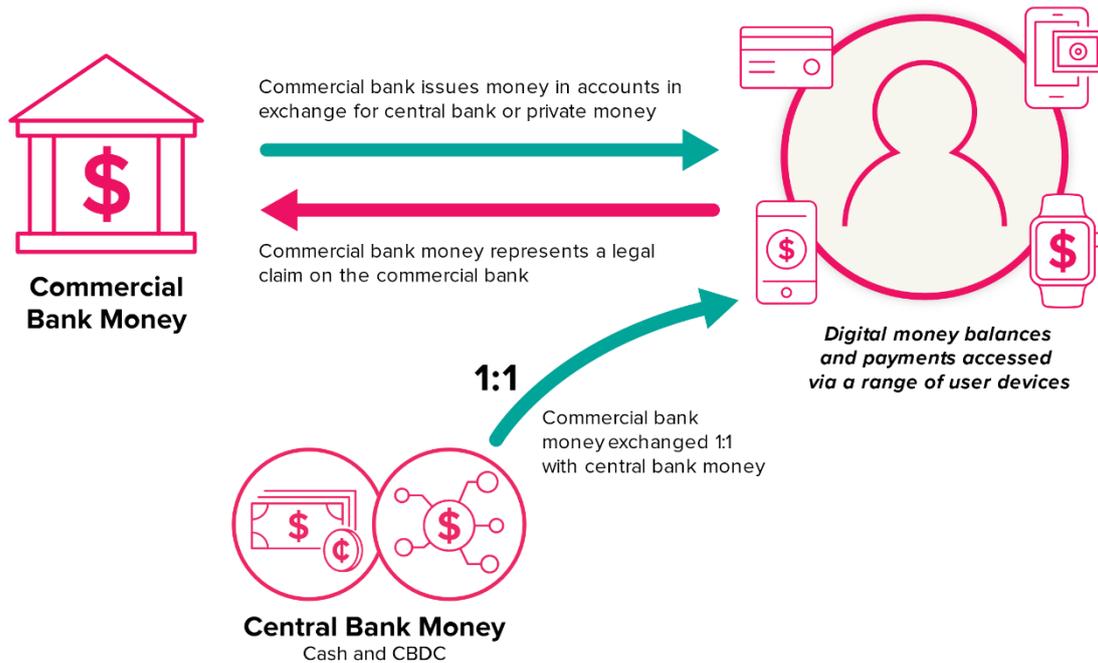
Having a single unit of account means that people know the value of the goods, services and assets they are buying with their money (for example, they do not need to apply an exchange rate), and that the money they hold in transaction accounts is worth the same as it would be if they transferred it to accounts in other commercial banks or private money issuers (like PayPal).

Currently the risk of losing New Zealand's single unit of account is very low. However, this risk could be heightened in a crisis where a private money issuer faces financial trouble. For example, firms might impose fees or penalties for accepting payments from 'more risky' banks. Alternatively, the single unit of account could be at risk if a new denomination of money issued by a global stablecoin became popular. If either risk became widespread, New Zealand could risk losing uniformity of money, which would be destabilising for price and financial stability.

³⁰ See *The Future of Money – Stewardship* (2021) for a more detailed explanation of the public good attributes of central bank money.

A CBDC would support New Zealand’s single unit of account by providing individuals and businesses with the option of converting privately issued money into digital central bank money (Figure 9). The ability for privately issued money to be exchanged for central bank money at face value underpins its stability as a form of money. For example, if people or firms refused to recognise the value of private money balances, that money could be converted into central bank money and then used. A CBDC would ensure that this benefit is available to those who do not have easy access to cash or who choose not to use cash.

Figure 9: Central bank money underpins commercial bank money



(b) Improving central bank money to meet future needs

A CBDC could provide the Reserve Bank with an opportunity to improve the technological form of central bank money to ensure it continued to be relevant and useful in the future. An important form of relevance is transactional relevance, which is threatened by emerging innovations in privately issued money and declining cash availability and use.

For example, a CBDC could increase the transactional relevance of central bank money by providing instant electronic peer-to-peer settlement—a service that is currently not provided by the private sector (see Annex A for further detail on the inefficiencies in New Zealand’s payment system). Instant settlement is both more convenient (it reduces the need to wait for payments to show up) and safer (it reduces the likelihood of payments failing to be settled after they have been instructed). Electronic peer-to-peer settlement would be particularly useful for in-person transactions such as at farmers’ markets and in marketplace trades.

Beyond that, a CBDC could also be designed to capture more advanced technological benefits, such as those being proposed by stablecoin developers. For example, a token-based CBDC could enable the execution of contracts or certain actions to be ‘programmed’ into the money itself, thereby reducing the need for manual or third-party processing and generating efficiencies.

The point of innovating central bank money is not to crowd out private innovation in money, but to secure our value anchor in the digital future and provide a platform that supports wide access to the benefits of innovation. A future-proofed CBDC would allow individuals and businesses to benefit from technological innovation by providing a platform for new payment services that use CBDC as the settlement asset. This would reduce the need for people to use new forms of privately issued money, such as stablecoins, that might not be regulated or denominated in NZD and that could undermine our single unit of account.³¹

(c) Additional monetary policy tool

A CBDC could be used as an additional monetary policy tool (used to influence interest rates) if the Reserve Bank issued it as an intervention akin to the Large Scale Asset Purchase (LSAP) programme, which aims to lower borrowing costs to households and businesses through the Reserve Bank injecting money into the economy by buying government bonds from banks in exchange for electronically created money,³² or if the Reserve Bank charged or paid interest on CBDC balances. Charging or paying interest on household and business CBDC balances would provide a more direct transmission of monetary policy (compared to relying on commercial banks to pass on rate changes) but could be unpopular. It may also be technically challenging to charge interest on a token-based CBDC without New Zealand losing its single unit of account (see Annex B).

4.2 Fair and equal way to pay and save

Central bank money offers New Zealanders access to a fair and equal way to pay and save and can support New Zealand's financial and social inclusion goals by being issued in a way that reduces barriers to financial inclusion (including some digital barriers).³³ The rest of this section describes these opportunities in more detail.

(a) Improving financial inclusion with a CBDC

A CBDC could directly provide basic saving and payments for those who are unbanked or underserved by the private sector by offering basic services at low or subsidised prices. This would recognise the positive benefits that are generated for all New Zealand when everyone is included in the financial system. Providing CBDC as a public good would set it apart from private digital monies and payment systems.

As a digital form of money, a CBDC could also act as a gateway to formal financial inclusion for those who are cash reliant or face barriers to the banking sector. Access to electronic payments is cited as an important first step towards financial inclusion and the use of other financial services.³⁴ Electronic transaction accounts that enable users to meet their payment needs and store value safely can lead to an increased use of other financial services. For example, The Bahamas has issued a CBDC to encourage its cash-reliant communities to switch to digital saving and paying.³⁵ Households in these communities might then be encouraged to open bank transaction accounts and access other services such as small-business loans and investments.

31 The Chief Economist of Diem, Christian Catalini (a stablecoin arrangement supported by Facebook) noted that the issuance of CBDCs would remove the need for a Diem stablecoin. Catalini noted that Diem does not want to replace the role of central bank money but rather wants "to build on and take advantage of that infrastructure to accelerate use cases for consumers both domestically and also globally" King, R (2021).

32 See [rbnz.govt.nz/monetary-policy/monetary-policy-tools](https://www.rbnz.govt.nz/monetary-policy/monetary-policy-tools) for more information on large-scale asset purchases.

33 This includes people who are not banked or have limitations to accessing the banking system, such as people without identification and proof of address, people with convictions, people with disabilities, illegal immigrants and children. It also includes people who face barriers to digital inclusion, such as people with disabilities, senior citizens, people with low socio-economic status, people who live in rural communities with low internet service, migrants and refugees with English as a second language, Pasifika, and Māori. See RBNZ (2019).

