Cambridge Centre for Alternative Finance

UNIVERSITY OF CAMBRIDGE Judge Business School

CAMBRIDGE DIGITAL ASSETS PROGRAMME

Considering Digital Assets for Humanitarian Cash-Based Transfers

Initial Scoping Study

with the support of UK International Development

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Please cite this study as *'CDAP at CCAF (2023) Considering digital assets for humanitarian cash-based transfers, Cambridge Digital Assets Programme at The Cambridge Centre for Alternative Finance'*

Table of contents

Research team

The Cambridge Centre for Alternative Finance (CCAF) research team consists of the following individuals: Jill Lagos Shemin, Damaris Njoki, Michel Rauchs, Zain Umer, Simon Callaghan, Alexi Anania and Bryan Zhang.

Contributors

The CCAF would like to thank the UN World Food Programme (WFP) for numerous interviews and for sharing their expertise in humanitarian cash transfers. The CCAF would like to thank the following individuals for their considerable support in developing and editing this report: Jorge Fernandes, Kyriacos Koupparis, Othalia Doe-Bruce and Suzana Moreno.

Firas Dahi, Aleksandra Fiutowska and William Tsao provided valuable research support at the project's initiation. Bruce Davis and Christopher Jack supported as reviewers.

Acknowledgements

The CCAF would like to thank the Foreign Commonwealth & Development Office (FCDO) for making this report possible and for their continued support of the CCAF and its research endeavours.

The CCAF is immensely grateful to the Cambridge Digital Assets Programme and its founding supporters for their continued support of innovative research in digital assets:

- Accenture
- Bank for International Settlements (BIS) Innovation Hub
- British International Investment (BII)
- Dubai International Financial Centre (DIFC)
- Ernst & Young
- Fidelity
- UK Foreign, Commonwealth & Development Office (FCDO)
- Goldman Sachs
- Inter-American Development Bank (IDB)
- International Monetary Fund (IMF)
- Invesco
- London Stock Exchange Group (LSEG)
- Mastercard
- MSCI
- Visa
- World Bank

The research team would like to thank Alpa Somaiya for the proofreading, Louise Smith for designing the report, and Neil Jessiman for press and communications support.

UK International Development

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The UK Foreign Commonwealth & Development Office (FCDO) welcomes the Cambridge Centre for Alternative Finance's (CCAF) latest expert assessment of digital assets (DAs) for cash-based transfers (CBTs). This paper contributes important knowledge to the discussion of DAs in humanitarian settings, highlighting from the Philippines pilot and extrapolating more broadly where DAs can improve the efficiency and effectiveness of humanitarian CBTs and where challenges remain.

Over the past decade, the UK has been at the forefront of the global revolution in digital financial services and assets. Leveraging UK expertise, the FCDO has worked internationally with partners to enable innovative and inclusive digital finance to support traditionally underserved and unserved customers. UK investments, including those delivered by British International Investments, strengthen financial markets in fragile and conflict-affected states to strengthen inclusive local markets.

Catalysed by the growth of the digital economy, DAs provide an innovative way of transferring economic value. The Covid-19 pandemic highlighted the value of digitalisation globally in providing economic relief packages. The need to disperse funds urgently shone a spotlight on existing cash transfer systems and the potential of DAs in providing alternative means of accessing financial services, supporting supply-chain management, and facilitating the distribution of aid and resources.

The proliferation of DAs has the potential to provide more efficient, transparent and secure ways of delivering aid and assistance to those in need. Considering their application in the Philippines, this paper highlights contexts in which DAs can operate effectively, albeit with the need of careful consideration of local factors. Benefits and trade-offs associated with DAs are contextually significant, and the choice and dignity of beneficiaries must be foundational to any intervention, including for women and girls.

The potential of DAs is huge. For example, the Philippines has a strong international reputation on disaster risk management and finance and it's possible that learning from this study could be applied more broadly to national policies, using DAs to link national pay-outs from insurance or catastrophe bonds to more efficiently and equitably reach individuals and businesses most in need.

In setting out a foundational framework for understanding DAs, this paper also points to further research in terms of benefits and challenges for agencies and beneficiaries in other local contexts. As a leading humanitarian donor, and given the increase in humanitarian crises globally, the UK is keenly interested in these efforts to use DAs to improve our collective humanitarian response for the benefit of those in need.

Nick Dyer
Director General Humanitarian and Development
Foreign, Commonwealth and Development Office

Cambridge Centre for Alternative Finance
UNIVERSITY OF CAMBRIDGE Judge Business School

CAMBRIDGE DIGITAL ASSETS PROGRAMME

In the past, emerging payment technologies such as mobile money and e-voucher cards have increased the efficiency and effectiveness of humanitarian cash-based transfers (CBTs). Today the humanitarian sector has begun exploring the next generation of emerging technologies and how they can offer more choice and resilience for beneficiaries. In this context, humanitarian agencies and development sector stakeholders are exploring whether different forms of digital assets, which can include cryptocurrencies, stablecoins, CBDCs and tokenised deposits, can bring innovation and real benefits to humanitarian aid.

However, the novel nature of digital assets means there are significant gaps in a common understanding of the language and terms and also in the foundational understanding of what features or designs designate something as a digital asset. Indeed, much of the global policy dialogue and debate around digital assets is in a state of flux and still being determined, especially concerning how digital assets are classified in regulations.

To bridge this gap among humanitarians and broader audiences alike, this scoping study conducted by the Cambridge Centre for Alternative Finance (CCAF) at the University of Cambridge Judge Business School provides some considerations for using digital assets in humanitarian CBTs. As part of the output from the CCAF's Cambridge Digital Assets Programme (CDAP), with the support of the UK Foreign, Commonwealth & Development Office (FCDO), this study provides a comprehensive introduction to digital assets and a conceptual framework to understand the potential use cases, value and risks for using digital assets in humanitarian CBTs. In particular, the analysis contained in the study identifies three humanitarian operating environments where digital assets are likely to have the most value-add compared with more conventional CBT approaches.

We are regularly reminded that humanitarian crises are not abating; if anything, they are growing in frequency, acuteness and duration. In the years to come, as the global digital assets ecosystem continues to develop, more research is needed to inform evidence-based intervention, humanitarian aid strategy and policymaking. For instance, conducting empirical research to better understand the conditions necessary for the safe, efficient, effective and scalable use of digital assets in CBTs. Further research on the longer-term effects of digital asset-based CBTs in resilience-building and financial inclusion will also be critical.

We hope this study will contribute in small part to a future where the humanitarian and development sectors can better harness technological innovation to provide aid and relief in times of need. We are very grateful to members of CDAP, the UK FCDO and colleagues at the United Nations World Food Programme for their help and support in making this study possible.

Bryan Zhang
Co-Founder and Executive Director
Cambridge Centre for Alternative Finance

Glossary

anti-money laundering – laws and regulations intended to stop criminals from disguising illegally obtained funds as legitimate income.

application programming interface – allows software programs to interact by exchanging data, enabling specific actions such as making a transaction. This includes payment APIs, data APIs, 'ecosystem expansion' APIs and 'consent and identity' APIs.

bigtech – large technology companies with extensive customer networks; they include firms with core businesses in social media, internet search, software, online retail and telecoms.

cash-based transfer – money/currency value given to identified people in need by a humanitarian or public agency. Humanitarian cash-based transfer programming often also includes vouchers.

central bank digital currency – an electronic form of central bank money that enables households and businesses to store value and make payments. It is central bank digital money in the national unit (for example, USD) representing legal tender. The liability lies with the central bank, similar to the physical currency in circulation.

decentralised finance – a financial ecosystem based on blockchain technology that lets users buy and sell assets and financial services as a form of investment or financing without middlemen.

dematerialised security – an uncertificated financial asset recorded in electronic book-entry form by a central securities depository.

digital asset – a digital instrument issued or represented using distributed ledger or similar technology. It does not include digital representations of fiat currencies, such as e-money.

digital financial services – services, such as payments, transfers, savings, credit, insurance, securities, financial planning and account statements, delivered via digital/electronic technology (for example, e-money, payment cards and regular bank accounts).

digital twins – digital representations of physical objects that embody the same rights.

distributed ledger technology – a digital system that allows simultaneous access, validation and record updating across a networked database. Distributed ledgers have no central point of control.

e-money – refers to issuing electronic funds and providing the digital means to access these funds.

end-to-end payments – a payment processing system that processes all payment types in one place.

financial token – used for investments (equity or debt instruments); often referred to as security tokens or digital or tokenised securities.

fintech – an acronym for 'financial technology'. It refers to technological advances that can transform financial services, stimulating the development of new business models, applications, processes and products.

natively digital security – a security that has been directly issued in the form of a digital asset with no corresponding physical or electronic underlying.

non-fungible token – a digital asset whose uniqueness and ownership can be demonstrated and verified using distributed ledger technology. It can create a tokenised proof of title to a unique digital version of an underlying digital asset (such as an image or a video) or physical asset (such as a painting or sculpture).

open-loop payment system – a payments network enabling otherwise closed-loop payment systems to share endpoints, for example, a card-based payment system that allows ATM cards from one bank to be used at another bank's proprietary ATMs.

payment tokens/digital currencies – currency/payment tokens in their pure form fulfil the economic criteria of money, serving as a means of exchange, store of value and unit of account.

permissioned distributed ledger technology system – a system that operates in controlled institutional environments where designated gatekeepers restrict access to a limited number of identified parties.

permissionless distributed ledger technology system – a system that provides a global decentralised infrastructure that anyone can plug into without disclosing their identity or receiving prior permission.

skeuomorphism – when graphical interface objects mimic their real-world counterparts' appearance or how users can interact with them.

smart contracts – self-executing computer programs that automatically enforce the rules and conditions encoded in them.

stablecoins/tokens – a category of cryptoassets that aims to maintain a stable value with reference to a specified asset or basket of assets and provide stability compared to the high volatility of unbacked crypto-assets. They are often pegged to a specific fiat currency.

tokenised security – an existing security (physical or dematerialised) represented as a digital asset on a shared ledger.

utility token – a token that gives the holder the right to use a product or demand a service.

virtual asset – a form of digitally stored value created by agreement within the community of virtual asset users. It is a medium of exchange that can be digitally traded or transferred and used for payments or investments, for example, a digital asset such as Ethereum. It does not include digital representations of fiat currencies, securities or other financial assets covered elsewhere in an organisation's stipulations.

virtual asset service provider – any entity that offers services or engages in activities that enable the transfer or exchange of virtual assets, for example, exchange between virtual assets and fiat currencies, exchange between one or more forms of virtual assets, transfer of virtual assets, and safekeeping and administration of virtual assets or instruments enabling control over virtual assets.

Acronyms

AML – anti-money laundering

API – application programming interface

ASEAN – Association of Southeast Asian Nations

ATM – automated teller machine

BIS – Bank for International Settlement

CBDC – central bank digital currency

CBT – cash-based transfer

BSP – Bangko Sentral ng Pilipinas

CCAF – Cambridge Centre for Alternative Finance

CCV – Crypto Collateralized Voucher

CFT – combatting the financing of terrorism

Covid-19 – Coronavirus disease

DA – digital asset

DeFi – decentralised finance

DFS – digital financial services

DLT – distributed ledger technology

e-money – electronic money

ETH – ether (the cryptocurrency)

fintech – financial technology

forex/FX – foreign exchange

FSP – financial services provider

ISS – Informal Sector Survey

IT – information technology

KYC – know your customer

NGO – non-governmental organisation

MNO – mobile network operator

MSMEs – micro, small and medium-sized enterprises

NFT – non-fungible token

PoS – point of sale

PSA – Philippine Statistics Authority

SDG – Sustainable Development Goal

UN – United Nations

UNICEF – United Nations Children's Fund

VA – virtual asset

VASP – virtual asset service provider

WFP – World Food Programme

Executive summary

Inspired by the considerable potential of distributed ledger technologies (DLTs) and digital assets (DAs), innovative humanitarian agencies have piloted projects to test DA implementation and how DAs can enhance existing services to meet the essential needs of the people they serve. However, there is limited foundational understanding of DAs, the different categories and types, and the different risks and benefits they may bring and in what contexts. This study seeks to extend this understanding for humanitarian actors.

We reviewed previous pilot programmes for this scoping study and used the Philippines as an illustrative case study to demonstrate how to consider country-specific contexts for potential DA pilots. The aim was to provide foundational knowledge on DAs and the factors that should be considered when implementing DAs for humanitarian cash-based transfer (CBT) programmes.

This paper identifies three humanitarian aid environments where DAs will most likely add significant value to CBT operations. These environments tend to be those that have little or no direct access to the global financial system, are prone to very high inflation or currency volatility, and have markets with low rates of financial inclusion, high informality and a robust digital finance infrastructure, plus a demonstrated trend in the uptake of one or several types of DAs.

The empirical review findings of CBT pilots using DAs suggest that DAs have the potential to benefit agency operations and beneficiaries, especially in mitigating the challenges of local currency instability, expensive international money transfers and privacy protection, and improving access to financial services for unbanked beneficiaries (including those who do not have access to mobile money services). Changes and related gains are more likely to be incremental than revolutionary and occur in parallel to existing CBT modalities. Indeed, how DAs and the underlying DLTs continue to advance and innovate may solve scalability issues, tracking aid disbursement and increasing the speed with which much-needed financial aid reaches beneficiaries.

Beyond the empirical review, there is little analysis in the current literature of how beneficiaries experience, or even if they prefer, DAs compared to the current CBT modality. The same applies to DA cost efficiencies and cost benefits compared to current CBT modalities. However, the results of our initial pilot regarding cost efficiencies offer a compelling justification for testing DA systems in various settings to more clearly determine if economies of scale and system advancements could cut costs further. This lack of knowledge limits humanitarian agencies' understanding of DA benefits and their ability to critically consider their value and applicability in CBT operations.

