



SYRIA



Exploring Blockchain Technology for Humanitarian Aid in Conflict Zones: A Syrian Case Study



Authors: Abdullah ALOkaily and Sohaib Alzoubi

PeaceRep: The Peace and Conflict Resolution Evidence Platform
School of Law, Old College, The University of Edinburgh
South Bridge, Edinburgh EH8 9YL

Tel. +44 (0)131 651 4566

Fax. +44 (0)131 650 2005

E-mail: peacerep@ed.ac.uk

PeaceRep.org

Twitter: @Peace_Rep_

LinkedIn: <https://www.linkedin.com/company/peacerep/>

This research is supported by the Peace and Conflict Resolution Evidence Platform (PeaceRep), funded by UK International Development from the UK government. However, the views expressed are those of the authors and do not necessarily reflect the UK government's official policies. Any use of this work should acknowledge the authors and the Peace and Conflict Resolution Evidence Platform.

About the authors:

Abdullah ALOkaily

With an interdisciplinary background and non-traditional educational journey, Abdullah is an avid researcher with an academic background in ECE and Computer Science and a keen interest in physics, philosophy, emerging technologies, and science communication. Currently focusing on web3 and blockchain technology, Abdullah is interested in exploring its potential, limitations, and incorporation into various aspects of human society; helping build the scientific literature on this topic one research project at a time.

Sohaib Alzoubi

Sohaib holds a Master's degree in Political Science from Central European University and a Master's in International Economics from the Berlin School of Economics and Law. Sohaib is a PhD candidate in Comparative & International Political Economy at Central European University, focusing on state approaches to blockchain technology and the potential macroeconomic effects of Central Bank Digital Currencies (CBDCs). He has worked in the Syrian civil society sector for over 13 years, engaging in various fields such as research, governance, monitoring and evaluation, and program management.

Cover images:

All images may be subject to copyright. Getty Images ©2024

Contents

Executive Summary	01
<hr/>	
Introduction	03
<hr/>	
Methodology	08
<hr/>	
Research Diagram	10
<hr/>	
Discussion and Findings	14
Challenges	14
Analysis of De Facto Authorities in Syria	18
<hr/>	
A Potential Approach for a Way Forward	21
Blockchain Technology by Syrian CSOs	22
Application and Advantages	25
<hr/>	
Conclusion	27
<hr/>	
Bibliography	29
Annex I: Terminology	32
Annex II: Current Use Cases	34
<hr/>	

Executive Summary

This paper explores the viability and feasibility of utilizing blockchain technology and its constituent applications and infrastructure within the work scope of civil society organizations (CSOs) in conflict zones, focusing on the Syrian context. This paper shows how blockchain technology could be used a potential tool to support CSOs in conflict zones and enhance their operational sustainability.

Over the past decade, blockchain technology has gained worldwide attention for its potential as a means to distribute and secure data through its usage of Distributed Ledger Technology (DLT) and as a means to publicly verify their authenticity. Given this functionality and the problems CSOs are facing in Syria – as well as other conflict zones – when it comes to fair and effective distribution of humanitarian aid, our main focus has been whether Syrian CSOs would be able and willing to adopt, implement, and normalize the usage of blockchain-based solutions to improve their current means of record-keeping, monitoring, and evaluation of aid and money transfer.

Since 2019, Syrian CSOs have faced a significant decline in funding due to various geopolitical challenges and the rise of global conflicts and humanitarian crises. This funding shortage threatens the sustainability of these organizations and the sector as a whole. Mitigating this issue may involve addressing logistical challenges, such as reducing transfer fees and implementing cost-efficient monitoring and evaluation systems.

The Syrian context is a volatile one where the country is separated into several de facto governing regions with drastically different stances towards new technologies. The differences between de facto authorities meant the presence of differences in the nature of CSOs and NGOs, primarily in how freely they can operate within each region, as well as differences in their funding sources and the array of their donors. These factors directly affect their openness to adopting new technologies, stances towards decentralized systems, level of training for their staff, and available resources. We noticed a clear tendency to learn more about, test, and potentially adopt blockchain technology and its applications within CSOs compared to both the public and private sectors; however, the knowledge gap that needs to be filled is relatively similar in all three sectors. This knowledge gap is a global phenomenon only heightened in Syria even in individuals with professional and academic technical backgrounds due to an outdated and crumbling educational system. Almost all of our interviewees who were asked about their level of knowledge on blockchains reported their familiarity with it only within the context of cryptocurrencies, and not with any other potential applications.

Yet, upon discussing the versatile use cases of decentralized networks in safe and decentralized data storage, countering censorship, secure communication, humanitarian aid tracking, and dispensing, usage for monitoring and evaluation, as well as using cryptocurrencies in delivering emergency financial aid, the interviewees showed a notable level of interest and intrigue regarding the usage of these technologies within their scope of work.