34 CPML and World Bank (2020).

35 Central Bank of The Bahamas (2021).

(b) Supporting broader inclusion goals

A CBDC that is coupled with key policy enablers could support New Zealand’s wider financial and social inclusion goals – financial and social inclusion in the payment systems is an issue of importance in our broader stewardship objectives.

An ability to prove one’s identity can be a key barrier to financial inclusion. To hold a CBDC or any transaction account, an individual or business must prove their identity to satisfy anti-money laundering and countering financing of terrorism (AML/CFT) requirements. A New Zealand CBDC could be a powerful national vehicle for providing or supporting services that make it easier for people to prove their identities. For example, a CBDC could support the uptake and use of RealMe or the digital identity trust framework being developed by the Department of Internal Affairs.³⁶

A CBDC could also be issued in conjunction with other government programmes to improve financial inclusion – for example, to support the Safer Credit and Financial Inclusion Strategy³⁷ inclusion goals.³⁸

India’s Unified Payments Interface provides an example of how financial inclusion can be enhanced when national digital identity and open-data frameworks are coupled with the public provision of financial market (payment) infrastructure. Through its unified programmes, India was able to increase the number of banked adults from 30 percent to almost 80 percent in three years, an increase that it is estimated would have taken up to 45 years had India relied on traditional or private-sector-led growth processes.³⁹

Another barrier to accessing the formal financial sector can be difficulty in accessing or using digital services. For example, people may live in rural areas without reliable internet access, be unable to afford smartphone or data plans or be unable to navigate online technologies. Digital exclusion is particularly relevant given current trends in bank services from in-person services to online services.

The private sector has already developed some solutions to promote digital inclusion in banking, such as providing bank account access points and transfer services via telecommunication platforms (text or calling) instead of internet platforms. Further, many technology firms are investigating (and some have developed) digital currency with a robust and secure offline functionality that allows it to mimic the back-up payment role that cash provides, for example payments between devices that rely on Bluetooth.

A CBDC solution could use technology that provides offline functionality to make the CBDC accessible to those that have limited access to electricity, telecommunications or the internet. However, a CBDC is likely to require at least intermittent access to these.⁴⁰ The extent to which barriers to digital inclusion can be addressed by a CBDC remains to be seen.

³⁶ See realme.govt.nz.

³⁷ The Safer Credit and Financial Inclusion Strategy is a cross-government and financial sector initiative jointly led by Te Puni Kōkiri, the Ministry of Business, Innovation and Employment and the Ministry of Social Development. See msd.govt.nz/documents/what-we-can-do/providers/building-financial-capability/safer-credit-and-financial-inclusion/safer-credit-and-financial-inclusion-strategy-summary.pdf.

³⁸ The Ministry of Business, Innovation and Employment’s open banking and retail payment system work may also support inclusion goals to the extent it reduces costs and allows greater choice.

³⁹ D’Silva, D, Filkova, Z, Packer, F and S Tiwari (2019).

⁴⁰ A digital currency must require access to a central agent via internet or telecommunications due to the double-spend problem. In order to ensure that digital money is not spent more than once, or that counterfeit digital money tokens are not created, they must be verified in some way. The method of verification differs depending on whether the money is account-based or token-based money and whether there is a central or distributed ledger underpinning it, but at some point electronic messaging is typically required.

Finally, a CBDC provides an opportunity to advance other government inclusion or fiscal objectives. For example, it could be used to make direct government-to-person payments. This could be useful in supporting individuals affected by crises (such as a natural disaster), paying benefits to individuals without bank accounts and paying out account holders who are affected by a banking failure (i.e. as a fast and secure pay-out mechanism for the Government’s incoming deposit insurance).

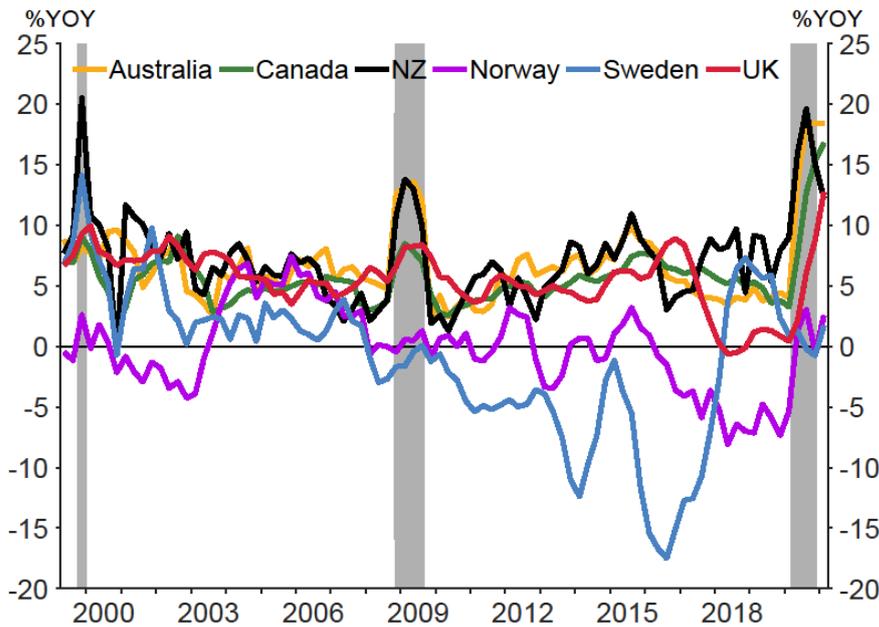
Going further, a token-based CBDC could take advantage of the programmability of tokenised money to build in certain actions or criteria – for example, to enable the automatic execution of rent or bill payments.

(c) Personal freedom, autonomy and back-up in paying and saving

The public have told us that freedom and autonomy in saving and paying is important to them.⁴¹ This includes the ability to withdraw their money from the banking sector, pay and save off-grid, and have personal privacy and autonomy over their spending and saving. Trends towards cash holdings during times of uncertainty support our finding that this choice and the ability to exit the banking sector continue to be valued by many (Figure 10). A CBDC would provide individuals with freedom and autonomy in saving and paying, primarily by giving them greater choice.

Figure 10: Cash in circulation increases during periods of uncertainty

Quarterly year-on-year percentage growth



Notes: The grey bars denote (in order) the year 2000 (“Y2K bug”) period, great financial crisis period and the COVID-19 pandemic. Source: Haver Analytics

Privacy is an important aspect of freedom and autonomy and is currently conferred by the anonymity of cash payments and balances. A CBDC cannot be completely anonymous, as in theory all digital transactions would leave a record on either a central ledger or a distributed ledger (due to the need to avoid the double-spend problem).⁴² However, a user’s privacy can be

⁴¹ In the form of feedback collected in our Future of Cash review and subsequent public research. See RBNZ (2019).
⁴² Cash has physical security features that people can check to make sure it is not counterfeit. For conventional digital money, some kind of digital ‘authentication’ must take place; i.e. for bank accounts this involves messaging to check that funds exist on a central ledger (i.e. transaction accounts).

protected through the CBDC's technological design, governance and supporting legal frameworks. These frameworks could be similar to privacy protections for transactions using transaction accounts or enhanced to closely resemble cash.

There are arguments for and against the traceability of transactions. Users may want to retain full privacy in transacting, for either legitimate or unlawful reasons. Meanwhile government agencies may want to retain some traceability of CBDC balances or tokens to reduce tax evasion or avoidance, or money laundering and financing terrorism.⁴³ A CBDC offers an opportunity to design a form of money that balances these interests.