This paper further highlights other issues to consider before implementing or scaling pilots into production. Some of these issues relate to implementation practicalities, such as infrastructure and the broader economic impact. Other practical considerations include evaluating whether DAs benefit the target beneficiaries and aid agencies more than other CBT modalities in specific contexts: converting DAs into local physical currency and cashing out, and how digital literacy influences the value a DA implementation would have. For any CBT intervention, providing beneficiaries with choice and dignity is a priority in humanitarian aid delivery. Thus, it is a crucial consideration in any DA CBT intervention. Indeed, this is what drives the humanitarian industry's interest in this study. Finally, it is essential to acknowledge that to encourage the use of any new modality, it must usually be as equally useful or advantageous as the current modality or currency is for the potential user. While known technologies – in this case, current CBT modalities in use – may have many challenges, such as higher costs and even unreliability, the challenges are known. For example, even though mobile money has scaled in many parts of Africa, it is still heavily cashed out into the local cash economy.

In this paper, we lay the foundations for understanding DAs, their unique properties and the factors to consider in pilot design. We hope it is a valuable resource for humanitarian actors in directing future research and resources on further exploring DAs in CBT operations and their delivery to beneficiaries.

1 Introduction

> Digital assets are a natural evolution in how economic value is represented and transferred. Building on advances in cryptography, peer-to-peer networking and distributed consensus, they follow the transition from physical tokens to electronic ledger-based entries and play an increasingly important role in digitally transforming financial markets and the economy at large.

1 Introduction

1.1 Background

Humanitarian responses and other development contexts have had to adapt rapidly to the changing landscape of technology and connectivity. In this regard, humanitarian aid agencies have leveraged technology advancements to enhance and broaden their reach and address challenges in reaching and supporting some of the world's most vulnerable populations.

One significant development has been the gradual shift from relying solely on in-kind assistance (food, shelter and blankets) to using innovative technology enabling CBTs or a hybrid intervention due to the need to adopt modalities that improve efficacy and traceability, foster long-term resilience and encourage multi-agency collaboration. More importantly, CBT programmes empower people, giving them the means and choices to address their essential needs in local markets.

Cash-based transfers have a track record of achieving these outcomes in local economies and initiating other multiplier effects. They are therefore being integrated into the policies, guidelines, standards and statements of principles of humanitarian agencies. To optimise the efficiency and transparency benefits of CBTs, humanitarian agencies and governments have been steadily transitioning from physical cash to electronic and mobile payment programmes that enable integrated end-to-end payments. Recent and current trends show that using e-money and other forms of digital money for humanitarian aid is increasing. With agencies and mandates continuing to focus on and bring a responsibility to resilience-building, there are robust debates in humanitarian circles/thought leadership on the link between CBTs and financial inclusion. The potential of these electronic and mobile payment programmes is promising, yet their full realisable capabilities are constrained because of the related limitations that plague existing CBT modalities. For example, refugees cannot access bank services such as transfers as they do not have the necessary identification, and to receive mobile money transfers, cash access points must be within a reasonable distance of beneficiaries. There are also several sociological issues, such as mobile phone ownership, especially concerning women in households where men are generally the primary custodians of handsets. However, recent research shows that the gender gap is closing worldwide.[i] As agencies adapt and scale CBT deployments, they are exploring ways to overcome the inherent limitations of using existing CBT modalities to improve outcomes for their beneficiaries and their own operations.

Recent advancements in DLT, the algorithmic technology base of which blockchain is one example, have brought another financial innovation – DAs – into more mainstream finance and payments conversations. These assets are a new digital means for recording and transferring economic value and have divided opinions on whether they have a future or even any relevance in replacing or complementing conventional CBT modalities. There are advocates that exaggerate their potential in humanitarian aid and sceptics. However, initial evidence from certain 'proofs-of-concept' DA pilots and real-world deployments shows that they can be beneficial, although the cases are limited and conducted in different contexts, and many use cases remain theoretical.

1.2 Objectives and methodology

This initial scoping study aims to provide a foundation and level of fluency for humanitarian actors, enabling them to initiate discussions on the feasibility, tangible benefits, implementation challenges and risks of using DAs for electronic humanitarian CBT disbursements. The paper also presents foundational knowledge on DAs more generally, and the factors that should be considered in implementing DAs for CBTs to ensure the humanitarian sector's decisions in deploying real-world DA applications are based on a strong and contextual understanding of DAs and not driven by reactive approaches.

This paper does not intend to directly compare any DA modality with other CBT modalities, which is premature at this stage. Rather than provide a complete framework for DAs in CBTs, it aims to give humanitarian actors, donors and partners a crucial fluency and foundational understanding of different types of DAs, how they have evolved and the factors to consider for each type in humanitarian CBTs. (It does not advocate any specific technology, DA type or related business model.) It then identifies the next

key research steps to prepare a complete framework or pilot design and the research that will contribute to current knowledge. This study provides a base for systematic considerations and solid impact evaluations for a broader set of projects that may interest humanitarian actors, generating a balanced view regarding practical implementation and the benefits of DAs for CBTs. The learnings from this review aim to build a larger body of knowledge to contribute to the shared understanding of the opportunities, risks and challenges of DAs in CBTs that could benefit the broader humanitarian ecosystem. This study focuses on the 'public good' element of the wider humanitarian sector. The concept of digital public goods is derived from the economic term 'public good', which refers to something that is non-excludable (it cannot prevent someone from using or consuming the good) and non-rivalrous (its consumption or use by one person does not limit or take away from someone else's).[ii]

This paper uses the Philippines as an illustrative case study, demonstrating how to consider a country's context for a potential DA pilot. The Philippines is useful as an illustrative case given its strong uptake of DAs (cryptocurrency, in this case) and strong digital payment infrastructure. It is also a long-term and active recipient of and leader in CBT humanitarian aid. The uptake of cryptocurrency in the Philippines is substantial, and the trend is growing; the Philippines has the third-highest uptake of crypto globally.[iii] It is one of the three main types of environments where DAs could have a disproportionate value-add in humanitarian CBT (described in Section 3.2.) The research team also found a willing contributor, the UN WFP's Philippines country office, to actively participate in the research. (The WFP has been active in the Philippines for decades, providing large-scale emergency aid that incorporates both physical cash and e-money CBT disbursement modalities.)

The study followed a qualitative research methodology, drawing on a review of past proofs-of-concept and pilot reports, as well as direct input from humanitarian experts based on their field experience of established CBT programmes and CCAF experts based on their ongoing DA research.

In this paper, Section 2 is a primer on DAs. Section 3 introduces CBTs and provides an overview of DAs with a specific focus on CBTs. Section 4 discusses the practical considerations in implementing a DA as a CBT modality. Section 5 is an illustrative case study of the Philippines, and Section 6 concludes with a set of examples of the next steps in pilot design and other lines of research to build on the foundation provided in this paper.

2 A primer on digital assets

Digital assets are a natural evolution in how economic value is represented and transferred. Building on advances in cryptography, peer-to-peer networking and distributed consensus, they follow the transition from physical tokens to electronic ledger-based entries and play an increasingly important role in digitally transforming financial markets and the economy.

2 A primer on digital assets

2.1 What are digital assets?

Digital assets are a new means of recording and transferring economic value in digital form. They improve electronic book-entry assets by being programmable, interactive, portable and auditable.

Representing asset rights

Assets are ownable items or property that have a monetary value. Some assets (for example, land, real estate and art) have a physical form. Others, such as financial assets (for example, money, stocks and bonds) and other intangibles (for example, goodwill and intellectual property), have no physical form. However, the set of rights attached to each type of asset – an abstract, legal concept – needs to be artificially represented via some medium. This medium effectively 'stores' the rights associated with the asset, thus providing a 'tangible' expression of the underlying economic value. In this way, assets, and the economic value they confer, can be transferred between different parties because the ownership rights are also transferred.

For most of human history, this medium took the form of *physical tokens* (for example, coins, paper money, certificates and tally sticks) that literally embodied the rights associated with the underlying asset. The physical exchange of tokens between parties to transfer ownership requires geographic proximity and the actual presence of the transacting parties. Starting in the 1960s, advances in computing and telecommunications facilitated the rise of *electronic recordkeeping*, where trusted organisations such as governments or financial institutions maintain asset registries of ownership in an electronic book-entry form. Constituting a significant technological improvement with corresponding efficiency gains and cost savings, these virtual book entries gradually replaced paper-based certificates as the dominant medium of representation.

Limitations of electronic assets

Today, most financial assets exist under this 'electronic' form.[1] Owing to the limited information technology (IT) available at the start of the computer revolution, they are little more than idle numbers in virtual accounts residing inside the proprietary confines of internal database systems that financial institutions and other core market participants individually maintain.[2] These closed systems operate in isolation, reducing electronic assets to 'dumb' data strings with little interactive functionality.

Moving assets between closed ledgers requires centrally routing messages through dedicated systems that instruct the involved parties to individually update their ledger books, transaction after transaction. Institutionalised clearing and settlement processes coordinate this domino-like chain of successive ledger adjustments (account debits and credits) across financial institutions' disparate back-end IT systems. As a result of this siloed information architecture, book-entry assets can only be held in an intermediated form via registered accounts at authorised service providers like banks and credit unions. Over time, this leads to a tiered market structure comprising a multi-layered web of financial intermediaries connected through major central hubs and bilateral arrangements.[3]

1 In this paper, we use the term 'electronic assets' (for the lack of a better alternative) to refer to static book-entry records managed in closed information silos. From a strictly technical perspective, DAs are also electronic assets and vice-versa.

2 Ledger, registry and account-based systems serve as official information repositories that constitute virtual assets and provide an environment in which operations on those assets can be carried out. An environment limited to narrow organisational boundaries reduces the number and complexity of operations that can be directly performed through the system and, instead, depends on adjacent systems and channels for additional 'functionality'.

3 Swanson et al, 2021 argue that technology architectures available in the early 1970s (primarily mainframe and later client-server) played a significant role in determining the design, and thus the resulting business models and market structure, of conventional financial market institutions such as central securities depositories and central counterparties.

From electronic to digital: unique properties of digital assets

Conceptually, it can be understood how DAs are the logical next step in the gradual evolution of asset representation and, consequently, transferability. Over the last three decades, advances in cryptography, peer-to-peer networking, distributed consensus and multi-party computation have opened new ways to securely record, store and update shared data without relying on a central point of control or authority. These developments, together with new technologies such as cloud and application programming interfaces (APIs), have given rise to collective accounting systems enabling trustless transactions (referred to as *shared ledgers* in this paper). These systems break down organisational silos and allow participants to operate collectively on a shared set of data records.

These innovations have significant implications for assets. Static book entries in closed ledgers are now transformed into dynamic data 'blobs' that can interact with applications beyond organisational boundaries. An unprecedented level of interoperability gives assets in this form (DAs) a set of native properties distinct from their 'electronic' counterparts. If electronic assets are static book entries, DAs are more akin to interactive tokens that can seamlessly move around.

Box 1: Unique properties of digital assets

If we compare electronic assets to static book entries, then DAs are more like dynamic data 'blobs' that can express financial contracts, directly interact with compatible applications and services, have verifiable transparency and be held without a single centralised entity intermediating.

- **Programmable:** By using smart contracts, the rights and obligations of financial or other contracts can be directly encoded into the receiving block on the blockchain such that related operations are automatically executed when specific conditions are met. These automated operations take immediate effect across all participants of the underlying system.
- **Interactive:** Barring deliberate restrictions, DAs can move freely within the same system,[4] and seamlessly interact with applications and other assets in the same blockchain system. This native compatibility enables instant asset swaps at the system level without relying on external reconciliation processes.
- **Portable:** Holders can directly control DAs through a cryptographic pair of keys. The public key is used to 'encumber' the asset so that only the corresponding private key can unlock access. This enables owners to directly hold, access and use DAs in a non-intermediated setting (via a self-hosted wallet) and indiscriminately move these assets between compatible applications and services.[5]
- **Auditable:** Depending on the system's design, users may independently audit the computer code that underpins the assets, verify the validity of encoded terms and trace the entire transaction history. The cryptographic nature of these operations adds further credence to the native audit log because records cannot easily be tampered with, providing unprecedented levels of verifiable transparency.

4 Cross-chain bridges enable asset movement between blockchains.

5 This property has led some commentators to attribute a bearer-like characteristic to DAs, although others have disputed this on philosophical grounds. Bearer instruments are objects that can be directly owned, held and transferred without the need for intermediaries that maintain registered accounts. Bearer assets tend to have a physical representation where ownership is generally determined by possessing the corresponding physical token. In the context of DAs, possessing the private key would be equivalent to possessing the physical token.

From electronic to digital: a gradual evolution

The gradual evolution in asset forms is best illustrated using the example of a company share (see Table 2.1). The share may be issued as a tangible paper certificate, held directly by the owner and physically exchangeable in a peer-to-peer fashion. The certificate may subsequently be immobilised and 'dematerialised' to re-appear as an electronic book entry in a registry maintained by a financial market infrastructure operator. The dematerialised share can only be accessed through intermediated accounts that are nominally registered to the owner and depend on costly and time-intensive post-trade processes to settle transfers.