We interviewed a sample of six professionals within the CSO space in Syria in each of the different areas of governance, as well as experts with engineering and technical expertise who are also familiar with or involved in civil society work in the different areas of governance in Syria. Interviewees attended workshops explaining blockchain technology and decentralized networks and their use cases, in an effort to demystify the concepts enough for the purposes of the interviews. The interviews focused on applicability and usability of blockchain technology, as well as the potential challenges to implementation.

Generally, we observed a clear sense of enthusiasm towards the potential benefits of the implementation of blockchain technology in a CSO space that is burdened with regulatory hurdles, an extremely challenging working environment, and funding issues usually stemming from over-compliance and high levels of spending waste as well as an increased cost of monitoring and evaluation endeavours. However, we also noted the justifiable lack of knowledge and experience with this technology and its products, which point to an explicit need for training and capacity-building programs to enable CSOs and NGOs to create blockchain-based solutions to local and region-specific problems. Additionally, we concluded that there needs to be an organized endeavour within the larger INGO sphere to push for regulatory frameworks that would allow for the usage of cryptocurrency in humanitarian aid in conflict zones, as that would ensure that donors' funds would be used solely for their intended purposes while alleviating fears of misplacing or misusing funds that might result in over-compliance practices that would negatively affect beneficiaries.

We also concluded that there seems to be a lack of academic and scientific literature on blockchain technology's usage in general, and an even more drastic shortage in the studies examining the use of blockchain technology in conflict, identifying a number of conflict zones and cases in which we see the study of these topics to be crucial to further grow and develop the literature in this emerging field.

Introduction

The Syrian uprising in 2011 and the events that followed significantly opened the way for Syrian civil society organizations to establish their existence and grow according to the needs of the population (Maghribi 2020). Before 2011, the Syrian authority imposed strict control on CSOs and only allowed mainly charitable foundations and organizations who are usually affiliated with figures from the Syrian government to operate. International bodies such as the International Committee of the Red Cross (ICRC), World Health Organization (WHO), and World Food Programme (WFP) were not allowed to work directly on the ground and provide services to beneficiaries. However, after 2011 the increase in funding, the absence of state institutions, the opposition's inability to establish service institutions, and the increased demand for humanitarian services all contributed to this growth (Alzoubi 2017). CSO presence in many fields, including health, relief advocacy and documentation of violations, has contributed to their rise as one of the most prominent actors in Syria.

However, since 2019 Syrian CSOs have been suffering from a remarkable drop in funding due to numerous geopolitical constraints and an increase in conflict and humanitarian crises globally. This funding shortage puts these organizations' sustainability at risk, as well as the sector in its entirety. The shortage in funding can be mitigated by alleviating the effects of some of the geopolitical and logistical constraints, for example by cutting costs on transfer fees and creating more cost-efficient monitoring and evaluation systems. This paper intends to be a stepping stone in the direction of better understanding blockchain technology as a potential tool to help achieve these goals in the context of CSOs within conflict zones.

The dearth of scholarly inquiry into technological progressions has left a gap in the operational frameworks of Syrian CSOs, as evidenced by the discernible deficiency in proactive endeavours towards cost reduction, augmentation of financial resources, service refinement, and enhanced coordination. More research and resources are needed to demonstrate the potential advantages of using blockchain and analogous technologies in humanitarian assistance. This research initiative resides in the ambition to venture into this relatively unexplored terrain, thereby pioneering and laying the groundwork for an expanded corpus of literature. This could facilitate more informed decision-making processes, rendering feasible actions for CSOs operating within conflict contexts, and fostering enhanced efficacy and operational acumen.

The added value of using blockchain technology in humanitarian work and civil society organizations can be summarized into three main points.

Transparency and traceability. According to former UN Secretary-General Ban Ki-moon, 30% of humanitarian aid does not reach its beneficiaries (Tanka 2018; Bricout 2020). This can be attributed to several factors including corruption and poor coordination, as humanitarian work suffers from the problem of duplication, which refers to beneficiaries receiving the same service from more than one party (Duberry 2019). This illustrates the need for a more transparent and tamper-proof system, which could be offered by blockchain technology as transactions are easily traceable and the data, once embedded within the blockchain, cannot be tampered with (Friedman & Ormiston 2022). Additionally, blockchain technology allows one to verify that the beneficiary received the service or assistance directly instead of relying on easily manipulated reports.

Immutability. CSOs suffer from data loss and manipulation, which exposes them to problems that affect their reputation and weaken the impact they can implement in their areas of work (Howie 2018). Moreover, losses due to data integrity issues are significant (Bricout 2020). Blockchain technology ensures that data cannot be erased or manipulated except by a system that allows modification according to predefined and agreed-upon conditions, taking advantage of smart contract technology (Salzano et al. 2024). This effect directly helps the beneficiaries, allowing them to protect their data in a secure environment, which is crucial in countries suffering from corruption and war.