Another key benefit of cash is that it provides a back-up form of payment in personal emergencies. This is particularly true immediately after a natural disaster, but becomes less reliable over an extended period of time without electricity and internet, as withdrawing money from ATMs and cash tills also relies on electricity.⁴⁴ A CBDC with offline functionality might also provide this benefit but would be limited in its ability to provide a means of payment during long periods without electricity and internet.

4.3 Payments efficiency and resilience

A CBDC that encourages innovation and resilience in the wider payments ecosystem could be used as a catalyst for competitive and interoperable payments services.⁴⁵ In doing so it would indirectly advance our stewardship objective of fair and inclusive paying and saving.

(a) Increasing innovation and competition in domestic money and payments

There is room for improvement in New Zealand's domestic payments system. In particular, a lack of competition in retail services, enabled by high barriers to entry by incumbents, has resulted in low incentives to address pain points and frictions (see Annex A). The Ministry of Business, Innovation and Employment's work on the retail payment system's regulatory regime and promoting open banking through a consumer data right will tackle some of these issues but will not address them outright. A CBDC could help address some of these issues.

A CBDC could be provided on an open payments platform that achieves network efficiencies in money (as the CBDC is the settlement asset), but allows new middle and front-end payment services by third parties. These services might comprise payment acceptance at point of sale, payments authorising, electronic wallet provision or customer on-boarding. In providing a CBDC in this way, the Reserve Bank might help level the playing field (or even enable new players to get onto the field) for new retail payment services.

An open CBDC payment platform might also drive greater interoperability in retail service providers by enforcing common standards such as operating hours, rules, messaging conventions and the use of open Application Programming Interfaces. A low-cost CBDC could put further competitive pressure on fees charged by the private sector for making and accepting other payments, such as those charged by expensive incumbent card schemes.

Further, a token-based CBDC could support the development of new retail payment services. For example, the Bank of England notes that a low-cost, token-based CBDC could make micro

⁴³ RBNZ (2019).

⁴⁴ See RBNZ (2019) for an explanation of the role of cash in a natural disaster or emergency.

⁴⁵ Bank of Canada et al (2020).

payments cheaper. This could pave the way for new business models such as per-use transaction charges in streaming services rather than subscription charges.⁴⁶

Creating a new payment platform could reduce the network effects enjoyed by existing payments systems, including ESAS. However, most countries have multiple payment systems that cater to different market segments.⁴⁷

(b) Improving payment-system resilience

A CBDC provides an opportunity to improve payment resilience, and thereby financial stability, by allowing individuals and businesses to conduct transactions that are free from private-sector credit risk. Electronic payments using bank deposits are exposed to that bank's credit risk, at least until they are considered final. Because electronic payments such as bank transfers are not settled instantly, there is some risk that payments will not be made if issuing banks fail in the intervening period. This risk is usually low in normal periods, but may be heightened during times of crisis or uncertainty.

Further, an open and competitive CBDC might indirectly create changes that improve wider payments system resilience. Firstly, it might encourage incumbents to improve their existing systems and services (e.g. to provide instant settlement). Secondly, it might enable new participants to enter the payments system that are more adaptable to future payments shocks and needs. Thirdly, it might reduce a reliance on some payment service providers (i.e. reducing central points of failure in the New Zealand's payments system).

(c) Addressing cross-border payments and remittances

Cross-border payments and remittances are fraught with cost and complexity. There is an impetus for domestic jurisdictions to contribute to global coordination efforts to improve cross-border payments. A CBDC may be well placed to support future cross-border payment arrangements as it can be designed with innovative functionalities that are not available through existing cross-border systems. In particular, a CBDC could be designed to participate in future cross-border CBDC payment arrangements that ensure 24/7 cross-border payment system opening times and facilitate instant settlement.⁴⁸ Globally, work is required to determine whether it is better to redesign existing cross-border systems or develop new systems based on CBDCs.⁴⁹

A New Zealand CBDC would allow the Reserve Bank to participate in global cross-border payment initiatives that involve connecting multiple CBDC systems together (referred to as CBDC bridges). Banks have been very slow to enhance efficiencies and lower the costs of cross-border payments, so a CBDC would act as a catalyst for improvement. At a minimum a CBDC issued in New Zealand might improve cross-border payment efficiency by reducing the number of steps required to facilitate international payments on the New Zealand side of the payments.

Careful consideration would also need to be given to whether a New Zealand CBDC should be able to be used as a means to pay and save in other jurisdictions. A CBDC could reduce the costs of remittances earned in New Zealand and transferred to other countries. However, a widespread use of a New Zealand CBDC in other jurisdictions, such as Pacific Island nations, might challenge the monetary sovereignty of those jurisdictions. That said, some Pacific Island countries already use the NZD, and given that remittances are a presenting problem it is likely that these countries would attach various degrees of weight to monetary sovereignty.

⁴⁶ Bank of England (2020).

⁴⁷ CPPI Red Book Statistics, BIS (2020).

⁴⁸ See Auer, R, Haene, P and H Holden (2021) for an analysis of potential cross-border CBDC models.

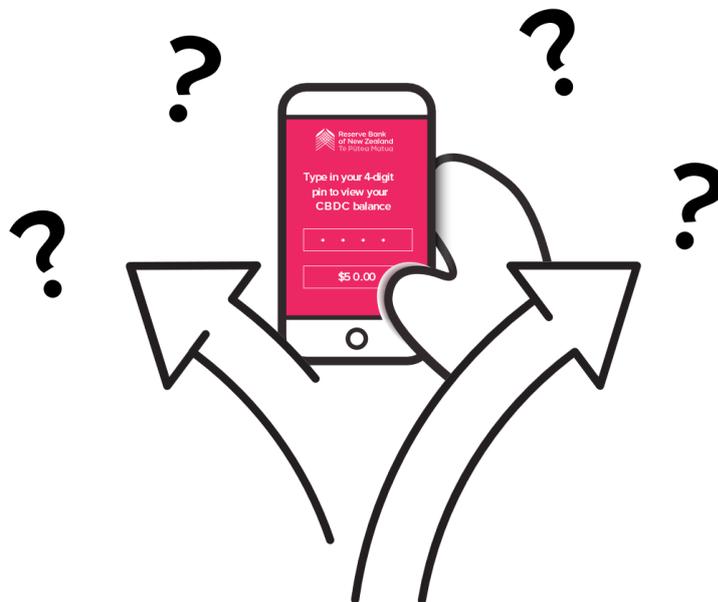
⁴⁹ CPPI (2020).

5 Challenges and risks of a CBDC

A CBDC is not without its challenges, of which some are inherent and some are more likely to relate to design decisions that could affect particular stakeholders.

This section describes, at a high level, the challenges and risks that a CBDC, or its implementation, could present. As a CBDC has yet to be designed and tested, it is not possible to quantify exactly the potential costs of a CBDC, therefore this section also outlines the areas that will need further exploration.

The key challenge is to ensure that a CBDC will not be compromised operationally by, for example, cyber-attacks. Another important challenge that is often cited is that the implementation of a CBDC could be destabilising to the financial system if not managed correctly. Finally, the development of a CBDC would present operational costs and complexity. These policy costs and risks are explored in more detail below.



5.1 Operational complexities and risks

A CBDC, like all electronic payment systems, would be exposed to cyber security threats, operational outages and data privacy breaches. These risks could be elevated if the CBDC were built on a new or untested system, such as a distributed ledger, or if it became a target of cyber criminals. The realisation of any of these risks could have significant impacts on public trust in the CBDC and the Reserve Bank. The Reserve Bank has high requirements for the reliability, scalability, throughput and resilience of its existing systemically important payments and settlement systems, and these would also apply to a CBDC.

As a form of digital currency, a CBDC should not be able to be 'double-spent'. This means people should only be able to spend the CBDC that they own and it should not be possible to manufacture fraudulent CBDC balances. This is similar to existing expectations of bank transaction accounts and cash.