Table 2.1: Evolution of representing and transferring economic value

	Tangible	Virtual (ledger-based)	
	Physical	Electronic	Digital
Form	A physical token embodying a set of rights	A data string recorded via a private ledger inside a closed information system	A data string recorded via a shared, immutable ledger as part of an open information system
Holding	Physical possession (bearer instrument)	Intermediated by nature (nominal account)	Direct via a cryptographic key ('self-hosted' or 'non-custodial')[6]
Functionality	Medium-dependent	Static (idle)	Dynamic (interoperable)
Transaction	Physical exchange of the token (requiring geographic proximity)	A web of intermediaries coordinating book-entry updates across a chain of private ledgers	The consensual update of a shared ledger replicated to individual books of involved parties
Example (company share)	A paper certificate	A dematerialised security[7]	A natively digital security and/or tokenised security[8]

At some point, the issuer and its agents may decide to re-issue the share as a natively digital security on a shared ledger, thereby leveraging DA benefits such as lifecycle management automation, near-instant settlement and the potential of direct custody by the owner. The company share may also exist simultaneously in all three forms (physical, electronic and digital). First, as a paper certificate immobilised by a central securities depository and re-issued as a dematerialised security, then as a tokenised security on a shared ledger representing the dematerialised security (now also virtually immobilised). Similarly, the company stock may consist of shares issued in different forms.

2.2 Shared ledgers as enabling information (eco)systems

Shared immutable ledgers form the underlying bookkeeping infrastructure that makes DAs possible. We use the umbrella term 'shared ledgers' to define network-based information systems that, by facilitating distributed bookkeeping between multiple agents, serve as enabling technical environments where DAs can be issued, moved and used. Over time, interoperable ecosystems form around these networks that offer a broad range of complementary tools, applications and services.

Distributed bookkeeping

Digital assets are enabled by technological advances that have changed the nature of virtual bookkeeping. Ledger-, registry- and account-based systems can now be designed to facilitate collective creation, storage, updates and sharing of digital records among multiple parties. In the previous section, we introduced the umbrella term 'shared ledgers' for types of information systems that enable distributed bookkeeping

6 In practice, private key management is often outsourced to specialised service providers, for example, digital custodians or wallet providers.

7 A dematerialised security is an uncertificated financial asset recorded in electronic book-entry form by a central securities depository. The concept emerged in response to the growing pains of physically handling ever-growing amounts of paper certificates to settle securities transactions.

8 A tokenised security refers to an existing security (physical or dematerialised) represented as a DA on a shared ledger. The 'original' security is locked by a trusted custodian and re-issued as a DA to benefit from the programmability and other enhanced features. A natively digital security, in contrast, is a security that has been directly issued in the form of a DA with no corresponding physical or electronic underlying.

between a network of participants with minimal need for central coordination. The systems provide a unified technical environment where asset operations can be directly carried out and simultaneously take effect across multiple parties.

In principle, shared ledgers are technology-agnostic accounting tools that may be implemented in various ways. In practice, though, blockchains and DLTs have emerged as the most prominent types of shared ledgers, largely thanks to properties that make them particularly well-suited for tracking asset ownership. Distributed ledger technology systems can be considered as a subset of distributed database systems that can operate without a central administrator. Most notably, DLT comprises the building blocks for combining the functions of the asset registry (where ownership is recorded) and transfer rail (how ownership changes) in a single information architecture. This seemingly innocuous detail has tremendous implications for the issuance, transfer and broader lifecycle management of digitally recorded assets.

Box 2: Blockchain and distributed ledger technology

Blockchains and distributed ledgers are electronic record systems enabling a network of independent entities to establish consensus around a shared ledger without relying on a central coordinator to produce or validate the authoritative version of the records.

This is typically achieved through a combination of peer-to-peer networking (to exchange messages between participants), cryptographic techniques (to prevent unauthorised tampering or forgery) and distributed consensus mechanisms (to collectively reach agreement over data updates without central coordination). Participants can independently verify the ledger's integrity; no single party can unilaterally modify transaction history. Some distributed ledgers also feature a shared execution layer that enables smart contract functionality (the ability to run self-executing computer code at the system level, which automatically enforces pre-specified terms when certain conditions are triggered).

While popularised by the public Bitcoin blockchain in 2009, the concept can be traced back to advances in distributed systems and cryptography research in the early 1980s. Nomenclature remains challenging as different terms are often used interchangeably and generally lack a widely accepted definition. Informally, DLT has established itself as an umbrella term encompassing a broad range of multi-party recordkeeping systems designed to operate under potentially adversarial conditions (tolerating – within limits – the presence of unreliable or malicious participants). In this context, blockchain technology may be considered a subset of DLT based on a particular data structure consisting of a chain of cryptographically linked data blocks.

More information about DLT systems is available in our 2018 and 2019 reports.

A single asset registry, equally available to all participants, reduces the need to maintain and reconcile separate database systems. Cryptographic messages exchanged over a dedicated peer-to-peer network contain all the instructions necessary to update the ledger. This process is automatically coordinated by a distributed consensus algorithm that mediates disputes without a central orchestrator. Ledger updates are quickly sent to all participants. They take effect instantly across the system, thereby mainly eliminating many of the typical post-trade processes, and the corresponding systems, activities and actors, that were otherwise essential in moving electronic assets. Assets recorded in this way can thus be issued more quickly and cost-effectively, immediately transferred and swapped across organisational boundaries (within system limits). They may even be programmed to behave in certain ways if the underlying DLT system features a shared execution layer for general-purpose computations (smart contracts).

Not all shared ledgers are the same

Since the launch of the Bitcoin blockchain over a decade ago, the design space for shared ledgers and associated systems has expanded considerably, resulting in a diverse range of DLT architectures. These models are based on various technological, social and legal premises, and are broadly categorised based on two fundamental features: the degree of openness (who can join the network and under what conditions) and the default user permissions (who can do what on the network). The two main archetypes are public and permissionless DLT systems, which enable anyone to join the network without restrictions, and private and permissioned DLT systems, which restrict access to authorised entities (see Figure 2.1). With the growth of DLT systems, hybrid designs within each archetype exist, with the aim to blend the strengths of both, maintaining accessibility and performance while managing risk. For instance, some DLT systems may be managed by a single authority while incorporating permissionless processes, while others may have access regulated by a consortium rather than a sole institution.

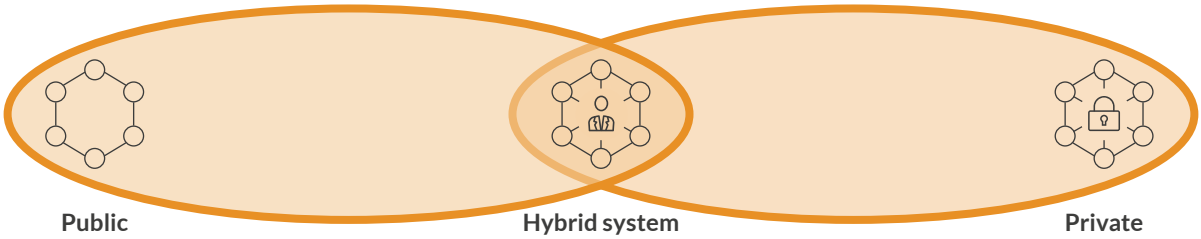

Figure 2.1: Main models of DLT systems, with the two main archetypes being public/permissionless or private/permissioned.

Adapted from Foley.com[iv]

Box 3: Distributed ledger technology system archetypes

1. **Public, open or permissionless DLT systems** provide a global decentralised infrastructure that anyone can plug into without disclosing their identity or receiving prior permission. This allows users located anywhere to execute financial transactions, create and deploy custom applications, and actively contribute to network operations, for example, by processing transactions or participating in governance. These systems rely on a combination of game theory and economic incentives (generally in the form of a native protocol asset called cryptocurrency) to encourage good behaviour among pseudonymous participants. Bitcoin and Ethereum are two well-known public blockchain networks that routinely handle payments and other financial transactions worth billions of dollars daily.
2. **Private, closed or permissioned DLT systems** operate in controlled institutional environments where designated gatekeepers restrict access to a limited number of identified parties. Data is only available to authorised entities, roles and permissions are specified, and the operator has greater discretionary control than in permissionless systems. Since all participants are authenticated and bound by contractual agreements, bad behaviour can be deterred using conventional legal and social mechanisms, generally resulting in less resource-intensive transaction processing and greater performance. Since private blockchains are often initiated and led by a consortium of financial institutions, they may be likened to shared industry utilities whose costs and operations have been mutualised.
3. **Hybrid DLT systems** have emerged in response to the perceived shortcomings of both the public and private models and try to leverage the best of both worlds. They are often semi-open (for example, access is mediated by a shared gatekeeper service), allow selective visibility into transaction and ledger data (semi-public) and offer flexible permissions within specific constraints (semi-permissioned). The Corda Network and LACChain Mainnet Omega are live examples of hybrid DLT systems with sizeable networks.

The nature and design of the system have significant implications for the performance, functionality, security and interoperability of digitally recorded assets. Each model has its advantages, but these are often achieved at a real cost that is often misunderstood or ignored. It is thus vital that the underlying trade-offs are considered to better understand the potential characteristic risks and regulatory considerations that come with a given implementation (Table 2.2).[9]

Table 2.2: Comparing public and private distributed ledger technology systems

DLT spectrum	Benefits	Trade-offs
Public, open, permissionless	• Existing network infrastructure operates 24/7/365, with additional resilience through redundancy and decentralisation • Non-discriminatory access (inclusive) • Pseudonymous participation (no authentication required) • Global reach irrespective of local restrictions • Offers some degree of transactional censorship resistance • Radical transparency through auditable code, public ledger data and traceable transactions • Permissionless development and deployment of custom applications that can natively interact with other networks • High interoperability due to a supportive ecosystem of developer tooling, token standards, composable applications and compatible services (for example, wallets)	• Risk of consensus instability arising from broken incentives or game theory, potentially leading to temporary or permanent network failure • More vulnerable network security and operations depending on volatile cryptocurrency tokens (risk of speculative attacks that may impact network behaviour) • Limited throughput capacity and scalability challenges increase the risk of network congestion and volatile fees during periods of high demand • Can lack settlement finality due to probabilistic consensus • Informal or opaque governance structures • High risk of cyberattacks with little to no recourse for affected users (lack of customer protection) • Lack of business continuity processes disrupt service during emergencies • Potentially unclear regulatory status • Privacy concerns due to public availability of transactional data (risk of surveillance)
Hybrid (somewhere in between)	Depends on the implementation, which typically aims to leverage the best of both worlds	
Private, closed, permissioned	• Regulatory-compliant infrastructure based on legal frameworks and contractual agreements • Formal governance structure enabling transaction revocability and recourse when justified (superior customer protection) • Potential for higher throughput capacity, faster performance and greater scalability due to a more centralised consensus process • More predictable network fees (for example, access, use and licensing) • State-of-the-art business continuity and recovery processes • Greater privacy for users because transactional data is not publicly available to third parties • Insulated from volatile cryptocurrency markets	• Limited number of operational networks that are readily available for use • Long set-up time for new networks due to the complexity of consortium formation (for example, fundraising, membership, governance and operational model) • Walled garden risk (exclusive access, lock-in and closed-loop system) • Limited network effects (network value constrained by scale and importance of authorised participants) • Limited interoperability if the platform is proprietary and code closed-sourced • Can face the same limitations as conventional systems concerning local restrictions • Subject to arbitrary decisions by operator(s) who retain full discretion

Broader ecosystem implications

Distributed ledger technology-based systems offer unprecedented levels of interoperability between assets, applications, tools and services. The degree of these offerings may vary depending on the design, scale and operating model, but the consolidation of previously separate, independently operating systems into a single information architecture means they now speak the same 'language'. All contained components are thus instantly compatible. Not only can assets directly interact with each other but also with third-party applications, tools and services that share the same technical standards and can plug into the same underlying networks.

This phenomenon is most clearly demonstrated in the rapidly growing decentralised finance (DeFi) ecosystem that has emerged on public blockchains such as Ethereum and Avalanche. Decentralised finance attempts to re-create an entire financial system based on interdependent on-chain applications that directly deliver automated financial services – payments, exchange, credit, insurance or derivatives – to users without a single centralised entity. The native composability of public blockchains enables these autonomous applications to seamlessly build on each other, using or re-assembling existing components for development and directly tapping into each other's liquidity and user base.[10]

9 Platform design may also impact market structure by indirectly shaping roles, activities and services.

10 This property is mainly derived from the combination of open-source code, smart contract functionality, public data availability and the permissionless nature of the underlying platforms.

Box 4: The distinction between on-chain and off-chain in blockchain

In distributed ledgers, the terms on-chain and off-chain refer to the environment in which DA operations are executed.

- **On-chain activity (L1)** encompasses all operations performed directly on the shared ledger ('on the chain') rather than adjacent layers. These so-called layer-1 (L1) activities fully leverage the system's core properties, such as instant settlement.
- **Off-chain activity (L2)** takes place outside the shared ledger ('off the chain') on a secondary layer (L2) which uses the core shared ledger only for ultimate settlement. This may happen in two ways:
  1. **Intermediated L2:** internal book-entry operations by trusted service providers such as custodial exchanges or wallets. Assets held in this way are functionally equivalent to electronic assets.
  2. **Disintermediated L2 ('sidechains'):** trust-minimised channels and systems tethered to the core shared ledger via cryptography, game theory and economic incentives. The Bitcoin Lightning Network is an example of a disintermediated off-chain layer that does not require intermediation.

In parallel, an entire industry of specialised service providers has surfaced to provide commercial offerings around DAs. Many re-introduce a degree of intermediation that, while negating some of the inherent benefits of DAs, such as direct custody, unlocks the typical benefits of centralisation, such as efficiency and safety. Today, wallet and exchange services play an essential role as secure gateways for non-technical users to interact with DAs and related applications through convenient and simple interfaces (off-chain). Similar to traditional financial services providers (FSPs), these specialised service providers can also bridge non-compatible assets and networks by acting as a connecting hub between different systems, serving as a one-stop shop for customers to store, access and use DAs irrespective of the underlying technical and institutional arrangements.