Financial benefits. Humanitarian work suffers from the lengthy and highly costly transactions due to bureaucratic obstacles and high transfer costs, as the value of remittances is estimated at 3% of the total financial aid (Thylin 2019; Bricout 2020). This long transaction chain causes delays in providing assistance, which could endanger the beneficiaries' lives in complicated and harsh circumstances. Blockchain technology helps reduce this cost by using cryptocurrencies, mainly stablecoins, which are cryptocurrencies that are pegged into the value of fiat, government-issued, currencies to mitigate any effects of other cryptocurrencies' price volatility – given that the stablecoin is sufficiently covered in value to avoid de-pegging and other issues (e.g., Tether's approach through putting a value of cash and other assets that is equal to their market cap into a bank account). Furthermore, almost two billion people do not have direct access to financial services, thus complicating humanitarian response operations that blockchain technology could easily mitigate (Tanka 2018).

Approximately since 2020, blockchain technology has been adopted by organizations in a number of prominent projects. The Relief Baskets distribution project, in which the World Relief Organization distributed nearly 100,000 food baskets directly to the displaced in the Zaatari camp using blockchain technology (Rehman et al. 2021). The idea of the project is based on transferring the basket's price to the seller directly as soon as the beneficiary confirms its receipt employing a retina scanner, making the beneficiary's eye-scan function as their private key. This project ensured that the service reached its beneficiaries and significantly reduced the cost. Another example is the Ghana Property Documentation Project, or what is known as Benben. Ghana had needed to establish an effective property rights system, but was unable to do so due to widespread corruption (Schmidt 2017). This project recorded property rights on the blockchain, ensuring that the data is not tampered with. The same project has been applied to other countries such as Georgia and Sweden and is considered one of the most successful projects for social good (Shang & Allison 2019). Another example is Decentralized Autonomous Organization (DAO) Ukraine, which raises donations to support the Ukrainian people in light of the Russian invasion. The project brought about seven million US dollars to the beneficiaries in the first months of the war, which made many anticipate this technology bringing in new types of donations (Roberts 2022). This is due to the fact that many people refuse to make contributions through the state, thus making blockchain the appropriate method to provide humanitarian work, without being affiliated with a political side. Another exciting area where blockchain is becoming active is advocacy. For example, a group of Chinese students published a message through blockchain technology, within the framework of the "Me Too" campaign, about the story of a student who was sexually harassed by a high-ranking member of the CCP (Liao 2018). The use of blockchain technology came as a response to the Chinese government's ability to erase these posts and articles on social media pages and censor search engines within the country. However, the tamper-proof nature and immutability of blockchain systems makes these stories unerasable.

Other projects are attempting to provide blockchain-based solutions for real-world problems such as identity-related issues; ranging from the obstacles facing the provision of authentic and verifiable identities in many cases, displaced populations being one of the most prominent examples, to countering identity theft (Nelson 2019).

In addition to that, a rise in the idea of using blockchain technology for the sake of establishing effective and immutable voting mechanism has led to the development of countless blockchain projects that revolve around, or at least rely on, on-chain voting mechanisms that allow for more efficient voting mechanisms that are more resistant to manipulation as well as unfounded claims of voter fraud due to the inherent secure and manipulation-proof nature of blockchain technology (Khan et al. 2021).

Despite these projects, the use of blockchain technology in CSOs is still limited for several reasons. Firstly, there is a lack of trust: Blockchain is often linked to cryptocurrencies, which have been subjected to heavy stigmatization by the media. The use of cryptocurrencies in illicit activities such as tax evasion, money laundering, and countless illegal aspects made many people view blockchain technology as a risky system (Tsukayama et al. 2021). Additionally, the lack of knowledge of and education in this technology as well as the low levels of adoption makes many people unfamiliar with its application and sceptical about its capabilities outside the financial framework (Baharmand et al. 2021). Furthermore, the notion that this technology is hostile to the concept of the state, or at least operates outside the framework of state institutions, makes many donors reluctant to use the technology itself. Moreover, blockchains have experienced security issues and exploitations of loopholes in their programming, such as what happened to the first DAO on the Ethereum blockchain (Ibid); where a vulnerability in the programming of the smart contract of the DAO was exploited by malicious actors and caused unsuspecting users to lose significant sums of money as a result. All of that makes people hesitant towards using this technology.

Secondly, administrative and governmental problems: as the work of CSOs is often linked to areas subject to security problems, the confidentiality of data is a prerequisite for protecting these organizations. As such, members of CSOs that would implement blockchain technology in their areas of work should do it with careful consideration in order to keep their organizations' data and functionality safe from intruders, as the security systems and safety guardrails in blockchain networks fundamentally differ from those used in traditional networks. Sharing data via the blockchain may expose these organizations to several problems which need technical solutions, while also needing to design governance systems that suit the organizations' needs (Nicolakis et al. 2018). This, in turn, requires high technical expertise and pilot projects to understand the effects of their application, which is different now.

Third, legal problems: blockchain technology is subject to fluctuations and changes in regulations, which makes many suspicious about using this technology and fearful of consequences. Not only that, but some of the features of blockchain technology may conflict with sensitive laws such as the General Data Protection Rights (GDPR).