A CBDC would also need to comply with relevant regulations and restrictions. In particular, the distribution of a CBDC would need to comply with AML/CFT requirements as well as financial market infrastructure and consumer protection regulations.

5.2 Risks to the banking system

Commercial banks are already facing competition for deposit funding from providers of new forms of private money, such as stablecoins and other new products. A CBDC presents another form of competition in deposit funding.

Competition and additional choice in financial services can benefit financial stability (not least by reducing the too-big-to-fail problem), but an uncoordinated and large-scale disruption to incumbent providers arising from implementing a CBDC could be disruptive to financial stability and our monetary policy settings. This section explores the potential impacts of a CBDC on the commercial banks' funding model and the Reserve Bank's monetary settings, and some of the ways we could mitigate these risks.

We note that the important issue here is not whether a CBDC (or another form of private money) affects bank services and profitability, but whether it does so in an orderly and non-destabilising way that is welfare enhancing for New Zealand. Ultimately, what is important is that we have an efficient, trusted, stable and reliable financial system, not one that is resistant to welfare-enhancing innovation in order to protect the status quo.

It is also worth noting that the following discussion is in the abstract. Assuming that we proceed to the next stage of policy development, there are some design decisions that in and of themselves will have greater or lesser impacts on the banking and payment industries. And within these design decisions there are calibration and operational decisions that can increase or decrease the degree of impact. Future work will need to move beyond the abstract to more detailed design to further analyse the potential impacts of a CBDC.

(a) Potential impacts of issuing a CBDC on commercial bank transaction accounts

To assess the impacts of a CBDC issued to all on the banking sector, the Reserve Bank would need to make assumptions about the size of the demand for the CBDC and where it came from (i.e. the types of asset that would be exchanged for the CBDC). Given that the CBDC would be issued to all, this paper assumes that it would be swapped for either cash or deposits in bank transaction accounts. Therefore the CBDC might compete for bank funding in the form of deposits in transaction accounts at both household and wholesale levels.

Moderate demand vs high demand for a CBDC

If the demand for a CBDC were moderate, banks would be able to exchange money in transaction accounts for CBDC with minor funding impacts for them. Given that commercial banks offer a broad range of services that include lending and investment, and are generally safe and reliable, the Reserve Bank considers that a 'moderate demand' scenario is probable.⁵⁰

However, if demand for a CBDC were high, banks might face runs on their transaction accounts for CBDC. Due to the low-credit-risk nature of central bank money, the risk of a large-scale run from deposits in transaction accounts to a CBDC might be increased during times of financial uncertainty. This risk is not new; bank depositors can already run to cash or safer digital assets. But a CBDC may increase the run risk if it is a) easier and faster to obtain than other safe bonds and assets, and b) there are no costs for, or limits to, holding large sums of CBDC established in the CBDC's design and operational rules.

⁵⁰ Deposits in transaction accounts are supported by a financial safety net that includes prudential regulation and supervision, access to central bank liquidity, the Bank's 'Open Bank Resolution' Policy, and the proposed Deposit Taker's Bill, including provision for a deposit guarantee scheme.

Potential impacts on banking sector of high-demand CBDC

A 'high-demand' scenario could have several negative impacts on the banking sector, and potentially New Zealand's financial system, if unmanaged. Importantly, the high-demand scenario can be thought of as one that assumes a regulator is either indifferent to impacts on the banking system, or does not calibrate the design or intervene effectively in the implementation or operation of the CBDC. As such, the following discussion should be read as a stylised example of what could happen in the absence of good design or effective intervention, and the sorts of scenarios to be alert to.

First, transaction accounts represent the lowest cost form of funding available to commercial banks. If banks lost a large portion of their funding to a CBDC they would need to increase their funding through more expensive means (such as offshore wholesale markets or by increasing remuneration on transaction accounts).

As their cost of funding increased, banks could become less profitable. This is less significant for financial instability, as New Zealand banks have robust profit buffers and (incoming) higher capital requirements. However, a greater reliance on wholesale funding could result in New Zealand banks being more susceptible to downturns in overseas markets.⁵¹ It could also reduce their ability to comply with the Reserve Bank's prudential liquidity policy (BS13).

Banks might also respond to lost funding by reducing credit or increasing the price of lending. This could have negative impacts on New Zealand's real economy if it contradicted our monetary policy setting. If households and firms find it very difficult to borrow it could ultimately lead to a credit crunch and a reduction in real economic activity.

Potential Reserve Bank mitigation and response

Further work is required to understand how large the demand for a CBDC could be, where this demand could come from (i.e. would a CBDC reduce cash holdings or transaction accounts?), how it might change as the financial or economic environment changes (i.e. materially worsens), and what the likely responses might be from the private sector and consequently the likely impacts on credit. These relationships would in turn depend on how the CBDC was designed and what limits might have been put in place.

Given the identified range of risks to the banking system, the Reserve Bank would need to consider how it would manage the issuance of a CBDC and ensure an orderly and non-destabilising introduction.

Household deposits in transaction accounts make up a smaller portion of bank funding than wholesale deposits, and would be less likely to be destabilising to commercial banks if they were lost. Further, household transaction accounts are less likely to be lost in a crisis scenario as they would be protected by the incoming government deposit insurance.⁵²

Conversely, wholesale deposits make up a larger portion of bank funding and will be protected to a lesser degree by deposit insurance depending on its design and limits.⁵³ As such, there would be an impact on bank funding, possibly a significant one, if there were a wholesale run to a CBDC. This impact would need to feature heavily in the design and calibration of a CBDC.

⁵¹ Wadsworth, A (2018c).

⁵² [Deposit taking measures protect financial stability and New Zealanders | Beehive.govt.nz](#)

⁵³ Financial institutions, related parties of deposit insurance scheme members, large non-financial corporates and government bodies will be ineligible for deposit insurance scheme coverage under the incoming government deposit insurance scheme. See [Questions and answers: Review of the Reserve Bank Act – April 2021 \(treasury.govt.nz\)](#).

One important design and calibration issue for future consideration is whether and by how much the Reserve Bank may want to limit the volume of CBDC that can be issued to wholesale customers, to reduce the possibility of a wholesale run on banks to a CBDC. In crisis scenarios we would be able to quickly detect a run to a CBDC and halt these flows to provide stability to the banking system if needed.

Alternatively, the Reserve Bank could impose negative interest rates on large holdings of CBDC. This might replicate the storage costs of cash and reduce the attractiveness of switching money from transaction accounts to a CBDC in large quantities.

These are just some high-level examples of the types of mitigant that will need to be thought through in the next stage(s) of CBDC development.

(b) Reserve Bank balance sheet

In addition to giving proper attention and consideration to the impacts of a CBDC on private-sector financial intermediaries, it is necessary to think through the impacts of the issuance of a CBDC on the Reserve Bank's balance sheet. This includes impacts on the size of the balance sheet and on our monetary policy settings, which would depend on how great the demand for a CBDC was, where it came from (i.e. cash, transaction accounts or other assets), and whether we satisfied the demand for a CBDC (see Annex C).

These considerations are not new; the Reserve Bank already makes decisions on the supply of money (in terms of cash in circulation and liquidity in the financial system), monetary policies and financial stability policies that all affect the value anchor and the financial system – it is just that the current calibration, relationships, processes and policies of existing roles are more established than those for a CBDC.