In this context, novel information systems such as shared ledgers increasingly interact with existing registration and transfer systems. Growing interlinkages between incumbents and new entrants are blurring the lines between the 'old' (electronic) and the 'new' (digital), hinting at a future of compatible co-existence between legacy systems and new digital rails in a broader distributed complex held together by various technologies and institutional arrangements. The entrance of incumbent financial institutions such as banks emphasises the larger play behind these developments as the financial system is slowly transformed.

2.3 Main types of digital assets

A note on taxonomy

As we have seen, DAs are, from a conceptual perspective, a new representation mechanism for digitally recording economic value. In this sense, they are not a product but a tool to create better products. Anything of value may thus be represented as a DA.

Some DAs are digitally upgraded versions of conventional asset classes that relate to well-established legal concepts, for example, e-money, financial securities and real estate. Others are either uniquely enabled by the underlying shared ledgers (for example, cryptocurrencies) or cannot be readily classified into existing legal and regulatory categories (for example, utility tokens that grant specific rights). This makes it difficult – if not impossible – to create comprehensive and coherent taxonomies.[11]

11 A coherent classification should be a function of the asset's nature and substance (according to the rights and obligations it confers on the holder), its primary economic purpose and function. More information can be found in our 2020 study that explores a range of legal and regulatory considerations for DAs.

In this paper, we follow the approach adopted by most policymakers and regulators that classify DLT-based DAs into three broad categories:[12]

1 **Money/payment tokens:** mainly act as a digital means of payment or exchange. Examples include cryptocurrencies such as stablecoins and central bank digital currencies (CBDCs), a particular kind of stablecoin category used for payments or settlement.

2 **Financial tokens:** used for investments (equity or debt instruments). They are often referred to as security tokens or digital or tokenised securities.

3 **Utility tokens:** an umbrella category for other cryptographic tokens that unlock access to a (generally digital) resource. This includes established concepts like vouchers or collectables (often non-fungible tokens (NFTs)), digital twins (digital representations of physical objects that embody the same rights) and many other enterprise and consumer tokens.

In this study, the first category is the most relevant.

The rise of digital money

The emergence of shared ledgers has enabled providers to create new types of digital money that may complement existing types, such as physical cash, bank deposits or e-money.[13] These types offer specific attractive features but may also introduce risks that must be properly understood and managed. Table 2.3 compares the main types of DLT-enabled digital money: cryptocurrencies, stablecoins (asset-backed, fiat-backed, crypto-backed or algorithmic) and CBDCs, and there are a few nuances within each type. In the table, green indicates specific attractive features, while orange indicates less desirable or risky elements.

12 Terminology may differ between different agencies. For further information, see our 2019 report that compares the regulatory approach of 23 jurisdictions.

13 The World Bank (2022) has published an excellent report that discusses the main types of DLT-based digital money in greater detail.

Table 2.3: Comparing types of distributed ledger technology-based digital money

	Cryptocurrency	Stablecoin			Central bank digital currency
		Asset-backed[14]	Crypto-backed[15]	Algorithmic[16]	
Issuer (Who can be held liable?)	No central issuer (public blockchain network according to protocol rules)	Private company (for example, crypto firm, regulated e-money provider, bigtech and bank)	No central issuer (for example, DeFi application)	No central issuer (for example, DeFi application)	Central bank
Availability (Who can access it?)	Indiscriminately to anyone in the world with a digital wallet (cannot be seized or frozen)	Depends on the provider/issuer	Indiscriminately to anyone in the world with a digital wallet (cannot be seized or frozen)	Indiscriminately to anyone in the world with a digital wallet (cannot be seized or frozen)	Depends on the implementation but is generally limited to registered inhabitants of the local jurisdiction and subject to local law and regulation
Transferability	No restrictions (censorship-resistant)	Generally unrestricted, but the provider may have emergency powers to halt/block transfers	No restrictions (censorship-resistant)	No restrictions (censorship-resistant)	Generally, the same restrictions as established types of money (subject to local law and regulation)
Underlying technology	Public blockchains	Generally, public blockchains	Public blockchains	Public blockchains	Private shared ledger
Value stability	Market-driven (highly volatile)	Generally high, but depends on the quality and liquidity of assets held in reserve, especially if the asset is a fiat currency or commodity asset (for example, gold)	Depends on underlying asset reserves and general crypto-market conditions (risk of volatility)	Subject to abrupt crashes if the underlying mechanism fails	Very high (guaranteed by the central bank)
Backing	None	Asset portfolio of fiat currency reserves (for example, bank deposits and money market securities) or exchange-traded commodities (for example, physical gold)	Asset portfolio of cryptocurrencies and other tokens	Automatic arbitrage mechanism governed by an algorithm	Institutional (central bank and state)
Regulation	None, or in some jurisdictions, various existing regulations apply, for example, AML/CTF and securities law	Depends on the provider/issuer and operating model	None	None, or in some jurisdictions, various existing regulations apply, for example, AML/CTF and securities law	Central bank
Examples	BTC (Bitcoin), (ETH) Ether	USDT (Tether), USDC (Circle), PAXG (Pax Gold)	DAI (MakerDAO)	TerraUSD (Luna)	e-Naira (Nigeria), e-CNY (China), Sand Dollar (Bahamas)

14 Fiat-backed stablecoins are collateralised by bank deposits or other cash equivalents, generally redeemable at par. They are the most widely used model today. It is important to note that the promise's credibility varies with the issuer's creditworthiness.

15 Crypto-backed stablecoins are collateralised by one or more other cryptoassets rather than national fiat currency. Collateralised debt positions are one of the techniques used to counter the highly volatile nature of the collateral.

16 Algorithmic stablecoins are not backed by other assets; instead, price stability is (supposedly) achieved through automatic supply balancing by smart contracts in response to market demand. They have a very mixed reputation to date as many projects have faced a self-fulfilling 'death spiral' where the value of the token suddenly crashes to zero with little room for intervention.

What is clear from this analysis is that each method has trade-offs and may fare better in some environments than others. Thus, for humanitarian organisations, the specific programming environment will determine the potential benefits and desirability.

For instance, cryptocurrencies can be accessed in all parts of the (internet-connected) globe, including users excluded from financial systems and even common identity systems, irrespective of restrictions or censorship. However, they expose holders to substantial price volatility and other consumer risks. Leveraging the same underlying rails (public blockchains), stablecoins aim to address price volatility by maintaining a stable value relative to an established currency (for example, the US dollar) or asset (for example, gold) through various mechanisms. The effectiveness of the stability mechanisms varies significantly between models and issuers, which may lead to substantial losses for unsuspecting users who mistakenly perceive them as safe and liquid payment instruments. Retail-focused CBDCs offer the safety and efficiency of government-backed money. Still, they are also bound by the same legal and regulatory restrictions as government-backed money, thus limiting their use to specific jurisdictions and user profiles.

In the context of humanitarian aid, practical solutions must provide users and beneficiaries with safety and efficiency, regardless of the provider or underlying model. We expand on the potential benefits to beneficiaries in the empirical review in Section 3.

3 Digital assets for cash-based transfers

As the main humanitarian interest of this paper is CBT programming, this section outlines how to consider using DAs for CBTs and identifies three primary humanitarian environments where DAs are best positioned to add value to CBT beneficiaries. This section first introduces CBTs, the different modalities and the rise of 'digital by default'. It summarises the potential for DAs in humanitarian aid operations to give strong contextual grounding and a more practical understanding of DAs. It then presents an empirical review of real-world examples of DAs in CBT programmes. The section concludes by outlining potential benefits to CBT beneficiaries and the limitations of the pilots.

3 Digital assets for cash-based transfers

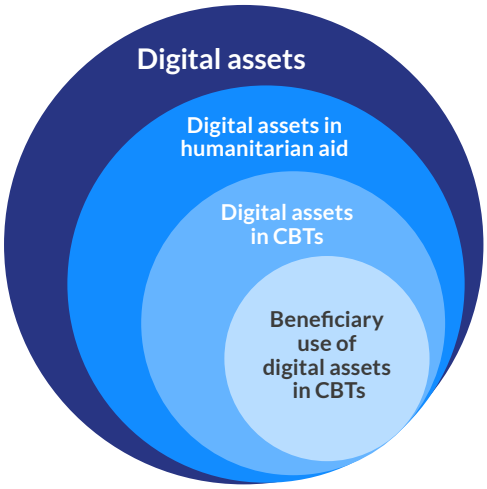

Figure 3.1: The focus of this paper in the broader context of digital assets and humanitarian aid

3.1 What are cash-based transfers?

The humanitarian aid sector has gradually transitioned from relying only on traditional in-kind assistance, such as food aid, toward CBTs. Cash-based transfers refer to the 'provision of cash-based aid distributed in the form of physical bank notes, e-money, mobile money, debit cards or value vouchers redeemable at locally contracted merchants.[v] The terms CBTs, cash-based interventions and cash-based programming are synonymous and frequently used interchangeably.

This transition is driven by the need to embrace modalities that foster long-term resilience, empower both women and men to make their own choices to fulfil their essential needs, encourage collaborative action within recipient communities and boost efficacy. Cash-based transfers were established to benefit recipients, as well as the donors and implementers:

- Beneficiaries are given more choices, allowing them to prioritise their essential needs, restoring dignity and preventing warping local markets.
- Cash-based transfers contribute to local economies with multiplier effects when used locally either as cash or working with local vendors and redeemed as vouchers.
- In many humanitarian contexts (especially those unrelated to natural disasters), CBTs are more cost-effective and easier to manage and distribute than juggling many in-kind aid items. However, this always depends on the specific context of the emergency, and situations still exist where in-kind aid is the more suitable choice. For example, in 2020, the WFP substituted cash with food in response to cashflow liquidity issues in Iraq. In late 2021, major infrastructure was damaged when Typhoon Rai hit the Philippines and FSPs could not operate for two months. In response, the WFP chose to distribute food to meet the most pressing needs of those affected.
- Implementers can efficiently perform reconciliations and account for aid disbursement using the readily available audit trail provided by mobile money and bank statements.
- In responding to the increasing emphasis on resilient and sustainable systems, several institutions have made impressive headway by implementing and committing to policies and investing in research that has built a body of best practices on using CBTs as a primary modality of humanitarian aid disbursement. One example is the 2016 Grand Bargain commitment 'to increase the use and coordination of cash-based programming'.[vi] This agreement between the largest donors and humanitarian organisations has been a principal driver in the accelerated use of cash assistance. In the years that followed the Grand Bargain commitment, cash programming more than doubled, hitting a record high of USD5.6 billion by the end of 2019.[vii] Furthermore, a World Bank report identified 277 cash transfer programmes worldwide in 2021, compared to 98 in 2019.[viii]

Cash-based transfers can use different modalities for distributing the cash value**.** First, there is the actual physical cash. Vouchers can be redeemed for specific items, commodities or assets that also fall under the CBT umbrella. Digital modalities include mobile money transfers, banking products such as cards that may be linked to an account or prepaid cards that allow beneficiaries to withdraw the value at an ATM, and e-money. The benefits of these digital modalities go well beyond convenience. They can foster long-term resilience, encouraging collaboration within recipient communities if provided efficiently and effectively. However, they also present some formidable operational and technical challenges. Table 3.1 describes some of the advantages and disadvantages of each CBT modality.

Table 3.1: Comparing cash-based transfer modalities[ix]

CBT modality	Advantages	Disadvantages
Physical cash	• Quick to begin distribution as no infrastructure is required. • Lowers administration costs. (However, this is not always the case when factoring in the overall cost, especially if the logistical settings involve hiring security guards.) • Large multiplier effects in local economies. • Flexible, easy to use and universally accepted.	• Privacy and security risks. • Difficult to track use. • Challenges in targeting and registration. • Individuals, such as the elderly and sick, may need additional support to access the benefits, such as home delivery and transportation, which incur additional costs. • Open to theft and exploitation. • Potential unpredictability of purchasing power due to local inflation or currency volatility.
Vouchers	• Large multiplier effects in local economies through direct and localised spending. • May be outside the purview of financial regulations, thus suitable for individuals who are unserved or underserved by the financial system due to identification challenges. • Can operate offline, unlike banking and mobile money products. Data on specific purchases provides tracking and data for donor reporting.	• Typically necessitate a third-party FSP. • Prone to forgery. • High administration costs and long set-up time. • Not universally accepted (unlike cash), restricting beneficiary choice. • Possibility of a parallel economy emerging. • Unscrupulous suppliers could deliver substandard goods to voucher recipients. • Suppliers may raise prices on better-quality goods to give beneficiaries lower-quality items. • Constant on-site supplier monitoring is required. • Donors may restrict the use of vouchers. • Susceptible to local inflation or currency volatility.
Mobile money-enabled cash aid delivery	• Tiered know-your-customer (KYC) requirements. • Extensive mobile money agent networks can be a powerful method for CBT delivery. • Reaches low-income people and forcibly displaced persons who are generally in hard-to-reach rural locations. • Enables tracking and creates digital records of transactions. • Increases accountability and transparency. • Large-scale disbursements can be carried out quickly and efficiently**.**	• High administration costs and long set-up time. (However, it is essential to note that setting up any contract with a private party is time-consuming. Contracting mobile network operators (MNOs) takes as much time, or less, than contracting other types of FSPs.) • Requires various enabling conditions, including charged phones, the internet and access to cash-out and payment services. (Fewer than 50% of WFP beneficiaries in the Philippines have no access to phones. Furthermore, the effectiveness also depends on who in the household has access to the handset and knows how to use it.) • Banking distribution infrastructure (branches and ATMs) is usually not found outside cities. • Beneficiaries need to be reasonably close to cash access points. • If restricted to a single mobile money provider, all beneficiaries must have open wallets with that provider. • Challenges regarding regulatory requirements for SIM card and mobile money registration for beneficiaries without the necessary identity documents, such as refugees.
Bank products	• Card-based systems allow beneficiaries to access cash (or commodities) via ATMs or payment merchants, possibly without needing a bank account. • Adaptable and can be used to satisfy multiple beneficiary needs.	• Extensive KYC requirements are challenges for marginalised and especially refugee beneficiaries. • Impractical.