Finally, to facilitate the comprehension of the topics discussed in our paper as it sways between the technological, financial, and political sectors with technical terms in each, Annex I contains the most frequently used and important technical terms. Annex II contains the existing use cases of blockchain technology by Syrian CSOs as well as NGOs and INGOs in the Syrian context.

Methodology

Our research methodology has four pillars:

Workshops: Perceiving the lack in general knowledge about blockchain technology, we recognized the need to bridge potential knowledge gaps in our sample participants. For that purpose, we conducted explanatory workshops and briefings for interviewees from the civil society sector unfamiliar with blockchain technology. We also followed up with CSO members who had attended similar workshops previously. The workshops were presented in an information-oriented manner highlighting facts and information as we have them on the technology to ensure participants' impartiality. This workshop includes 15 CSOs activists.

Interviews: Following the workshops we conducted eight interviews with people in our research sample segregating the interviews into two groups in terms of the questions presented and the background of the interviewees.

- a. Three interviewees had formal academic backgrounds in Science, Technology, Engineering and Math (STEM) areas as well as considerable experience with Syrian CSOs. With this group, we focused our questions on how they perceived blockchain technology especially as it relates to the technical needs of CSO work. Moreover, we probed into the technical and logistic challenges CSOs are currently facing, and the value of the usage of blockchain technology in those domains. Additionally, having discussed the technical infrastructure of decentralized networks with them, we considered the shortcomings of the usage of said technologies in their field of work as well.
- b. The second group of interviewees were from five Syrian CSOs. We assessed their knowledge, aimed to identify the most prominent challenges faced by CSOs, and formed a preliminary picture of the CSO's readiness to use blockchain technology on a large scale. We interviewed organizations in different sectors, mainly health, capacity building, documentation of violations, relief, and peacebuilding or advocacy. This list needs to be more comprehensive in future research, but this research includes the most prominent sectors in which Syrian CSOs operate.

Desk Research: We performed thorough desk research for the purposes of the literature review. This step was crucial in understanding the pre-existing literature and where our research might benefit from it and where it may deviate from it, as well as examining which arguments our research findings might differ with. In addition to that, each of the authors draws on their previous expertise in both civil society and blockchain.

Analysis and Synthesis: Having conducted our workshops, interviews, and research, we analysed the information obtained through the interviews and desk research. We cross-examined the information on each front and analysed it more thoroughly to synthesize our arguments and main findings well as drafting our hypothesis, interview questions, and research scope.

Research Diagram

Our research interacts and operates with four actionable areas:

Knowledge: This section aims to determine the nature and extent of Syrian organizations' knowledge of blockchain technology and cryptocurrencies in general, and their uses in CSOs' activities. We rely on the CSOs Key Informant Interviews (KIIs) to determine their knowledge of blockchain technology.

Application: This section aims to identify the current and possible uses of blockchain technology for CSOs. We mainly relied on the three interviews with experts in this section since they are the ones who can determine blockchain technology. However, we asked organizations to give us answers based on their experience on the ground. Moreover, part of the literature review aimed at finding current and possible applications in Syria or other areas with similar contexts.

Challenges: Two kinds of challenges are entailed here. Challenges that CSOs face in general, and this is to understand the blockchain's ability to contribute to solving these challenges; for that, we relied on the organizations' answers. We also strived to identify the challenges that prevent the use of blockchain technology in the scope of civil society work on a large scale. Finally, we relied on experts' and organizations' answers to define these challenges.

Uniqueness: This means the distinctive nature of blockchain-based solutions. In other words, it identifies the pros and cons of blockchain technology instead of the traditional tools used in civil society's work. Therefore, we relied mostly on expert answers since they are familiar with this technology.

Results:

Having followed the above-mentioned methodology, we were able to draw out several conclusions as our research findings.

Main Challenges: We have identified several significant challenges that might hinder the advancement toward wider adoption of blockchain-based solutions within the context of the current status quo. The most notable roadblock we noticed in the research was a considerable knowledge gap that is not exclusive to the Syrian CSOs' workforce but rather includes donors, regulatory authorities, and beneficiaries themselves, as many interviewees stressed. One of the main reasons for this knowledge gap is the lack of adequate workshops, training courses, and capacity-building programs that target CSOs' workers and focus on blockchain technology. Furthermore, the knowledge gap is radically heightened by the absence of any adequate education on blockchain within academic institutions in Syria, especially within the IT Engineering, Electronics and Communication Engineering (ECE), and Computer Science (CS) majors. Moreover, the knowledge gap is complemented by the accompanying and serious issue of misinformation and stereotypical views on blockchain as being a tool that is mostly used for illicit activities, which colours donors' opinions of the technology and makes them hesitant about moving toward adoption.