5.3 Design complexities

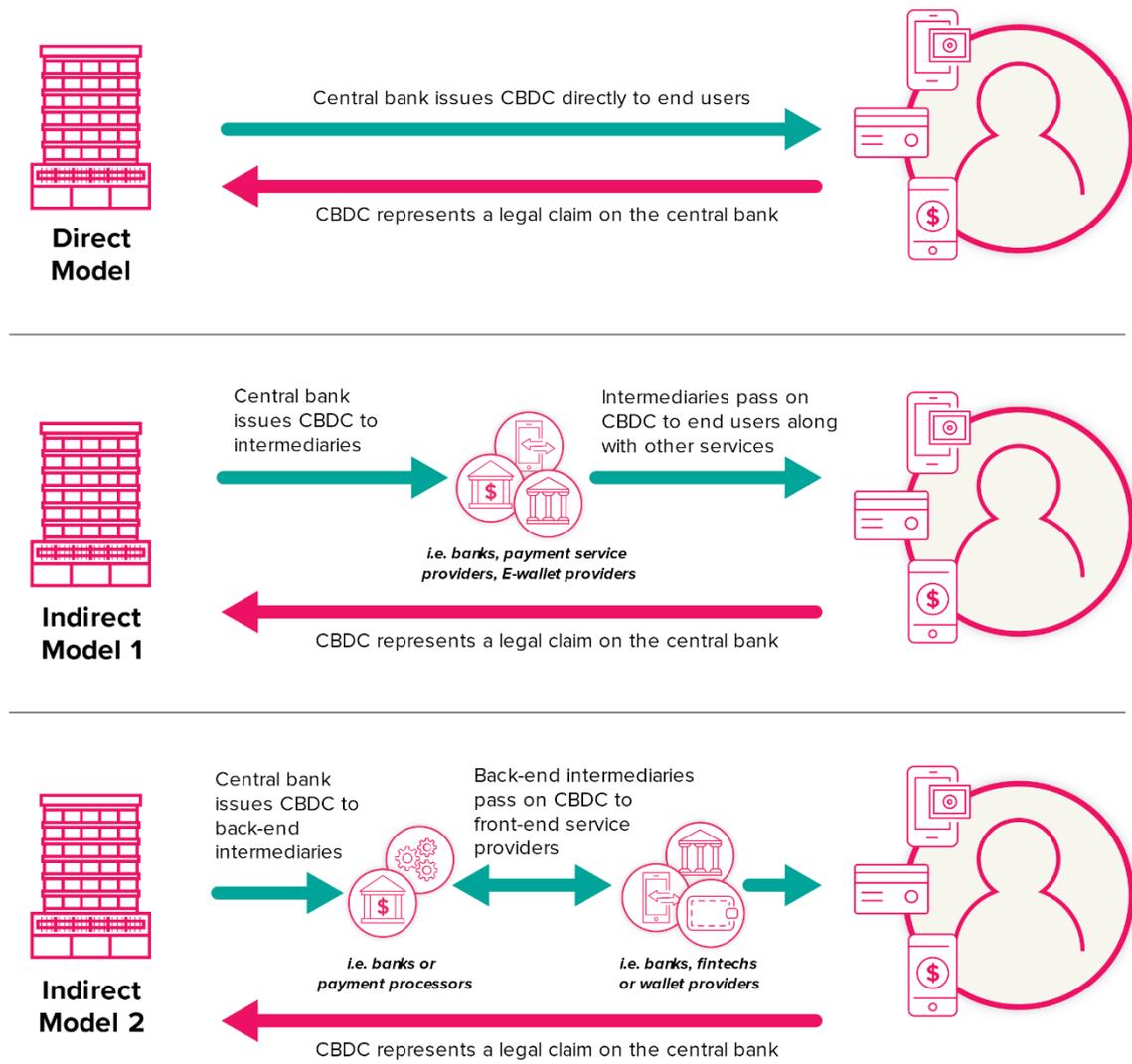
The development of a CBDC would require a significant investment in technology and systems to engage in experimentation and, if a CBDC were to be issued, support a new CBDC payments infrastructure.

As stated, the consideration of the form a CBDC should take includes whether it is token or account based, whether it uses distributed ledger technology or conventional infrastructure, how it can safely support offline payments, who can access it and how much can be made available.

Further consideration would also need to be given to its distribution. For example, there is a spectrum of distribution models to consider, ranging from a CBDC that could be distributed via a direct model, whereby the Reserve Bank would provide end-to-end infrastructure and services, to a CBDC distributed via an intermediated model, in which the Reserve Bank would provide only legal issuance and the private sector would provide all other services and infrastructure. There are many possible variants along the spectrum (e.g. the central bank may provide core back-end infrastructure and outsource the front-end services). The particular objectives of a CBDC and the design choices would all have a bearing on the array of distribution choices. Figure 11 illustrates three stylised operating models. Most central banks are considering a model where the central bank issues a CBDC and the private sector provides front-end and some back-end services.⁵⁴

⁵⁴ Auer, R and R Böhme (2020).

Figure 11: Direct vs indirect distribution of a CBDC



Source: Auer, R and R Böhme (2020), author's elaboration.

6 Developing CBDC design principles

The high-level opportunities and challenges of a CBDC discussed in the previous chapters can guide the general direction in which the further design and experimentation of a CBDC could go.

To summarise, Section 4 described the opportunities of a CBDC to directly support our stewardship objective of ensuring that central bank money remains a monetary value anchor; and to indirectly advance our stewardship objectives by incentivising inclusion, innovation and resilience in the wider money and payments ecosystem. It noted that:

A CBDC could strengthen New Zealand’s monetary value anchor by:

1. Ensuring the NZD remains our unit of account in a digital future by providing individuals and businesses with the option of converting privately issued money into a digital form of central bank money.
2. Improving the technological form and functionality of central bank money to ensure it remains relevant.
3. Providing an additional monetary policy tool (by it either being issued to provide monetary stimulus, or by being interest bearing).

A CBDC could ensure access to a fair and equal way of paying and saving by:

1. Providing a basic form of paying and saving to all at a low cost and acting as a gateway to the formal financial sector.
2. Supporting wider financial inclusion efforts, including through partnering with government programmes.
3. Providing freedom and autonomy in saving and paying by giving individuals greater choice, and providing personal back-up in times of uncertainty.

A CBDC could improve payments efficiency and resilience by:

1. Increasing innovation and competition in New Zealand’s payments system.
2. Improving payments system resilience, and therefore financial stability, by providing a low-credit-risk form of payment, enhancing future resilience and having the potential to reduce the number of single points of failure in the current payments system.
3. Allowing New Zealand to participate in global cross-border payment initiatives that involve exchanging CBDCs.

To achieve these opportunities, a future CBDC design would need to adhere to the following design principles.

Table 2: Design principles capturing the opportunities of a CBDC

Design principle	Summary	Opportunity
Uniform	A CBDC that is uniform would be exchanged 1:1 with cash and support the NZD as our single unit of account.	A CBDC supports the continued use of the NZD as our unit of account
Universal	<p>A CBDC that is made available to all households and businesses would:</p> <ul style="list-style-type: none"> • Provide access to the benefits of central bank money – as a stable value anchor and lowest-risk form of money – to all. • Support financial inclusion through support for the unbanked and making direct government-to-person payments. • Provide resilience in payments systems by providing an alternative in case other systems fail. 	<p>A CBDC supports the continued use of the NZD as our unit of account</p> <p>Serving the financially and digitally excluded with a CBDC</p> <p>Improving payment system resilience with a CBDC</p>
Cash-like	A CBDC should facilitate autonomy and privacy in paying and saving, provide a personal back-up form of payment (including offline functionality to the extent possible) and enable peer-to-peer payments.	<p>Serving the financially and digitally excluded with a CBDC</p> <p>Providing autonomy in saving and paying and a personal back-up with a CBDC</p>
Innovative	<p>A CBDC should be designed to:</p> <ul style="list-style-type: none"> • Meet evolving needs and maintain the transactional relevance of central bank money over time, including by supporting electronic peer-to-peer payments and near or instant settlement. • Drive innovation and cost efficiency for end users, including through competition and open access. • Be interoperable with other payments services. • Support cross-border payments and be able to support low-cost remittances. • Provide the option of a new monetary policy tool. 	<p>Improving central bank money to meet future needs</p> <p>Potentially providing an additional monetary policy tool</p> <p>Increasing innovation and competition in domestic money and payments</p> <p>Improving payments system resilience</p> <p>Improving cross-border payments and remittances</p>