Many large actors in the humanitarian aid industry consistently implement measures to make resilience-building an impact goal of their programming, demonstrated in programmes such as the UN WFP's R4 Rural Resilience Initiative, Food for Assets programmes and Regional Resilience Frameworks.[x] Cash assistance is no longer a niche programming tool but a critical component of emergency response.[xi] Many humanitarian organisations such as Mercy Corps and the WFP have adopted CBTs in their strategic approaches to achieving the Zero Hunger Sustainable Development Goal by 2030. In 2020, the WFP dispersed USD2.1 billion in CBTs across 67 countries, equivalent to 37% of its annual aid portfolio. The CBT programme scaled to USD2.3 billion in 2021, reaching 36.3 million beneficiaries.[xii] Mercy Corps, an international non-governmental organisation (NGO), disbursed USD57 million in 2021.[xiii]

3.2 Digital assets for humanitarian aid

Among the many kinds of environments where humanitarian assistance operates, the analysis of this paper asserts that there are broadly three kinds of humanitarian operating environments where DAs would likely have substantial value-add to conventional CBT modalities. These are environments that:

1 have little or no direct access to the global financial system (where it is challenging to send in-kind assistance or conventional remittances)

2 are prone to high inflation or currency volatility (where the value of cash or vouchers regularly fluctuates, causing inefficiencies in humanitarian programming and negatively impacting beneficiaries)

3 have low financial inclusion and high informality but robust digital finance infrastructure and an increasing trend in the uptake of DAs (one or several types, for example, cryptocurrencies, stablecoins and CBDCs).

It is important to note that even in extreme environments, humanitarian agencies and partners will already have operations and disbursement mechanisms in place. However, these are frequently likely to be unreliable and inefficient. As a new modality, DAs must, therefore, not only be competitive with established methods or value transfer mechanisms but also provide some additional value, for example, beneficiary preference, future scalability, speed, traceability, cost or efficiency savings, improving community resilience or overcoming the challenges of local infrastructure.

Many communities in countries that receive humanitarian aid often lack the necessary trust in financial institutions and have a history of being excluded from the formal financial sector or have survived without the security of stable economic and political institutions. If humanitarian agencies are to rely on a digital currency to facilitate transactions, its value must be accepted and trusted by the community (assuming any legal or regulatory preconditions that might apply are also satisfied). Thus, in a changing global financial landscape, it is these three environments (described above) where DAs are most likely to be considered to overcome challenges. For example, in environments prone to high and frequent currency volatility (environment 2), a DA can provide a dual benefit, reducing the risk of local inflation or currency volatility undermining the impact of their financial assistance.

As described in Section 1.2, this paper explicitly focuses on considering DAs in the context of CBTs. As CBTs are part of the larger humanitarian aid operation, it is relevant grounding to understand how DAs can serve and improve humanitarian aid broadly and concretise the value proposition of underlying DLT systems and DeFi infrastructure in humanitarian work. In this respect, DAs are an innovative tool that can not only substitute or supplement existing CBT modalities but also impact other areas of operation. Box 5 outlines some use cases of DAs beyond value transfer.

Box 5: Potential benefits of digital assets in humanitarian aid beyond value transfer

Although using DAs in humanitarian contexts is still in its infancy, their potential extends beyond value transfer. Hence, it is pertinent to outline the potential for DAs more broadly in humanitarian aid operations. However, minimal research and pilot assessments cover the possible benefits of DAs in humanitarian contexts, probable designs, ease of implementation, challenges and risks. Further, there is even less literature on the socioeconomic outcomes of DA adoption in humanitarian aid, which still need to be tested.

Below are some examples of DA use cases that go beyond value transfer in humanitarian aid and the environments in which these agencies operate. Most of these benefits accrue to the humanitarian aid actors, but they also extend to the aid recipients and their communities, detailed in Section 3.3.

Reduced operational and transaction costs

Operational costs can be reduced by decreasing the multiplicity of stakeholders in the aid disbursement value chain. Transaction costs can be reduced by removing the reliance on traditional financial intermediaries. The ability of DAs to enable peer-to-peer value transfers can offer significant cost-efficiencies in CBT modalities such as voucher programmes as well as operations such as paying contractors, field expenses or other disbursements.

Faster and more efficient disbursement through automated payments

Digital assets can support advanced and customised smart contracts, automating the execution of agreements and predefined aid disbursement conditions. This reduces the time it takes to deliver funds to implementation partners and beneficiaries and the need for these agencies to front operational funds themselves. Smart contracts can minimise the transitional complications of manual contracts and administrative delays. In humanitarian aid delivery, time is of the essence; hence, using trusted automation to speed up operations can save lives.

Greater transparency and accountability for donors

Digital assets can enhance donors' accountability by providing a complete audit trail that monitors donations received by beneficiaries, hence preventing the diversion, misuse or misallocation of funds. This immutable audit trail can also offer a feedback mechanism for beneficiaries. This further serves as an accountability mechanism for beneficiaries.

A paper detailing learnings about cryptocurrency at UNICEF states:
'… The transparency of [those] technologies may also create new expectations about how accountable organizations can be. As more of our partners offer services that can be paid for in cryptocurrency, the number of ways to disburse Bitcoin, Ether, or similar currencies will increase. One can imagine a world in which pharmaceutical companies or connectivity providers (for example, mobile network operators) accept payments in Bitcoin, which would enable international organizations holding these assets to invest them directly—and to enable their donors to see exactly where their resources are being used and how.'

Moving funds into or out of financially isolated environments

In countries cut off from the global financial system, DAs can be a tool to transfer funds in a 'borderless', decentralised way without needing a bank intermediary. This can shorten delivery timelines by removing the need for bank settlement or transfers to local mobile money operators, moving funds in real time.

In Ukraine in 2022, DAs played an essential role in international support of the country's defence and humanitarian efforts, with at least USD100 million donated through DAs. Digital assets enabled millions of dollars to be transmitted directly to NGOs, civilians on the ground, and the Ukrainian government and military. This involved sales of NFTs,[17] including a government-created NFT to raise money and give cryptocurrency to 66,000 refugees.[xiv]

Better visibility across complex and multilinear humanitarian aid supply chains

Using DAs as a means of payment, together with the nature of distributed ledgers, can help overcome the need for a centralised database, offer end-to-end transparency and connect data silos. Humanitarian aid, especially CBTs, is frequently implemented by multiple contracted parties and numerous UN agencies, each with its own systems and databases for tracking and monitoring beneficiaries (and in the case of CBTs, CBT amounts, delivery and frequency). The lack of a centralised database has severely impacted efficiency and inhibited the desire for increased transparency for the humanitarian sector and UN agencies for decades.

17 NFTs are 'one-of-a-kind' assets in the digital world that can be bought and sold like any other piece of property but have no tangible form of their own. The digital tokens can be thought of as certificates of ownership for virtual or physical assets.

Expansion of donation modalities and greater openness to innovation

In Christopher Fabian's 2018 paper *Un-Chained: Experiments and Learnings in Crypto at UNICEF*,[xv] the long-time head of the UNICEF Office of Innovation writes that 'crypto-donors expectations tend to differ from those of traditional donors and that early investors in or architects of various blockchain-related systems are comfortable with a higher level of experimentation, failure, and risk than traditional development donors (for example, governments and foundations).' This sentiment opens opportunities to develop funding proposals or programmes that may present more significant risks in the early stages of innovation but potentially lead to more meaningful outcomes.

There have already been examples of such DA donations:

- In early 2018, the Pineapple Fund donated USD55 million in Bitcoin to charities.[xvi]
- Mexican crypto exchange Bitso offered to send donations to earthquake survivors in Bitcoin, Ether and XRP (three major cryptocurrencies).
- UNICEF France mobilised the online gaming community to 'mine' Ether on their computers and send the newly minted digital coins to a UNICEF account. This simple prototype raised ETH84 (more than USD40,000 at the time of writing).
- Save the Children was one of the first aid agencies to accept Bitcoin and other cryptocurrencies as donations (since 2013). In early 2022, the #HODLHope campaign was launched to create meaningful change for children, families and communities worldwide. One year, the organisation raised more than USD5 million in crypto donations.[xvii] The agency has partnered with Gemini, a large crypto exchange, and currently accepts more than 50 cryptocurrencies and NFT donations.[xviii]
- In October 2019, UNICEF launched the UNICEF CryptoFund, a new financial vehicle allowing UNICEF to receive, hold and disburse cryptocurrency.

Such examples are only continuing to scale.

3.3 Empirical review of digital asset past pilots in cash-based transfers

Several proofs-of-concept and pilot programmes have been conducted to explore the viability and value of DA use cases for CBTs. This demonstrates that while using DAs for dispersing aid is a new concept, organisations recognise they have real-world use cases and will be a vital part of the future of humanitarian aid delivery. The pilot programmes set the stage for further experimentation and to scale projects to evaluate the real impact of DAs on CBTs.

Evaluating the impact of these pilots is essential for understanding the conditions needed to harness the benefits of DLTs and DAs while mitigating the risks. The results will also contribute to building a robust body of knowledge on this emerging concept. The pilots span projects led by aid agencies and partner NGOs (for example, the UNICEF CryptoFund and Oxfam UnBlocked Cash Project), but there are also initiatives led by private firms that collaborate with aid agencies and NGOs to pilot, adapt and scale their initiatives (for example, the Rahat collaboration with UNICEF Innovation Fund). Table 3.2 summarises some of these pilots and proofs-of-concept.

Table 3.2: Pilots involving digital assets in cash-based transfers

Pilot project	Blockchain used/CBT arrangement	Proposed user benefits	Pilot outcome	*Open/closed-loop system[18]
WFP Building Blocks[xix] (2017)	• Voucher-based cash transfer on the Ethereum blockchain with nodes. • Computer servers operated by member organisations. • All member organisations are 100% equal co-owners, cooperators and co-governors. • Stage: 'The project has now completed its life cycle with the WFP Innovation Accelerator.'[xx]	• Enables beneficiaries to securely access and receive multiple forms of assistance from various organisations coordinated via one access point. • Protects beneficiary privacy by employing anonymous identifiers.	• Over 1 million beneficiaries supported every month. • Active in two countries. • Transferred over USD400 million. • 15 million transactions processed to date. • USD2.5 million saved in bank fees to date.	Closed
The Start Network[xxi] (2017) Launched two consecutive pilots, Disberse and Trócaire	• Each wallet is identified as a node on Ethereum. • Funds can be deposited on the platform in fiat, which is then converted into an e-money token. • The platform functions as a swap exchange and enables participants to track funds.	• Speeds up aid funding distribution. • Enables aid tracking.	• The Disberse initiative was implemented solely for testing purposes, and while it was found to be feasible for funds transfer, it resulted in only minor cost savings without any notable reduction in time. • Trócaire: no additional transfer cost, and transfer took five days (compared to bank transfers that cost at least EUR35 and take six days).[xxii]	Closed
Sikka[xxiii](2017) Developed by World Vision International Nepal Innovation Lab	• Relies on a short message system (USSD) that can be accessed through basic mobile phones with minimal capability. • Upon enrolment, beneficiaries receive the digital wallet linked to a mobile phone number serving as their ID on the Ethereum blockchain. • Tokens can be used to redeem cash, goods and services at local vendors. • Tokens represent DAs pegged to cash, commodities or materials.	• Ensures that most of the donated funds reach the intended beneficiaries by minimising operational and overhead costs. • Reaches rural communities characterised by poor infrastructure and intermittent connectivity following a disaster.	• The first pilot in 2018 distributed USD5,500 to 73 beneficiaries as part of a cash-to-work programme. • Reduced cost per beneficiary by 78%.	Closed 'The value of the Sarafu tokens is valid within the defined ecosystem of beneficiaries, vendors and cooperatives that the implementing agency defines.'
Oxfam (2019) UnBlocked Cash Project (UBC)[xxiv]	• Cash and voucher assistance humanitarian solution built on the Ethereum blockchain mainnet. • Leverages collateralised blockchain tokens to digitise local currency and deliver aid to individuals in remote communities affected by natural catastrophes. • Stage: pilot phase completed; scaled to distribute cash and voucher assistance.	• Reduces aid distribution costs. • Reduces delivery time. • Drives transparency and accountability. • Promotes the dignity of disaster victims.	• USD2 million in aid distributed digitally. • 35,000 beneficiaries assisted in the Pacific. • Delivery time reduced by 96%. • Ninety-six percent of users satisfied. • Decreased distribution costs by 75%.	Closed

18 An open-loop payment system is a payments network that enables otherwise closed-loop payment systems to share endpoints, for example, a card-based payment system that allows ATM cards from one bank to be used at another bank's proprietary ATMs or a remittance/money transfer system that enables funds deposited with one participating entity to be collected at another entity. https://www3.weforum.org/docs/IP/2016/FS/WEF_FI_Principles_Humanitarian_Payments.pdf. Accessed 8 August 2022.