Applications in which blockchain might prove most useful: Within the current status quo and the resources currently at hand for Syrian CSOs, our study findings and analysis have shown that the most applicable use cases of blockchain technology can be narrowed down to two. The first of which is the usage of blockchain networks to transfer monetary aid in the form of cryptocurrencies, namely stablecoins, from international donors to the CSOs on the ground. Based on our preliminary data and findings, implementing this approach might be able to save tremendous amounts of funding that otherwise goes to transfer fees and ensure that a larger sum of donations reaches the intended beneficiaries' covering their very real needs; however, it is yet to be seen in practice on the ground. Moreover, the technology itself tends to guarantee a faster means of financial transacting for when emergency aid is needed, as well as a more accurate, transparent, and tamper-proof record-keeping system, so it stands to reason that it might ensure similar features if implemented within emergency aid. This has recent precedence in cryptocurrency aid to Ukraine as well as relief aid in the Syria-Turkey Earthquake of 2023, but it remains to be tested in more diverse conflict zones and within different scenarios to make sure such results would replicate.

The second most important use case of blockchain systems by Syrian CSOs would be the assurance that aid is reaching beneficiaries fairly without overlooking any persons in need while also ensuring fair and equitable distribution. The issue of duplicate reception of aid is a serious one in the Syrian context as it leads to one person or family receiving more aid (in financial or supplies form) while others might not receive any. Through the implementation of a blockchain-based record-keeping system amongst CSOs as well as integrating the role of digital identities, this issue can be successfully circumvented.

Types of blockchains that could be most useful: blockchains can be deployed either as a permissionless 'public' chain or a permissioned 'private' chain (Shu et al. 2021). The benefit of a public chain is that it is widely auditable: anyone can query the chain and analyse the data (Ibid). On the other hand, this might in some cases open up organizations or people to unwanted vulnerabilities, including surveillance, hacks and potential thefts of funds. In contrast, a private, permissioned blockchain limits who can operate, read and write to the blockchain. But this diminishes some of the benefits of blockchain as it effectively limits the extent to which the ledger is distributed. After conducting the interviews with the interviewees of a technical background as well as our analysis of the problems presented by CSO members, we dedicated a portion of our study to determining the types of blockchain that would be most useful for Syrian CSOs. We have come to a conclusion that was further established by the comments of one of our interviewees that the most adequate type of blockchain architecture to be used by CSOs in Syria would be the hybrid model, which benefits from some of the main features seen in both public and private blockchains. Additionally, we noticed that public blockchains might be equally useful, however, in a less wide area of applications for the time being because while they do offer a significant advantage in terms of security and decentralization, they might also be less flexible to suit the needs of CSOs as well as being financially costly to use (Yang et al. 2020).

The special cases of different control regions: Having conducted our research by conducting interviews from each of the control areas in Syria, we studied each of their cases separately. We also evaluated the regions that would be most open to the implementation of blockchain-based solutions as well as having the properties that would allow for these solutions to function in an optimal manner. After reviewing the data and information at hand we have concluded that – for the time being and within the current circumstances – the governing authorities in Northwestern Syria (The Interim Government) are providing an easier environment for the implementation of blockchain-based solutions.

This conclusion is based on the general understanding of the level of freedom and autonomy of CSOs (in which regime-held areas are the one in which CSOs enjoy the least freedom), the level of funding that flows into each region (Northeast Syria is the area enjoying the highest fund opportunities), and the policies and affiliations of each region's governing authorities, as well as the level of control of a region's authority over CSOs' and NGOs' work.

Usefulness of pre-existing projects: We noticed that most blockchain-based applications and many of the current popular projects seem to not offer a valid use case in the Syrian context. The vast majority of the currently predominant decentralized applications (DApps), Decentralized Finance (DeFi) projects, as well as the most prominent blockchain-based protocols, offer little to no added value for CSOs in the Syrian context as they focus on applications that are not necessarily beneficial in the scope of work of CSOs. Some of the most globally prominent use cases of blockchain technology are the ones that focus on investment, trading, commercial non fungible tokens (NFT) projects, and other areas that, while potentially important in their own right, offer little to no added value for CSOs in the current atmosphere and context. We should note that such applications might prove useful within capacity-building programs for marginalized and disenfranchised communities, which would warrant looking into separately in the future.

Stakeholder Preference Nuances: During our interviews with both the technical experts as well as CSO members, we observed the varied spectrum of nuanced situations they have to deal with in terms of stakeholders' preferences, whether donors (the demand for paperwork instead of digital copies in monitoring and evaluation, increased bureaucracy, preference of older technologies, openness to new innovations, etc.) or beneficiaries (inability to deal with an electronic system adequately, fears of new technology, concerns regarding privacy, etc.).

Answering the Research Question: After due research, analysis, and thorough evaluation and based on the rigorous studying of the collected data in an attempt to answer the research question as accurately as possible, we have come to the following conclusion: Syrian CSOs are willing to implement and adopt blockchain-based solutions within their efforts and activities on the ground such as transaction and fair distribution, but they do not have the capacity to do so with their current range of resources. This is largely due to current circumstances of governance, funding, staff-readiness, and other factors pertaining to the status quo, as evidenced by our data, interviews, and analysis.