Meanwhile, Section 5 presented the challenges and risks that a CBDC could confer. To summarise:

1. A CBDC would present challenges and risks that would need to be resolved before it could be issued. A CBDC, like other electronic systems, would be exposed to operational and cyber security risks that, if realised, could have significant impacts on price and financial stability.
2. The implementation of a CBDC could have potentially very large impacts on banking sector funding and on the Reserve Bank's balance sheet. This could be destabilising for the financial system if not mitigated or managed appropriately.
3. It can be seen that designing a CBDC that captures all benefits and mitigates all challenges raises a myriad of issues that need to be considered and consulted on, which is why the Reserve Bank sees the process of policy development for a CBDC as multi-dimensional and one that will take a considerable amount of time to work through.

Given these challenges, two additional design principles for future work on a CBDC should be added to the four set out above.

Table 3: Design principles addressing challenges of a CBDC

Design principle	Summary	Challenge
Managed issuance	A CBDC should be issued and governed by the Reserve Bank in a manner that avoids unnecessary disruption to the cash system, wider financial system and monetary policy settings.	Risks to the banking system
Integrity	<p>Given the operational challenges and risks of a CBDC as both a digital form of money and central bank money, a CBDC will need to have a high level of integrity. A CBDC should:</p> <ul style="list-style-type: none"> • Be unquestionably operationally resilient – that is, have a similarly low tolerance for system outages and down-times as existing systemically important payment infrastructure. • Not be able to be 'double-spent' or fraudulently spent, similarly to the expectations of banknotes and coins and of transaction accounts. • Provide near-instant and legally final settlement. • Have appropriate compliance and risk management controls and comply with all regulations. 	<p>Operational complexities and risks</p> <p>Design complexities</p>

7 Conclusion and next steps

As steward of money and cash, the Reserve Bank is considering the opportunities and challenges of a CBDC that is issued to all.

This Issues paper describes how a CBDC could contribute to the Reserve Bank's stewardship objectives but how it could also present several significant risks and challenges. The opportunities and challenges of an abstract CBDC have led the Reserve Bank towards a set of high-level design principles. These principles provide an indication of what a future CBDC might need to look like and can be used as a guide for future investigations. The principles are summarised below.

Table 4: CBDC design principles

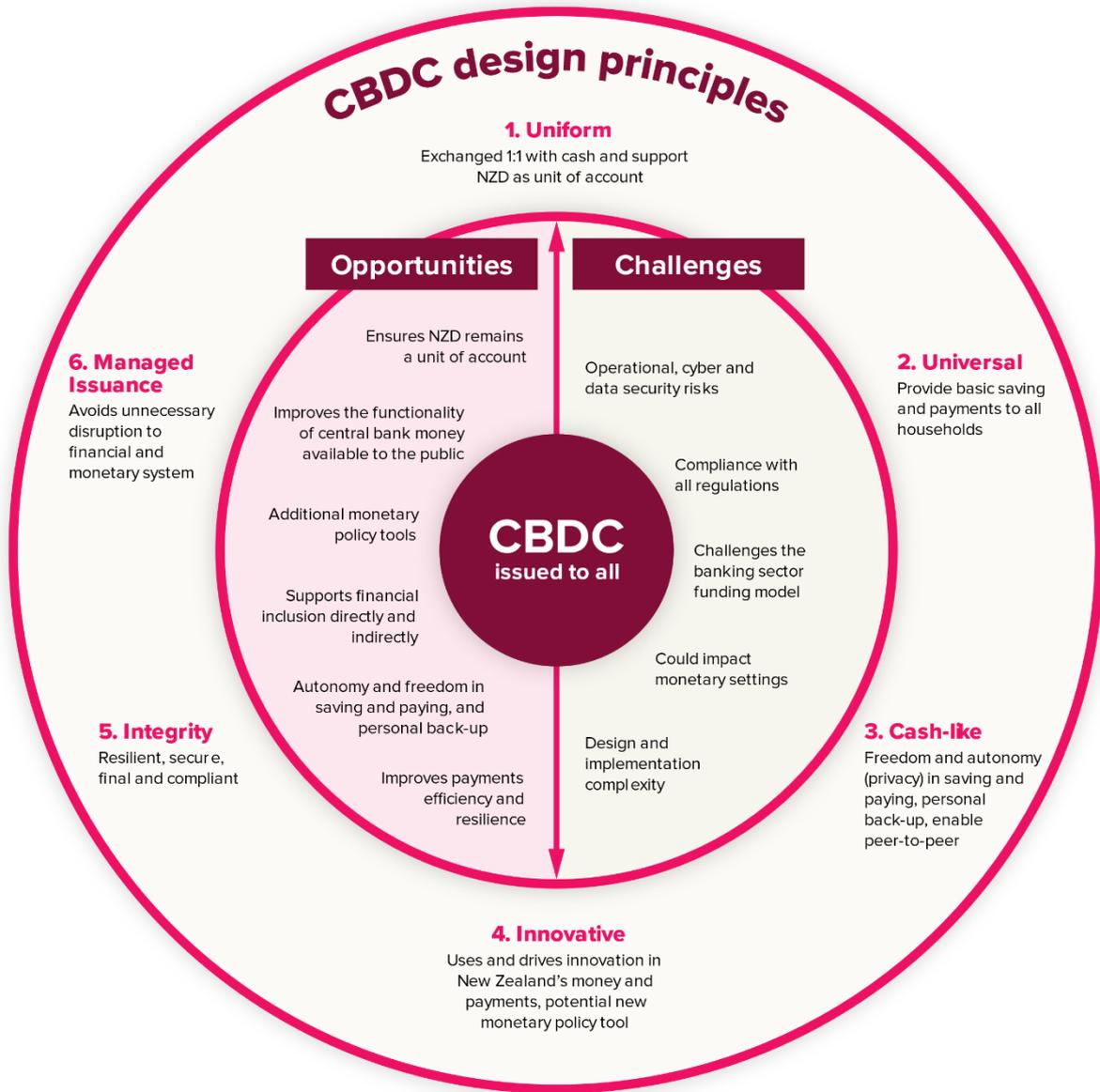
CBDC design principles	
1.	Uniform: A CBDC should be exchanged 1:1 with cash and support the NZD as our single unit of account.
2.	Universal: A CBDC should provide low-cost, basic saving and payments to all households, including those that are financially and digitally excluded.
3.	Cash-like: A CBDC should facilitate autonomy and privacy in paying and saving, provide a personal back-up form of payment, and enable peer-to-peer payments.
4.	Innovative: A CBDC should be modern, be interoperable and drive innovation in New Zealand's money and payments ecosystem, and provide a potential new monetary policy tool.
5.	Integrity: A CBDC should be unquestionably operationally resilient, avoid double-spending, provide near-instant final settlement and comply with all regulations.
6.	Managed issuance: A CBDC should be issued and governed by the Reserve Bank in a manner that avoids unnecessary disruption to the cash system, the wider financial system and monetary policy settings

Note: The shaded rows denote principles that on balance address the opportunities of a CBDC, and the white area denotes principles that on net address the challenges of a CBDC. In practice, some principles address both opportunities and challenges raised in this paper.