Pilot project	Blockchain used/CBT arrangement	Proposed user benefits	Pilot outcome	*Open/closed-loop system[18]
Grassroot Economics[xxv]	• Offers community inclusion currencies (CICs). • Issues digital credit in Sarafu tokens that are redeemable for goods and services. • Sarafu tokens issued on Bloxberg Network, an Ethereum-based platform using the proof-of-authority consensus algorithm. • Enables free transactions.	• Community investment corporations are a superior approach to investing in economic growth and community resilience compared to direct cash contributions.	• Over 40,000 households and small businesses joined the Sarafu Network following the Covid-19 pandemic. • Following the pilot's success, the Kenyan Red Cross, the Danish Red Cross and GE launched blockchain-based Sarafu Basic Income System.[xxvi]	Closed
Leaf Wallet[xxvii] (2019) Acquired by IDT in March 2022	• Stellar blockchain-backed and phone-accessible wallet allowing cash in/cash out and no fees for fund storage. • Stores value at the token layer in a stablecoin.	• Offers digital financial services (DFS) for refugees and under-resourced communities. • Safely stores and transports money across borders.	• Reached over 7,000 users to date. • Scaled across four African countries.	Closed
Rahat (relief in Nepali)[xxviii]	• Digital currency disbursements using mobile-based blockchain tokens and the Ethereum blockchain platform.	• Decreases fund transfer times. • Provides real-time visibility into the flow of funds to aid agencies. • Reduced aid distribution and transaction costs.	• Over 4,500 beneficiaries to date. • Over NPR989,000 worth of CBT and voucher projects initiated. • More than 75 vendors and mobilisers engaged.	Open
Crypto voucher pilots in Kenya and Ecuador, CARE with Binance Charity / BNB Chain and Celo[xxix, xxx]	• Pilot in Kenya: partnership between CARE and Binance Charity / BNB Chain - a distributed blockchain network upon which developers and innovators can build decentralized applications (DApps)[xxx] • Pilot in Ecuador: partnership between CARE and Celo - an open-source blockchain, making DeFi systems and tools accessible to anyone with a smartphone [xxx]	• Improves aid delivery to women and women's groups. • Vouchers linked to recipients' needs. • Reduced cost of aid distribution.	• Pilots launched in Kenya and Ecuador.	Closed
Kenya Red Cross (2018)[xxxi] IFRC	• Blockchain open-loop cash-transfer pilot project relying on a private blockchain. • Implemented on a blockchain using multi-chains with four nodes of the controlling entities (KRCS, IFRC and RedRose).	• Assists over 2,000 drought-affected households in Isiolo County, Kenya.	• Efficient and scalable, with 2,090 beneficiaries receiving money in three days (compared to the ordinarily lengthy KRCP CTP verification and validation process taking up to three weeks).[xxxii]	Open
impactMarket Unconditional Basic Income (UBI)45F	• An open, free, crowd finance infrastructure programme. • Distributes aid funds through Cedo dollars (cUSD) stablecoin. • Uses Celo stablecoin, acting as a utility and governance token for the Celo platform.	• Reduced disbursement costs and speed. • Optimised for use on basic mobile devices.	• USD2.9 million claimed as UBI. • Active in 28 countries. • 41,800 beneficiaries.	Open

The pilot programmes in Table 3.2 demonstrate the feasibility and benefits of DAs in CBTs in specific contexts and designs. The best examples of programme viability are the WFP Building Blocks[xxxiv] and Oxfam UnBlocked Cash Project (UBC),[xxxv] deployed in a near-live setting, supporting over 1 million and 35,000 beneficiaries each month, respectively.

Empirical review and beneficiary benefits

Most humanitarian agencies (under the Grand Bargain compact) and CBT providers are committed to giving beneficiaries choice and dignity with their programmes. This empirical review allows us to analyse pilot programmes, developing insights about the benefits to beneficiaries. This section summarises the findings of the pilot reviews, outlining the potential benefits for recipients in implementing a DA solution into CBT programmes. We also include current examples demonstrating the benefits of DAs outside the humanitarian aid context.

Hedge against local currency instability

As described in Section 2.3 and Table 2.3, stablecoins aim to address price volatility by maintaining a stable value relative to an established currency (for example, the US dollar) or asset (for example, gold). Whereas some DAs are speculative due to high price volatility, some stablecoins are designed as a more stable store of value. They are considered an inflationary hedge as they are independent of monetary policy, especially when pegged to 'stronger' fiat currencies of stable or growing economies.

The UnBlocked Crypto Collateralized Voucher (CCV), backed by the DAI token cash pilot, was the first stablecoin used in CBTs. By leveraging the established monetary value of Ethereum, Oxfam did not have to assign a value to each token it issued on a private chain.[xxxvi] Even though this use of stablecoins was not prompted by a need to hedge against a local currency, the pilot demonstrates the viability of using stablecoins in CBTs.

An example outside the context of humanitarian CBTs is Turkey's 2021 inflation and the consequent significant increase in the country's traded volumes of DAs, such as Shiba Inu (SHIB) and USDT, to hedge against the Turkish lira.[xxxvii]

Cheaper international money transfers

This benefit is particularly relevant in cross-border money transfers where recipients rely heavily on remittances. Many humanitarian operations are in geographies with some of the world's highest-cost remittance corridors, making the cheaper costs even more impactful. This need for such impact is significant and recognised in the Sustainable Development Goals; SDG metric 10.C aims to reduce the cost of remittances in high-cost corridors to less than 3% of the transaction costs.[19]

Digital assets can reduce the cost of cross-border transfers by bypassing or eliminating the number of intermediaries in a payment transaction, thereby decreasing the fees usually imposed by conventional banking systems and other money transfer operators.

In the WFP Building Blocks pilot, for instance, the programme substantially reduced the organisation's bank-related transfer fees by 98%.[xxxviii] In this design, every beneficiary is given a virtual wallet on the blockchain and a virtual bank account identity. This enables a wallet-to-wallet-to-merchant chain. Financial service providers are only required to compensate merchants participating in the scheme.

Leaf Global Fintech is another example. By functioning on the Stellar blockchain, it operates on a borderless, decentralised application which means the only additional fee associated with international transfers is for currency conversion. Current legacy infrastructures such as MoneyGram and Western Union charge customers up to 33% for cross-border transactions under USD10. With Stellar, Leaf can provide the same services for 4% or less.[xxxix]

Examples outside CBT research include using DAs for money transfer remittances in countries that rely heavily on remittance corridors, such as Nigeria. In Nigeria, there is evidence that the expatriate population uses DAs as an alternative to costly conventional transfer remittance methods. It has emerged as one of the leading countries in cryptocurrency adoption per capita, with an estimated 32% of the population using or owning cryptocurrency.[xl]

19 Complete SDG 10.C is: 'reduce to less than 3% the transaction costs of migrant remittances and eliminate remittance corridors with costs higher than 5%', a target which applied to Primary Sustainable Development Goal 10: 'Reduce inequality within and among countries.'

Media reports show that increasing numbers of Nigerians use crypto to send remittances. In 2021, official remittance flows fell by almost 30%, a more significant decline than the World Bank and International Monetary Fund predicted. And despite the government ban, cryptocurrency trading in Nigeria has continued to surge.[xli]

Unrestricted to one mobile network

This benefit is particularly relevant in environments where the best conventional CBT modality depends on the local mobile money provider, part of a local telecom operator. In this case, the money is only accessible within the local mobile money ecosystem, which is restricted to that country. Using DAs can avoid this restriction, offer beneficiaries choice, and assist displaced populations and those that may need to leave a country and do not want their money 'tied up' in that country's mobile money wallet.

Leaf Global Fintech's model focuses explicitly on assisting refugees who cross borders frequently and do not want to lose access to their money. The cross-border, cross-network platform enables migrants to travel between countries without needing to carry actual cash because it is compatible with all major mobile money providers in the countries it operates in. This enables people to cash in and out of any mobile money number regardless of the country or network.[xlii]

Enhanced privacy contributing to beneficiaries' dignity

Digital assets can maintain beneficiaries' dignity by substituting personal identifiers such as names, dates of birth and biometrics for anonymous identifiers when delivering aid and storing data. An example is the Building Blocks pilot, which protects the sensitive data of refugee families by bypassing banks when transferring cash. The system uses anonymous identifiers to ensure beneficiaries' privacy and security.[xliii] It should be noted that any enhanced privacy system should remain within the remit of the country's regulatory framework.

Inclusivity for vulnerable populations

The focus of some DA pilots is gender equality. For example, the Unblocked cash projects are designed for gender equality by intentionally mitigating the risks of gender-based violence that may result from cash and voucher assistance.[xliv] This potential benefit has been proposed as a basis for extending access to aid to these vulnerable individuals.

Potential access to other (affordable) financial services

As pilots scale, further inclusion opportunities may become available, as having an account and building transaction history is the first step in accessing additional financial products. For example, digital wallets can incentivise previously unbanked individuals to save, consequently opening credit opportunities. An example is the Leaf Global Fintech wallet that piloted by offering micro-loans to their platform users who had previously never had access to credit to start businesses and generate income.[xlv] This was in addition to the platform's payments component that enables cheap international transfer remittances, especially benefitting refugees. Another example is the Grassroots Economics non-profit foundation, which offers local credit through a monetary system that fosters economic activity within the community by supporting its members.[xlvi]

Additional results and learnings from the empirical review

In addition to recipient benefits, the empirical review also revealed improved cost efficiencies and speed of accessing aid. The costs encompass all those incurred in transferring support through CBTs, such as operational, administrative, market-wide social and transaction costs. It is important to note that quantifiable gains cannot be compared across pilots because cost efficiency depends on factors such as set-up fees, intervention scale, humanitarian contexts and DLT design structure. Furthermore, it is crucial to understand where the efficiencies occur, as any calculations would need to consider the implementer's costs (for example, administrative and transaction costs) against those incurred by the beneficiaries (for example, costs in accessing the funds).

To date, there are three main areas where efficiency gains have been seen:

1 **Lower administration costs:** Distributed ledger technology's potential to streamline aid distribution value chain processes accounts for most administrative efficiencies across the pilots. For instance, the UnBlocked Cash trial on Efate in Vanuatu 'demonstrated modest cost savings linked to operational activities, but there was no evidence that the cost of financial transaction between programme stakeholder accounts reduced.'[xlvii]

2 **Lower financial transaction costs:** The decrease in financial transaction costs is due to the unique benefits of using DAs instead of fiat currencies. These benefits include hedging against local currency instability, cheaper international transfers and savings on foreign exchange/currency conversion. Building Blocks saved the WFP USD2.4 million in transaction fees in Jordan,[xlviii] and Sikka, developed by the World Vision International Nepal Innovation Lab, reported a 78% cost reduction per beneficiary.[xlix]

3 **Shorter delivery timelines:** Digital assets in CBTs shorten the time to distribution. Findings from Oxfam's UnBlocked Cash initiative suggest a 96% reduction in delivery time,[l] and all other assessed pilots also show shorter delivery times. It is important to note that the pilots report improved delivery times at the ecosystem level (across the value chain of aid distribution) and that the infrastructure's internal transaction settlement times may be longer.

Limitations and challenges of the pilot projects

A limitation of this empirical review is that all the current pilot programmes have been implemented in a protected simulated environment. Thus, efficiency benefits have yet to be determined or shown at scale. It is unclear whether the pilot projects will be used with existing financial infrastructure or will replace and automate the entire system. Furthermore, the benefits described above primarily apply to marginalised communities, financially marginalised regions and regions affected by natural disasters, where delivering aid through existing modalities is challenging. No review or pilot directly compares beneficiaries' preferences or the benefits of a DA CBT implementation to an existing CBT modality. This lack of analysis is a severe limitation in cases where beneficiary benefits are the primary interest.

As well as limitations of the review, there were also challenges in the pilot projects. While some challenges were caused by DAs, they were not unique to DAs; they were the same ones that also limit existing CBT modalities, like liquidity challenges (at cash-out agents) and connectivity infrastructure. However, the pilot programmes did address some constraints of existing CBT modalities, such as connectivity requirements, by proposing platforms that can work offline or where connectivity is intermittent. A good example is the Grassroots Economics initiative. Tokens built on the Sarafu Network's distributed ledger system are used as digital vouchers and can be redeemed by a user regardless of whether they own a smartphone or have internet access. The system eliminates the need for an internet connection by employing USSD codes that can be sent to any mobile phone.

Other challenges identified in the pilots reviewed include:

- inadequate network infrastructure
- limited smartphone adoption
- few networks that will exchange DAs for physical items and cash
- no regulatory frameworks
- liquidity challenges
- security vulnerabilities associated with DAs.

Regarding the design, some pilot programmes have adopted existing cryptocurrencies such as Bitcoin or Ether, while others have developed tokens on their own blockchain platforms as the means of payment transfer. The strengths, weaknesses and trade-offs of both approaches in humanitarian aid still need to be explored.

4 Practical considerations

This section discusses the practical considerations of using DAs in place of or alongside existing CBT modalities. As the domain is very nascent, it lacks the methodical pilots and findings that could be used broadly to provide a comprehensive comparative framework. Therefore, this paper puts forward a set of initial critical questions that should be asked and several key factors and considerations that should be taken into account before designing a pilot or implementing DAs in the context of humanitarian CBTs.

4 Practical considerations

The humanitarian (and mobile money) community has established frameworks, decision trees and tables comparing the benefits and drawbacks of using digital CBTs as part of implementing digital cash and voucher programmes. Decision trees can also help determine whether digital CBTs can be used effectively for CBT implementation in a given context.

The DA domain is still nascent; hence, there is insufficient information about their use to develop similar decision trees or defined comparative frameworks. Part of this paper intends to provide the foundational knowledge base and considerations for determining the most meaningful next research steps (detailed in the conclusion) to help develop these frameworks.

This study resulted in a set of factors we structured into key dimensions for considering DAs in CBTs. These preliminary dimensions can be used in pilot and programme rationalisation (determining whether a pilot should be designed or pursued) and initial pilot and programme scoping.

Above these dimensions are overarching critical questions (outlined in Table 4.1) that should be asked and answered when considering DAs in humanitarian CBT programmes.