Discussion and Findings

Challenges

We can identify the knowledge gap as the primary barrier to adopting blockchain technology and cryptocurrencies by civil society organizations. In general, knowledge in this context has a main characteristic: it is limited and confined to blockchain applications as an infrastructure for cryptocurrencies. Although all interviewees have received some training in blockchain technology, their understanding of the subject remains rudimentary. This suggests that the broader civil society community, which lacks comparable exposure to this technology, likely has even less knowledge of blockchain technology and its potential applications. These findings are consistent with global trends. According to the Broker Chain website, which compiles data from the 80 countries with the highest awareness of blockchain technology, only five countries have an average knowledge score that exceeds five out of ten. This indicates that the knowledge gap is a global phenomenon, but the gap is more significant in the Syrian context, which continues to suffer from a devastating civil war. Additionally, in general the knowledge gap is more significant at the civil society level in comparison to the private and public sectors. Moreover, while blockchain technology has become widely used for cryptocurrency applications, many people remain unaware of the technology behind these cryptocurrencies. This knowledge gap is reflected in the experiences of one interviewee, who admitted, "I am completely ignorant. Even after the training I received from ZeFi Foundation, I am still ignorant of this technology." Notably, even individuals interested in technology often need to understand blockchain better. As one interviewee noted, "I consider myself a knowledgeable person in technology, but my knowledge about blockchain is too low." This observation underscores the pervasive knowledge gap surrounding blockchain technology and highlights the need for continued education and training to promote broader awareness and comprehension of the subject. Furthermore, it should be noted that the vast majority of people in Syria with a formal academic education or training in a technical field that can be perceived as relevant to blockchain technology, received their education in Syria where the academic environment has been sub-par for decades and unable to keep up with emerging technologies, and that reality has only been compounded by more than a decade of military struggle and heightened corruption.

Several factors contribute to the knowledge gap surrounding blockchain technology. First, the fear of the unknown. One interviewee noted, "Before the training I received about blockchain technology, I thought it was complex and obscure, but I was surprised by its relative simplicity and applicability." This comment illustrates a culture of apprehension towards technology which is prevalent in Syria, resulting from a lack of emphasis on technological education before the onset of the Syrian conflict, which has only intensified in the years since 2011. This explanation suggests that training and education, even in a simplified format, may alleviate fears and reduce barriers to engagement with technology in general, particularly blockchain. One interviewee said in this regard: "Even though I need to improve my knowledge about blockchain a lot, but now I feel more comfortable to read more and see what can be done in my organization". The apprehension towards contemporary technology tends to increase with age, with the elderly being the least equipped to navigate such technologies. Some interviewees have suggested that the CSOs leaders, who usually use traditional management approaches (this might have something to do with their age) may be less inclined to engage with modern technology, thereby dampening the enthusiasm of Syrian CSOs toward such technologies. This observation underscores the potential generational divide in technology adoption, highlighting the need to address the knowledge gap among CSOs leaders to promote broader engagement with blockchain and other cutting-edge technologies.

Secondly, the absence of communication channels between the global blockchain community and Syrian CSOs. Aside from a few isolated efforts, there exist no channels for communication or information sharing between the global blockchain and cryptocurrency community and Syrian CSOs. This has resulted in a lack of mechanisms for understanding the problems faced by CSOs that blockchain technology can address. The absence of communication can be attributed to the weak ties between Syrian CSOs and the private sector more broadly, and to the lack of engagement between these organizations and individuals working in technology and blockchain specifically. This means there are some indicators in which the Syrian private sector started to utilize blockchain in their interests, however, this knowledge has not passed to the CSOs. Additionally, those interested in blockchain and cryptocurrencies often focus on their impact on the private and public sectors while overlooking the potential applications of this technology within Syrian CSOs. One expert states: "Despite my experience in blockchain and cryptocurrencies, it never occurred to me to promote this knowledge among organizations, perhaps because I don't have direct communication with them."

Third, the Syrian CSO culture. The culture of Syrian CSOs is resistant to change or risk averse for several reasons, including those related to the organizations themselves, and others related to donors. The Syrian CSO culture mostly sprung into existence in conditions of war, which made its scope of work based on an emergency response paradigm at the expense of strategic planning. Donors' interest in indicators and results at the expense of creativity reinforced this culture, meaning that neither donors nor Syrian CSOs are ready to take risks by carrying out creative projects that may have an impact, in light of donors' exaggerated interest in achieving a specific quota of beneficiaries according to predetermined plans. The transformation of the prevailing culture within Syrian CSOs can only be achieved in the face of significant challenges that necessitate effective solutions. Such challenges include the inadequate level of transparency and funding, which pose a formidable obstacle to the sustainability of these organizations. These challenges present an opportunity to surmount the prevailing culture of resistance to change entrenched in Syrian CSOs. One CSOs activist remarked on the matter: "Organizations operate with *Al Haji Mentality* (a narrow mindset), it's really difficult for them to think outside the box and benefit from this technology."