We are seeking public feedback on the opportunities, challenges and indicative design principles. Following public engagement on the issues outlined in this paper, and subject to that feedback, we will conduct a detailed design and scenario analysis to understand the performance and impacts of different CBDC designs. This analysis will help us identify how the opportunities and challenges identified in this paper might play out in practice and how the risks could be mitigated.

Figure 12 The CBDC wheel

The CBDC wheel summarises the key elements of this paper. It sets out the opportunities, challenges associated with a CBDC issued to all, and the resulting design principles proposed in this paper to guide further work.



8 Have your say

We want to hear what you think about the issues and proposed approaches outlined in this paper.

We need your feedback by 10am, Monday, 6 December 2021.

If you can, please use the online feedback form available at <https://www.surveymonkey.com/r/Future-of-Money-CBDC>. You do not need to answer every question, there is an opportunity to give free-text answers, and you may attach documents if you wish. Doing this online will assist with collation and analysis of all the feedback received.

If you wish to send us a letter instead of answering the questions then you can do so using the online questionnaire. You just need to enter your details and attach the letter without answering the questions. Or, you can email or post your letter to: futureofmoney@rbnz.govt.nz

Future of Money
Money and Cash Department
Reserve Bank of New Zealand
PO Box 2498
Wellington 6140

Or, if none of the above options are suitable then please phone us on 04 474 8693 between 10am-4pm Monday-Friday and we'll arrange a time to call you back to take down your views.

We intend to prepare and publish a summary of responses to the three issues papers we are releasing, and an outline of next steps, by 30 April 2022.

We would like your feedback on the following:

1. Do you agree with the motivations for considering a CBDC, as set out in Section 3? Which motivations are more compelling to you (the declining cash use, innovations in private money or the Reserve Bank's stewardship objective to preserve the fairness and equality afforded by central bank money)? Please rank them in order.
2. Are there other motivations not discussed in this paper that should be considered?
3. Do you agree that the scope of work should focus on a general-purpose CBDC in the first instance?
4. Do you agree with the multi-step process for the development and implementation of a CBDC as outlined in Section 3.1 and illustrated in Figure 8?
5. Do you agree with the description of the opportunities presented through the implementation of a CBDC?
6. Are there other opportunities that should be considered?
7. Do you agree with the design principles that have been developed to capture the opportunities, described in Section 4?
8. Are there other design principles to capture the opportunities that should be considered?
9. Do you agree with the description of the challenges and risks in Section 5?
10. Are there other challenges and risks that should be considered?

11. Do you agree with the design principles that have been developed to harness the opportunities and to address the challenges described in Sections 5 and 6 respectively?
12. Are there other design principles that should be considered in respect of the opportunities and challenges described in Sections 5 and 6 respectively?

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Annex A: A primer on the inefficiencies in New Zealand's payments system

New Zealand's payments ecosystem is underpinned by ESAS, a real-time gross settlements system responsible for settling all electronic interbank payments. It provides the core infrastructure (platform) on which a set of overlaying payment clearing and settlement systems is built. These arrangements form the '*back end*' of domestic payments, are governed by an industry body, and subject to Reserve Bank regulation and supervision.

Currently, access to wholesale accounts at the Reserve Bank is limited to a small set of regulated financial institutions with business needs to access settlement services, and the holding of deposits in accounts is not encouraged. New payment service providers, fintechs and non-bank deposit takers that cannot access wholesale central bank money or settlement services must instead settle their obligations via commercial bank services.

The *front end* of the payments system consists of a series of additional *overlay* and *standalone* payments systems that are owned and operated by commercial banks and payment service providers, including payment messaging services, card issuers and acquirers, point-of-sale technology providers and digital wallet providers.⁵⁵ In New Zealand, the prevalence of proprietary-owned (closed-source) point-of-sale technology and commercial-bank-owned payments systems makes it difficult for new retail payments platforms, service providers and business models to enter.

Due to the network effects and benefits of vertically bundling services, incumbent service providers are better off when a larger number of users interface with their platforms, and consequently may not be inclined to allow competing providers to access their systems. Any competitor must establish its own network of users in order to gain traction.

The lack of competition in New Zealand's payments system has contributed to low incentives to address front-end pain points and frictions, or to service low-volume customers, and has resulted in high card-interchange fees. For example, the vast majority of payments in New Zealand are not settled instantly,⁵⁶ and although the risk of settlement failure is very low and the system is suitable for many if not most transactions, certain use cases such as peer-to-peer payments would benefit from 24/7, seamless and near-instant settlement. Such solutions have been provided in other jurisdictions supported by faster payments systems.

Additionally, high card-interchange fees are predominantly borne by small merchants that have little bargaining power, and this has resulted in some merchants refusing certain card payments, such as contactless payments. Our 2020 survey revealed that 72 percent of New Zealanders preferred to use credit or debit cards as their main way of paying, and 36 percent preferred to use the contactless functions on their cards as their main way of paying.⁵⁷ The Government has announced it is setting up a regulatory regime for the retail payment system. As part of this regime, interchange fees for Visa and Mastercard products will be regulated.⁵⁸

⁵⁵ BIS (2020).

⁵⁶ The time of day in which a payment in New Zealand will be settled is bank and system dependent. Most payments are settled within an hour but payments instructed overnight, during weekends or on public holidays are not processed until the next business day.

⁵⁷ RBNZ (2021a).

⁵⁸ See mbie.govt.nz/business-and-employment/business/competition-regulation-and-policy/retail-payment-systems.

Finally, cross-border payments are opaque, slow and expensive. These payments rely on a system of correspondent banks and international messaging services to instruct and settle payments. Frictions include fragmented data standards, a lack of interoperability, different compliance requirements, varying operating hours and dated legacy payment system platforms.⁵⁹ Remittances to and from New Zealand and the Pacific are particularly costly due to a small number of providers and AML/CFT costs.⁶⁰

⁵⁹ FSB (2020).

⁶⁰ To address global cross-border issues, the Financial Stability Board, Committee on Payments and Market Infrastructures and other international organisations, initiated by the G20, have been leading a roadmap to enhancing cross-border payments. The roadmap sets out a commitment to enhance the existing payments ecosystem and explore the potential for new and emerging technologies to also improve cross-border payments. To support improved cross-border payments in the Pacific, the Reserve Bank is working for other government agencies in New Zealand, Australia and the Pacific to reduce the costs of complying with AML/CFT regulations in the Pacific.

Annex B: Account-based vs token-based digital money

Broadly speaking, digital currency can be broken down into two categories: currency that relies on existing technologies and conventional account-based structures, and currency that employs new or different technologies such as distributed-ledger technology and public-private key cryptography. These two groupings have been categorised as 'account-based' and 'token-based' money due to the different verification processes employed in making payments.

Conventional account-based money

The best example of conventional account-based digital currency is funds held in a transaction account at a commercial bank. Ownership of the funds is proven by identity. To spend funds, a person must prove they are the rightful owner of the funds. Auer et al (2020) characterise this relationship as "I am therefore I own".

With account-based currency, a central agent manages a ledger of accounts; in our example it is the commercial bank. The central agent arranges refunds and payment cancellations as necessary in the case of payments made in error and fraudulent payments. Funds can be accessed through a variety of channels including online websites and payment cards. If passwords or cards are lost they can be replaced upon verification of the owners' identities as the rightful owners of the funds.

Other examples of account-based money include funds in ESAS, in digital wallets such as PayPal and Apple Pay⁶¹ and credit card schemes. As interest is already paid in ESAS, it would be conceptually easy to pay interest on a new account-based CBDC.

Token-based money

The best examples of token-based currency are physical payment tokens like notes and coins. The ownership of the cash is proven by physical possession (the bearer pays). There is no central agent managing transactions of cash, and once a payment has been made with cash it cannot be cancelled or refunded. Auer et al. (2020) define physical token ownership as "I possess therefore I own" and digital token ownership as "I know therefore I own".