Table 4.1: Critical overarching questions to first answer when considering digital assets in humanitarian cash-based transfer programmes

Overarching question	Rationale
What is the regulatory status of DAs? Are they regulated, unregulated or banned under the existing regulatory framework?	When considering using DAs, this is the first question to answer so that all operations and activities comply with the relevant legislative and regulatory requirements.
What is the main motivation for considering DAs in CBT operations?	There are different reasons for using CBTs in humanitarian operations, such as addressing hunger, poverty, livelihood resilience, disaster relief and health outcomes. The starting point should be prioritising the impact goals whenever considering implementing a DA for a CBT programme.
Is there a specific problem or challenge in CBTs that using DAs will solve or improve?	The motivation for piloting or implementing a DA in CBTs should always be grounded in solving a problem or overcoming a challenge to prevent the 'technology looking for solution' issue versus 'a problem with a solution that happens to be technology'.
How will a beneficiary's experience using DAs compare to other CBT modalities?	Beneficiary choice and dignity are at the centre of CBT operations. These issues should be better assessed and understood as part of any endeavour to scale DA use for CBTs.
Are the proposed DAs as secure as the current modality being used for CBTs?	Digital assets should only be considered if they provide real, tangible benefits to users and maintain or improve security (money and data) and beneficiary safety. They should be compared to current CBT modalities and alongside whatever currency/money/value beneficiaries use.

As previously mentioned, as well as the overarching questions, we provide a set of factors, structured into key dimensions, to take into account when considering whether to use DAs in CBTs, as listed in Table 4.2. It should be reiterated that this is an emerging and developing technology with an evolving regulatory environment globally. These considerations are not exhaustive but act as a guide when developing a complete framework.

Table 4.2: Practical considerations and factors for using digital assets in cash-based transfers

Dimension	Considerations	Unique to DAs or also required for current digital finance modalities
Infrastructure	Smartphone and feature phone penetration	DAs
	Connectivity in terms of the network, the internet, USSD, accessibility and reliability	Both
	Existing digital wallet infrastructure	DAs
	Availability of electricity	Both
	Local vendor networks (cashing out in local physical cash)	Both
	Fees for transferring, disbursing and transacting	Both
Beneficiary and socioeconomic level	Beneficiary literacy and digital literacy levels	Both, to different extents
	Local language	Both
	Social risks to beneficiaries, for example, violent crimes aimed at women holding disbursements	Both
	Percentage of the population that is unbanked	Both
	Phone ownership	Both, more so with DAs
	User preference/societal trends	Both
	Beneficiary acceptance, trust and preference in the local country/cultural context	Both
	Job creation in the local ecosystem	Both, more so with DAs
Regulation	Digital asset regulation in the local jurisdiction	DAs
	Licensing/authorisation in the local jurisdiction	DAs
	KYC and customer due diligence requirements	Both
	Capital flow restrictions or other constraints	DAs
Humanitarian operations	Internal operations that allow DAs as a modality to be recorded in current financial operations	DAs
	Local office capacity and internal motivation/team resources	DAs
	Segregated operational responsibilities for the implementer	DAs
	Need to transact in multiple currencies	Both
Technical accessibility	Available shared ledger networks (open or closed) and their accessibility in beneficiary country/geography	DAs
	Ease of enrolling and transacting (relatable and skeuomorphic)[20]	Both, in different ways, depending on smartphone access
	Ability to transact in different currencies	Both, more so with DAs
	Interoperability with FSPs and cooperating partners (closed-loop partner platforms)	DAs and other DFS modalities (for example, vouchers)
Enabling systems: architecture*	Shared ledger architecture: Open/permissionless versus closed/permissioned networks[21] Revocability/recourse (for example, transactions and governance) Independent verifiability of transactions and history (transparency) Smart contract functionality Network application development and deployment	DAs
Enabling systems: performance*	On-chain transactional capabilities/performance: throughput, confirmation/processing times, scalability and congestion risk	DAs
	Network resilience: consensus stability, continuity, safety and data availability	DAs
Enabling systems: costs and fees*	Transaction fees Network operating fees Cost predictability (public blockchains)	DAs

** Table 2.2 in Section 2 provides a more detailed comparison of available options and the respective trade-offs.*

20 Skeuomorphism is when graphical interface objects mimic their real-world counterparts' appearance or how users can interact with them. Skeuomorphic design helps put the user in a familiar mindset to determine how they should interact with the interface and predict the possible outcomes of their action.

21 Refer to Box 3 and Table 2.2 in Section 2.

The regulatory dimension

- How do the current KYC requirements for financial services/DFS affect beneficiaries? Do they prevent or enable access?

An agency's internal operations

- Does the organisation have internal processes to manage DAs?

The beneficiary and social dimension

- Is there the necessary phone ownership among beneficiaries, and if not, is there value in developing this for CBT programming?
- Did beneficiaries choose to receive assistance in this way?
- If they did choose this method, was it because they understood it would improve financial and digital inclusion and access?

The cost consideration dimension

- Open source versus proprietary:
  - What will it cost to build the applications compared to using existing applications that can be bought or licensed?
  - What are the access conditions, including fees and licensing?
- Public versus private networks:
  - How do public and private blockchains compare for the programme's sustainability, operations and risk?
  - What trade-offs can be accepted?
  - Is there a way to acceptably test for risks first in pilot/programme design?
  - Public blockchains can be less expensive but less predictable (which can increase costs). Private blockchains usually cost more, but they can be managed by the permissioning entity, allowing more predictability. A public blockchain can be a victim of its own success with unmanaged congestion and throughput. And while the initial costs may be lower than private blockchains, the transaction fees can go up or down based on throughput.

The enabling systems dimension

- How important is the revocability of transactions?
- Does your organisation prioritise playing a role in governance or being able to inform governance of revocability/recourse?

An existing network under the enabling system dimension

- Is it an open or a closed network?
- Can this seamlessly plug into the system as needed?
- What are the access conditions, including fees and licensing? (This also ties to cost considerations.)
- Does the network have the necessary smart contracting functionality?

An open-source network or a proprietary network

- Does your organisation need to prioritise your own application development and deployment on networks?
- Does the existing network code allow this option (open source)?
- Do you require auditable code?

Public/permissionless versus private/ permissioned blockchain networks

- Does the humanitarian operator want an active role in processing transactions and/or governance?
- How do these compare for operationalising humanitarian CBTs and the scalability of CBTs?

These dimensions and factors help prepare humanitarian actors and CBT partners with the conceptual tools necessary to inform the next steps in exploring the design of DAs in a CBT intervention. For humanitarian actors and aid organisations, the existing operational environment for CBTs will guide the dimensions or factors to consider and explore at the outset.

For example, in volatile environments where the banking and payments infrastructure is weak, severely disrupted or non-existent (as described in Sections 3.2 and 3.3), DAs or virtual currencies could bypass these conditions to facilitate payments. Here, virtual currencies might be an alternative means of remitting funds, making payments, managing cash-transfer programmes and even storing funds. Whereas mobile money, for example, relies on regulated financial intermediaries, beneficiaries can make a payment using a virtual currency with only an internet connection and a digital wallet on a phone or device. This potential to leapfrog legacy financial systems is one of DAs' most compelling features.

These factors demonstrate that the practicalities of using DAs will be unique for every situation and jurisdiction. They should be considered in the context of the existing CBT modalities to ensure they are appropriate and fit for purpose.

5 Case study: the Philippines

This section presents an illustrative case study of the Philippines as an example of how to approach a structured DA pilot in a country context. It describes the digital finance environment in the Philippines, the government's vital work in developing cash transfer infrastructure and regulatory innovation and DAs in the country. It outlines how the Philippines is one of the identified environment types where DAs can most benefit from humanitarian aid activities.

5 Case study: the Philippines

5.1 Digital finance and digital assets in the Philippines

As described in Section 3, this research identifies three main types of environments where DAs should have a disproportionate value-add in humanitarian CBTs. The Philippines falls into the third category: a market with low financial inclusion, high informality and a demonstrated robust digital finance infrastructure with an increasing trend in the uptake of DAs/cryptocurrencies.

Regarding informality in the Philippines

- The Philippine government recognises the issue of high informality in the economy, especially informal labour. The data from its Labor Force Survey indicates that 38.3% of those employed are in vulnerable employment. This means nearly two out of five workers are less likely to have formal work arrangements and access to social protection and are more at risk during a crisis or shock.[li]
- The government created the *Magna Carta of Workers in the Informal Economy* to conduct the Informal Sector Survey (ISS), which outlines the structural problem in the Philippines. In 2017, the Philippine Statistics Authority estimated there were about 14.3 million informal or self-employed workers nationwide, representing more than one-third of the estimated 40.83 million workforce.[lii] The number has continued to grow, as the 2018 ISS estimated there were 15.68 million workers in the informal sector, roughly 38% of the working population. Other estimates put the number of informal workers at 63%, comprising a share of approximately one-third (USD98 billion) of the country's total economy.[liii] Additionally, in 2021, the Asian Development Bank Institute estimated that the total informal employment sector in the Philippines was 85% of the population, 80% of which was affected by the pandemic.[liv]
- As public authorities have different definitions of what comprises the informal economy, we can only estimate its size, especially since many in the informal sector are undocumented. After the ISS, there were no follow-up surveys. As a result, the lack of official data 'limit government policymaking and programming' as it constrains the development of interventions to respond sufficiently and 'appropriately' to the challenges of workers and economic units in the informal economy.

Regarding financial inclusion and digital financial infrastructure in the Philippines

Despite recent solid progress, about seven in ten adult Filipinos are still financially excluded, according to the 2019 Financial Inclusion Survey conducted by Bangko Sentral ng Pilipinas (BSP, the Philippines' central bank). Additionally, financial exclusion disproportionately affects the millions of Filipinos in lower-income classes and those who are unemployed, less educated and belong to the younger generation. Financial exclusion is also prevalent in the agricultural, MSME and start-up sectors and among informal workers.[lv] On a positive note, the government is cognizant of this challenge and recently launched the National Strategy for Financial Inclusion 2022–2028,[lvi] which serves as the country's financial inclusion blueprint for the next six years.

The Philippines has a robust digital payments infrastructure thanks to strong government support in scaling, innovating and investing in digitising government-to-peer payments systems and creating an enabling environment through policy design. An excellent example is the Digital Payments Services Act filed by the Senate in June 2022,[lvii] followed by the launch of the Digital Payments Transformation Roadmap (2020–2023).[lviii] The following points are particularly noteworthy:

- The Act [lix] provides a comprehensive legal and regulatory framework which supports the twin objectives of maintaining a payment system to control systemic risk and providing an environment conducive to sustainably growing the economy. In particular, the Act aims to facilitate transactions, arrangements or exchanges of goods and services by promoting safe, affordable and efficient digital payments by the government and general public.[lx]

- In June 2021, the BSP launched its Open Finance Framework, a policy framework to enable portability, interoperability and collaborative partnerships between BSP-supervised financial institutions and fintech players. Interestingly, as the Chair of the PhilSys Policy and Coordination Council Inter-Agency Committee Sub-Group on Use Cases and Authentication, the BSP spearheads the strategy to facilitate the conduct of PhilSys-enabled e-KYC.[lxi]
- The 'BSP Online Buddy' (BOB)[lxii] is BSP's consumer assistance chatbot. It was developed to provide consumers with more direct complaint mechanisms, establish trust in DFS and improve market conduct.

As mobile phones are now a viable channel for mobile banking and electronic payments, there has been substantial growth in the number and volume of e-money transactions, reflecting the ongoing shift toward digital payments.[lxiii]

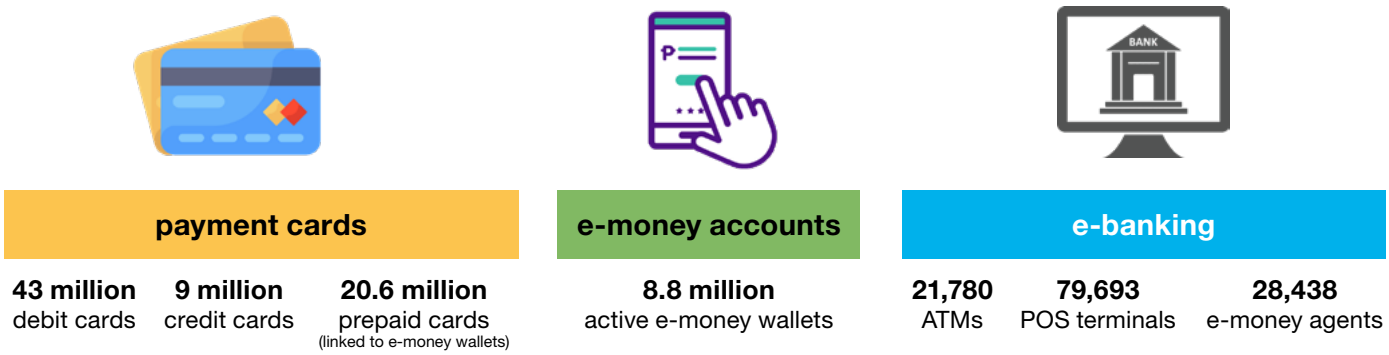

Figure 5.1: There is robust digital financial infrastructure in the Philippines today.
Source: BHP.gov.ph

Regarding innovation in digital assets in the Philippines

The examples described above demonstrate a trend of notable innovations in financial services in the Philippines at multiple levels among regulators and consumers. This shows regulators' eagerness to explore innovative policy tools, which directly relate to the regulatory approaches to DAs. Below, we describe the local regulation of DAs and cryptocurrencies. Another notable policy innovation is the BSP's approach to CBDC development, outlined in Box 6.

Box 6: The Bangko Sentral ng Pilipinas embarks on a wholesale CBDC pilot

In 2022, the BSP launched a wholesale CBDC pilot called Project CBDCPh[lxiv] to provide comprehensive insight into the potential implications of CBDCs on the Philippines' financial system and learn more about how a CBDC would address frictions in the current national payment system, particularly in safety, efficiency and reliability.