The fourth issue pertains to the association between blockchain and cryptocurrency. To further illustrate the point, blockchain is a form of decentralized data structure, whereas cryptocurrencies are one (the first in fact) of many applications of such a data structure. Specifically, there is a common misconception among individuals that equates the two while failing to recognize other potential applications of blockchain technology. Such misunderstanding, coupled with the negative stereotypes surrounding the illegal use of cryptocurrency, has tarnished blockchain's reputation, thereby causing CSOs to shy away from even studying its potential implementation. However, the effects of this phenomenon appear to be weak at the Syrian CSOs level, as evident by numerous interviewees' lack of awareness regarding blockchain's relationship to cryptocurrencies. Nonetheless, this perception has repercussions for donors, as governments' apprehensions about blockchain's illicit applications may discourage them from supporting or adopting blockchain-based projects.

The fifth problem can be seen in the considerable setbacks that the Syrian academic environment has taken during the war. Some of our interviewees had a formal academic education within STEM specialties while having also been involved with several CSOs, and the discussions with them reflect the serious blows that the Syrian academic environment has taken in recent years. Namely, blockchain as a technology is not taught or mentioned in almost any Syrian academic institute and the vast majority of IT engineering, electronics and computer engineering, computer science, and other STEM specialties have only heard of it from online sources or social media or the likes of them; the small portion who have any kind of knowledge about blockchain have only gained their knowledge through self-education. This aspect is especially important as the CSOs' staff is eventually comprised of the components of the society they function in, and most graduates seek CSO work as it is more financially rewarding than other areas of work.

The sixth and final problem we will discuss here is the irrelevance or inadequacy of most current blockchain applications in the Syrian context. Based on the interviews we conducted as well as our observations, we can identify a clear rift between many popular blockchain applications and a valid use case for them by Syrian CSOs. The vast majority of the currently predominant decentralized applications (DApps), Decentralized Finance (DeFi) projects, as well as the most prominent blockchain-based protocols, offer little to no added value for CSOs in general (Peter et al. 2019) and in the Syrian context in particular. The main issue here can be traced back to the financial isolation of Syria since the pre-war years which was only heightened and made more severe by the war. The incredibly unique nature of the Syrian conflict and its components caused certain problems to arise in Syria that might have no parallel across the globe. As can be self-evident, the solutions for these unique problems are not included in applications that are designed to benefit the larger global market. As such, a main problem can be seen in the lack of relevance of the existing blockchain projects which vary in applicability for Syrian CSOs from being incredibly useful – namely the ones related to transacting services – to being not applicable at all, such as investment applications and entertainment. As such, we notice a lack of applications that can be defined as intrinsically useful for CSOs within the Syrian context.

Additionally, the interviewees raised several challenges, including logistical impediments such as weak access to electricity and internet connectivity (both of which will be addressed in our review and suggestions), the absence of a well-defined regulatory framework pertaining to blockchain technology and cryptocurrencies, concerns regarding the potential exploitation of these technologies by extremist factions, and technical issues related to data protection and security apprehensions.

Despite these problems, based on both our observations and interviews, we have seen the desire and willingness of Syrian civil society organizations to develop a deeper understanding of this technology (mainly among youth activists), especially its potential uses in mitigating the problems of transparency and lack of funding.

Analysis of De Facto Authorities in Syria

The de facto forces can be ranked in terms of their openness, from highest to lowest: Northeast (Self-Administration), Northwest (Interim Government), Southwest (Salvation Government), and Syrian government areas. Based on the interviews we can argue that the arrangement of the de facto forces in terms of openness to using blockchain technology is influenced by several factors. First, the degree of de facto authorities' centralization and possession of resources play a significant role. The more centralized and resourceful a de facto force is, the less likely it is to adopt blockchain technology. The central government in Damascus is the most centralized and advanced, with abundant resources that enable it to restrict the use of this technology by Syrian CSOs. Additionally, the Syrian government's apprehension towards cryptocurrencies – as well as the tightening of the usage of any currencies other than the Syrian Pound – makes it highly resistant to this technology since it is afraid that the technology might be used to liberate the capital, which the government is doing its best to control. Although rumours from unofficial channels suggest that the Syrian government is employing cryptocurrencies to circumvent economic sanctions, these activities are limited to a small group of individuals close to the government who are blacklisted by global financial entities. In contrast, other de facto forces, such as the Northwest Interim Government and the Northeast Self-Administration, do not have enough technical and technological resources, expertise, and capabilities to restrict the use of blockchain technology among Syrian CSOs.

Based on the interviews with activists, another factor affecting the openness of de facto forces towards blockchain technology is their interest in promoting themselves as open to the West and democracy. The more they promote themselves as such, the more likely it is for Syrian CSOs to use this technology in their work. The Autonomous Administration is considered the most open to the West, while the central government is the least open, without forgetting the impact of the economic sanctions on government-held areas. As for the Northwest, it is greatly influenced by Turkish politics, especially the "Salvation Government", and therefore its policy is linked to Turkey's policy, which seems strict or volatile towards cryptocurrencies. Furthermore, it is speculated that the regime is following a selective policy regarding blockchain and cryptocurrency usage in its areas similar to that of Beijing and Moscow, which shows the effect of international alliances on the stance towards blockchain as well.