Digital token-based money can be best understood by the example of cryptocurrencies, where ownership is proven by knowledge of a private key that is used to sign transactions digitally. Verification that the private key is correct can be performed by anyone (using public-private key cryptography) and consequently, once payments have been made, they cannot be cancelled or refunded.

A token-based CBDC could be programmable in that actions and rules can be embedded into money tokens, for example to execute contractual agreements after certain conditions have been met. The choice to issue a CBDC as account based or token based would depend on which design is considered the best to meet the CBDC objectives.

However, it may be more challenging to pay interest on token-based CBDC without affecting the 1:1 value of the tokens compared to other forms of fiat money. A token-based CBDC operates in a manner more similar to cash, whereby each token represents a specified face value. To pay interest on cash would be to change its value, and has not been carried out in practice. Conceptually, this could also hold true for a token-based CBDC.

⁶¹ Apple, the Apple logo, and Apple Pay are trademarks of Apple Inc., registered in the US and other countries.

The distinction between account-based and token-based money can be summarised by considering the features offered to the end user. These are summarised in Table A1. One important distinction relates to ownership, where the ownership of money held in accounts is proven by identity, whereas the ownership of token-based money is proven by possession.

Table A1: Features of account-based and token-based digital money

Features	Account-based money	Token-based money
Ownership (and ability to spend)	Proven by identity, verified by a central intermediary: "I am therefore I own".	Proven by possession of token, verified by decentralised network of users with no central intermediary: "I know therefore I own".
Transparency	Only the central agent can view all information. Central agent can choose how widely information is shared.	Depending on the infrastructure, up to all transaction information can be seen by everyone, but it is not linked to individual identities.
Programmability	Operational rules programmed on actions pertaining to funds held in the account.	Operational rules programmed into the tokens.
Risks	Account can be hacked or identity stolen. Centralised agent bears cost of risk management.	Tokens can be lost or private keys stolen. Individual bears cost of risk management.
Ability to earn interest	Interest paid on account balances.	Interest paid on a token might affect the exchange rate between tokens and other forms of money

Source: Auer, R and R Böhme (2020), Wadsworth (2018b), and author's elaboration.

Annex C: Reserve Bank balance sheet

The impacts of issuing a CBDC on the Reserve Bank's balance sheet would depend on both the size of the demand for a CBDC and whether and how that demand would be met.

Table A2 provides three scenarios to illustrate how the Reserve Bank's balance sheet could be affected.

In the first scenario, demand for the CBDC is moderate and the Reserve Bank only issues CBDC in exchange for either cash or deposits in transaction accounts. The second scenario assumes demand for CBDC is high and the Reserve Bank still issues CBDC in exchange for other assets (presumably because there are insufficient funds in transaction accounts to swap for CBDC). The third scenario assumes the Reserve Bank issues CBDC as a monetary policy tool by exchanging it for other assets only.

Scenarios two and three highlight that a run on commercial bank transaction accounts to a CBDC could also increase the Reserve Bank's balance sheet if the commercial banks used liquid and non-liquid assets to swap for CBDC. They also show that if a CBDC were to be issued in exchange for other non-liquid assets then a CBDC would provide some monetary stimulus, i.e. it could be issued as a monetary policy tool or its issuance might conflict with monetary policy settings if that impact were not intended.

Table A2: Stylised examples of Reserve Bank balance sheet impacts from issuing CBDC

Scenario 1: Demand for CBDC is low to moderate

Assets	Liabilities and equity
	Cash in circulation – CBDC[a]
	Bank settlement accounts – CBDC[b]
	+ CBDC[a] + CBDC[b]

Note: CBDC[a] represents transfers from cash and CBDC[b] represents transfers from transaction accounts.

Scenario 2: Demand for CBDC is high

Assets	Liabilities and equity
+ CBDC[c]	Cash in circulation – CBDC[a]
	Bank settlement accounts – CBDC[b]
	+ CBDC[a] + CBDC[b] + CBDC[c]

Note: CBDC[c] represents new CBDC balances being issued in exchange for other assets, similar to the LSAP programme.

Scenario 3: CBDC issued as monetary stimulus

Assets	Liabilities and equity
+ CBDC[d]	Cash in circulation
	Bank settlement accounts
	+ CBDC[d]

Note: CBDC[d] represents the central bank buying assets using a newly created CBDC, similar to the LSAP programme.

Scenarios 2 and 3 both illustrate that increases in CBDC[c] and CBDC[d] provide monetary stimulus.

Annex D: Wholesale CBDC

While our current priority is to consider a general-purpose CBDC, this paper refers to another kind of CBDC: the wholesale CBDC. This annex provides background on the concept.

A wholesale CBDC can be thought of as a limited-purpose and limited-access CBDC that might bring particular benefits to wholesale payment efficiency and resilience. The benefits of a wholesale CBDC in New Zealand appear to result from broader access to wholesale money (not currently conferred by ESAS), and opportunities to improve wholesale payments and settlements, including post-trade settlements. However, many of these benefits could also be achieved by revising our ESAS rules, or reforming wholesale post-trade settlement infrastructures. Compared to a general-purpose CBDC, the challenges of issuing a wholesale CBDC are potentially less complex due to the sophistication of the users and, owing to a limited number of participants, fewer use cases to design for and solve.

Access to wholesale central bank money

A wholesale CBDC could expand access to wholesale central-bank money beyond current ESAS members. Non-ESAS members are subject to higher payments and settlement fees and less choice of settlement assets. Access to a new form of wholesale central bank money could encourage and support innovation – new providers could build payment services using the CBDC platform and conduct settlement in central bank money. The Committee on Payments and Market Infrastructures (CPMI) recommends that central banks ensure that the provision of central bank money through wholesale deposit accounts and their corresponding payments systems is flexible enough to allow for innovations in money and payments.⁶² The Bank of England and Swiss National Bank have recognised the benefits to competition and the neutrality of central bank money by expanding access to their real-time gross settlement systems to non-banks and payment service providers.⁶³

There are two reasons why we might issue a new CBDC rather than expand access to ESAS. First, expanded access to ESAS might pose challenges to the stability of the interbank settlement system and our reputation if it were not accompanied by rigorous risk controls. However, such risk controls could be too onerous for smaller firms. Second, a new, purpose-built CBDC could be designed to ensure that it is future proofed and optimised for new wholesale use cases, for example by considering token-based technologies and an expanded purpose and functionality.

Post-trade efficiency

A new form of wholesale CBDC could also be designed to increase efficiency in post-trade clearing and settlement. For example, a token-based CBDC could be used to facilitate faster and more efficient post-trade securities or foreign exchange settlement. A token-based CBDC could be used to settle the payment side of delivery vs payment transactions and payment vs payment transactions. Such tokenised settlement is beneficial, as it does not require the underlying ledgers to interoperate for a settlement to occur, can reduce the costs and complexities of ownership records and transaction histories, and can support the development of new structures in securities settlement.⁶⁴

⁶² CPMI (2003).

⁶³ The Bank of England cited that expanding access would increase innovation in the payment system and reduce single points of failure in the payment system (see Bank of England (2017)). The BoE's expanded access was accompanied by a comprehensive risk management framework with which all members must demonstrate compliance. The Swiss National Bank expanded access to its real-time gross settlements systems to non-bank firms, including cash-processing operators, licensed fintechs and FMs[financial market infrastructures?] in 2019. The Reserve Bank of Australia has also recommended that the new payment platform be open to a range of payment service providers, and the Reserve Bank of India was scheduled to review the membership of its core payment systems (see CPMI and World Bank (2020)).

⁶⁴ Bech, M, Hancock, J, Rice, T and A Wadsworth (2020).