In early 2023, the BSP said the pilot would continue through 2024. The pilot is only for wholesale CBDCs, which involve transfers of large-value transactions; it is limited to several participating financial institutions. The BSP focuses on wholesale CBDCs over retail CBDCs because it believes the former will more significantly contribute to addressing frictions on large cross-border foreign currency transfers, settlement risk exposure from using commercial bank money in equities and operating an intraday liquidity facility.[lxv]

As the Philippines is an archipelago of islands, wholesale CBDCs offer additional value as they enable efficient and seamless money movement between banks. They are also expected to facilitate cross-border transfers within the ASEAN free trade block.

The BSP has emphasised that the objectives of this project are 'very modest', with the main intention to 'build a necessary capacity within the BSP as well as with supervised financial institutions to have that hands-on knowledge on the functionality, architecture, as well as the operational and organisational requirements for CBDC.'[lxvi]

Before this pilot, the BSP created a CBDC Technical Working Group, which published a report on CBDCs. The report comprehensively discusses the many issues surrounding CBDCs. It tackles the implications of CBDCs on the pillars of central banking in the Philippines, including monetary policy and price stability, financial stability, and the payments and settlement system. Other aspects are also considered in-depth, presenting diverse views of other central banks and their work in this area.[lxvii]

Consumers in the Philippines are increasingly using DAs. The country is one of the world's fastest cryptocurrency adopters, and the Covid-19 pandemic only fuelled this trend.

- The Philippines has the third-highest uptake of crypto globally.[lxviii]
- There is a high level of awareness of cryptocurrencies (74%) and, more specifically:
  - fifty-three percent of Filipinos expressed interest in investing in cryptocurrencies in the future
  - thirty-nine percent of Filipino cryptocurrency owners said they would use these assets to pay for online purchases.[lxix]
- In 2020, the Philippine Bureau of the Treasury, the Philippine Digital Asset Exchange and UnionBank launched a mobile application for distributing government-issued treasury bonds. The blockchain-enabled mobile application (Bonds.PH) aims to provide easy investment options to the country's unbanked population.[lxx]

In the context of broader traditional finance, this is especially interesting considering that approximately 77% of Filipinos did not have bank accounts then, primarily because they did not meet the necessary compliance criteria.[lxxi] Chainalysis' 2021 Global Crypto Adoption Index ranks the Philippines in the top 20 out of 154 countries based on several metrics, including total cryptocurrency activity weighted by purchasing power parity per capita. It ranked tenth for on-chain value received.[lxxii] Part of the Index's methodology is to highlight the countries with the greatest cryptocurrency adoption by the general public and focus on use cases related to transactions and individual savings rather than trading and speculation.[lxxiii]

Box 7: The role of remittances in the Philippines as a driver for cryptocurrency use

While remittances represent 10% of the Philippines' annual GDP, roughly three-quarters of the population do not have a bank account. Blockchain technologies and cryptocurrencies have helped fill this gap; the average remittance fees for cryptocurrency exchanges hovers at 30–50 basis points.[lxxiv]

Consumers inside and outside the Philippines have been adopting cryptocurrencies as an alternative way to send remittances and invest or build assets. The Philippines regulates crypto exchanges, which are required to register with the BSP as remittance and transfer companies.

The incredible speed with which cryptocurrencies are being adopted, the creative and enabling regulations, and the consistent humanitarian industry involvement in response to natural disasters set the Philippines apart from other countries in aid operations. The Philippines is becoming a regional leader in demonstrating scalability and DFS uptake across the spectrum, from basic cash-out services of social protection payments to cryptocurrency trading and remittances.

Taken together with the activity in CBDC research and enabling blockchain-based financial applications, analysis shows that the Philippines is prioritising an innovative and enabling environment for DAs and is conscious of the merits it can bring.

5.2 Regulatory landscape for digital assets in the Philippines

The Philippines has an existing regulatory framework for digital and cryptoassets. As of 2019, 11 crypto exchanges had formally registered with the BSP, and 37 others had obtained licences from the Cagayan Economic Zone Authority. This government-owned corporation supervises developments in the Cagayan Special Economic Zone and Freeport located in the north-eastern tip of the Philippines.[lxxv] By 2020, there were 16 crypto exchanges.

The BSP oversees the regulation of cryptoassets within the jurisdiction. It expanded cryptocurrency regulation after seeing 'accelerated growth' in the use of crypto exchanges and virtual assets (VAs), issuing Circular Number 1108 on 25 January 2021 regarding Guidelines for Virtual Asset Service Providers (VASPs). The regulatory framework aligns with the guidelines recommended by the Financial Action Task Force, the global standard-setting body for finance.[lxxvi]

The guidelines cover VASPs that offer services or engage in VASP activities in the Philippines. They do not cover businesses that participate in and provide financial services related to an issuer's offer and/or sale of a VA, which fall within the jurisdiction of the Securities and Exchange Commission and entities solely acting on their own behalf.

For clarity, a VASP refers to any entity that enables the transfer or exchange of VAs by offering services or engaging in the following activities:

- Exchange between VAs and fiat currencies
- Exchange between one or more forms of VAs
- Transfer of VAs
- Safekeeping and/or administration of VAs or instruments enabling control over VAs

A VA refers to any digital unit that can be digitally traded or transferred and used for payment or investment. It is used as a medium of exchange or digitally stored value created by agreement within the community of VA users. Broadly, VAs include digital units of exchange that:

- have a centralised repository or administrator
- are decentralised and have no centralised repository or administrator
- may be created or obtained by computing or manufacturing efforts.

In the guidelines, digital units of exchange used to pay for the following are not considered VAs:

- Goods and services solely provided by the issuer or a limited set of merchants specified by the issuer (for example, gift checks)
- Virtual goods and services within an online game (for example, gaming tokens)

Within the scope of activities subject to the rules and regulations concerning cryptoassets in the Philippines, there is a key exclusion that would benefit humanitarian agencies exploring DAs in CBTs for humanitarian aid. The definition of VAs excludes 'the payment of goods and services solely provided by its issuer, or a limited set of merchants specified by its issuer (for example, gift checks).' Cash-based transfer activities appear to align with this and so do not fall under this regulation (for VASP activities) and are exempt from the extensive requirements that must be continually met.

These extensive requirements include the following:

- A 'certificate of authority' to operate a 'money service business'
- A minimum paid-in capital of MXN50 million
- Registration fees and annual service fees
- A cybersecurity framework to ensure wallet security
- Financial consumer protection and awareness measures
- Customer due diligence measures
- Extensive transactional requirements
- Notification and reporting requirements
- Sanction and jurisdictional checks

Bearing in mind the burden of these requirements, a priority consideration when designing a pilot is ensuring that humanitarian CBTs do not meet the definition of a VA or VASP activity at any point or in any way.

Another consideration for the humanitarian sector or a consortium is to develop a strategy for encouraging more explicit regulation on deploying DLT projects, for example, using the pilot to demonstrate how DLT can benefit aid disbursement. This would require clarifying, at the outset, which regulatory frameworks are applicable. Without this clarity, a pilot project becomes complex to navigate and severely limits its benefits, especially the use of the findings.

6 Conclusion

This section summarises the results of this study and their relevance for humanitarian agencies. It also suggests steps in approaching pilot design for DAs and areas for further research that build on this paper and contribute to the larger body of knowledge on DAs and DAs in humanitarian aid to inform further programme design.

6 Conclusion

One of the main aims of this paper is to provide the humanitarian community with a knowledge base as they start to explore DAs for CBTs and, more broadly, for humanitarian aid. Past pilots using DAs are more ad hoc and do not seem to show a logical progression or concentrate on any one type of DA. The primer in this paper provides the necessary foundational framework for understanding DAs, how they have evolved, how they are continuing to evolve and their different properties and, thus, what their various benefits and trade-offs are. This is an enormous contribution to the humanitarian sector in having a common level of fluency in exploring DAs.

This paper now builds on this foundational understanding by suggesting key questions to answer before taking the next steps in designing a more concrete pilot and potential areas for further research. Both will contribute to building a more systematic body of knowledge on DAs.

6.1 Next steps in designing a pilot

When designing a pilot, humanitarian agencies can now use the framework of the key considerations presented in this brief paper. Using this foundation to inform pilot design (including what DA and CBT contexts to consider), a pilot can provide a framework for understanding DAs in the context of CBTs and determine country-level interest.

The environment

A pertinent next step for humanitarian actors would be determining in which of the three key environments to conduct a pilot. Alternatively, they could carry out a more extensive research study by conducting a pilot in each environment to compare the benefits of implementing DAs in the field. The empirical data will contribute to making more informed assessments about DA viability, effectiveness and utility in CBT operations and directly comparing particular DAs alongside other CBT modalities.

In particular, further exploring the Philippines could include a more detailed analysis of CBTs in a specific region, identifying/selecting beneficiary profiles and determining what type of DA(s) to pilot. The pilot design should also identify the principal risks and trade-offs to propose appropriate mitigation measures.

The methodology

Beyond the technical aspects of DAs, there are also technical aspects of the pilot and evaluation methods to consider when planning a pilot and, if it moves forward, in implementation. To design a pilot for maximum benefit and long-term use, the methodology would have to incorporate aspects that answer questions such as the following:

- Will it compare different DA types or one DA in different local contexts?
- Will it implement a DA modality among different beneficiary groups and compare them?
- Will an evaluation be designed from the start of the pilot, and will there be a baseline?
- Will the pilot be designed to rigorously test one aspect or impact in one specific area, like a benefit in cost reduction or time delay?
- How can unbanked beneficiaries use DAs to improve their food security and livelihood?

Current cash-based transfer modalities and user experience

Humanitarian agencies want to leverage as many tools and resources as possible to give beneficiaries choices. It is important to acknowledge that any new modality must be equal to a current modality or currency and offer the users superior benefits. Although available technologies may be unreliable, have many frictions and have higher costs, users feel comfortable because they know about and have experienced these difficulties. Hence, new technologies are often considered riskier, especially for vulnerable and risk-averse people, simply because they have yet to be experienced. Understanding the point at which beneficiaries will begin to prefer or adopt a DA for CBTs over other modalities is another potential next step for humanitarian actors in evaluating the application of DAs for CBTs.

These novel payment technologies will still need a critical foundation of rigorous evidence that documents the full spectrum of impacts they might have on key public objectives (for example, financial stability and consumer protection). While these may be outside the main objectives of humanitarian CBTs, they are undoubtedly pertinent to advancing humanitarian aid disbursement. Further, these technologies also lack a critical foundation to validate claims of performance and functionality compared to traditional forms of digital payment (for example, e-money). Risks and uncertainties are still being understood, managed and mitigated to ensure these technologies gain public confidence and are adopted.[lxxvii]

This underscores why a detailed, evidence-driven analysis comparing DA types to other CBT modalities in a structured, methodically driven pilot will be a valuable next step. Other donors, such as USAID, also cite this as crucial to 'underscore the importance of due diligence and responsible, evidence-based approaches to these innovations'.[lxxviii]

6.2 Further areas of research

Designing and preparing a pilot can require significant buy-in from many parties, additional human resources and even designated funding. This initial paper and research have identified and better-defined additional areas for further research, irrespective of a pilot's specific design.

Implementing digital assets in specific environments

Conducting empirical research on the characteristics of the environments where DAs could add the most value can help select pilots that are both scalable and most impactful to people's lives. Also, these challenging environments impact humanitarian aid operations overall, and further research efforts could thus delve deeper into using DAs for humanitarian aid beyond CBTs. By building on this research, interested humanitarian agencies can:

- more critically evaluate implementing DAs in environments like sanctioned regimes, regions cut off from conventional finance or jurisdictions with extreme or common currency volatility
- perform a methodological assessment to determine how to compare DAs to the local currency.

This fascinating work could contribute to the larger body of knowledge on DAs in humanitarian aid environments and outside humanitarian aid work.

Risks and benefits of digital asset types

Another area of research would be to assess the key benefits and risks of different DA types/instruments (refer to Section 1) and how their comparative benefit to CBTs changes according to circumstances. One example could be to consider specific beneficiary circumstances such as income, literacy and refugee status. This can inform where a particular instrument may be more or less risky and, hence, its value as a consideration in humanitarian work. The current gap in the literature and analysis of beneficiaries' experiences and preferences impedes our ability to consider DAs in CBT operations more seriously. The same can be said for the gap in cost-benefit analysis.

Engaging with the private sector

Determining a framework for how to engage with private sector actors seeking to partner in humanitarian work is another important research area for the humanitarian industry. Building from the foundational fluency and understanding provided in this paper, humanitarian actors and donors can better structure their thinking and approach to engaging with private sector partners. As part of this activity, subsequent research could dive more deeply into specific areas presented in this paper and define the critical risks in such engagements and possible mitigation measures.

'In initial analyses, crypto-donors' expectations tend to differ from those of traditional donors. For example, early investors in or architects of various blockchain-related systems are comfortable with a higher level of experimentation, failure, and risk than traditional development donors (e.g., governments and foundations). This may create opportunities to develop funding proposals or programs that present greater risks in the early stages but potentially lead to greater innovations.'

(Un-Chained: Experiments and Learnings in Crypto at UNICEF)[lxxix]

Resilience-building and financial inclusion

Finally, humanitarian aid actors want to demonstrate that their work improves resilience for beneficiaries and communities. A vital part of this is making the case that CBTs and the modalities and channels used to distribute them create pathways to financial inclusion. There is scope for exploring the longer-term adjacent effects of DA-based CBTs as a stepping stone for broader DFS, resilience-building and financial inclusion.

Endnotes

Endnotes

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Cambridge Centre for Alternative Finance
25 Trumpington Street
Cambridge CB2 1QA
United Kingdom

Email: ccaf@jbs.cam.ac.uk
Tel: +44 (0)1223 33911