The third factor contributing to the openness of de facto forces to blockchain technology in Syria pertains to the degree of autonomy and resources of the Syrian civil society organizations. In the Northwest region, these organizations are perceived to be the most financially independent and well-funded, owing to the majority of funding that is channelled towards them, thereby reducing the capacity of de facto forces to curtail their activities. Conversely, organizations are characterized by limited funding and a paucity of freedom in the areas governed by the central government. This fact can be observed in the control that the central bank is displaying on their transacting activities as well as the direct authority and indirect manipulation of the central government in the projects and organizations that receive the most funding, utilizing the unilateral power at hand as well as the lack of transparency and accountability. In the Northeast region, organizations enjoy a moderate level of freedom but have less funding compared to their counterparts in the Northwest.

Religious and social factors may also affect the extent to which the de facto forces are open to using this technology in the work of civil society organizations. For example, powers of a religious nature may be reluctant to allow dealing with cryptocurrencies, since they are often linked to gambling and usury. Here it must be emphasized that the political and military scene is a changing scene which makes this arrangement unsustainable, and therefore a periodic review is needed to better understand the context. Moreover, it is important that marketing, public relations, and advocacy efforts take into account the religious and cultural nature of the society within their campaigns. Several Islamic religious authorities have already weighed in on the legality of cryptocurrencies from a religious standpoint which can be utilized in such efforts, and most have concluded that in the case of following specific rules cryptocurrencies' usage would be permissible as per Islamic teachings. Furthermore, the separation between blockchain technology and cryptocurrencies should be made clear even on the end-consumer level.

A Potential Approach for a Way Forward

Two distinct approaches have emerged for leveraging blockchain technology in Syrian CSOs. These approaches differ based on their starting point, offering advantages and drawbacks. The first path entails directing efforts toward Syrian CSOs themselves. This path capitalizes on the relative autonomy Syrian CSOs enjoy with donors, so persuading these organizations to adopt blockchain technology is easier. Additionally, Syrian CSOs possess a greater awareness of their challenges and are, therefore, better equipped to design projects that effectively utilize blockchain technology. The presence of networks encompassing numerous Syrian CSOs also facilitates mobilization and advocacy initiatives, thereby enhancing the likelihood of achieving desired outcomes. However, this path is hindered by the limited financial capacity of Syrian CSOs, which may render them unable to fund blockchain-based projects without donor approval. Moreover, Syrian CSOs face many issues, such as individualism, competitiveness, and inadequate collaboration, which may curtail their overall impact.

Conversely, the second path centres on engaging donors as the primary stakeholders. This approach capitalizes on the superior financial and technical resources at the disposal of donors, rendering them more capable of implementing blockchain-based projects that require extensive planning to ensure success. Additionally, donors wield considerable influence within Syrian civil society, given the perception that these organizations are primarily donor driven. Consequently, persuading donors to support such initiatives can motivate organizations to respond positively to blockchain-based projects. However, donors are beset by bureaucratic obstacles, as decision-making processes often involve multiple levels of approval, impeding the feasibility of implementing such projects. Additionally, donors frequently reflect the policies of the governments that fund them. This factor is significant, particularly considering the perplexing policies and regulations concerning blockchain and cryptocurrencies among Western governments, suggesting that these governments are presently unwilling to support this type of project. Moreover, donors may be reluctant to implement this type of project in light of the economic sanctions imposed on the Syrian government, which may expose them to problems that they do not need.

This paper does not advocate for one path over the other concerning leveraging blockchain technology within Syrian CSOs. Instead, it emphasizes the importance of pursuing both paths, as they do not contradict each other and may even complement one another.

Blockchain Technology by Syrian CSOs

The initial and crucial step towards leveraging blockchain technology within Syrian CSOs is implementing a pilot project that achieves success and effective marketing. This entails executing a successful project that serves as a core example for persuading donors and Syrian CSOs of the significance of utilizing this technology on a broader scale. Additionally, effective marketing and adequate PR campaigns for this project are vital, given that Syria has already witnessed several successful blockchain-based projects, such as a new system for the distribution of food aid baskets in two refugee camps (for further information, see Use Cases below). However, the issue is that this project was not effectively highlighted, which limited its potential for being utilized on a larger scale. As one of the respondents stated, "If it were not for the training, I would not have known about the relief basket distribution project, through blockchain technology. This is strange. Why did we not know about a successful project, even though our organization has worked effectively in Syrian civil society for ten years", another interviewee says: "There is no success story that others follow and there is no passion to learn about this technology."

The initial phase would involve a project that should consider the following steps:

Identify a crucial problem and assess blockchain technology's added value in solving it. The significance of identifying a critical issue outweighs the potential impact. For instance, if there are two projects, one addressing a critical problem with a medium impact and the other addressing a non-critical problem with a significant impact, the former should be prioritized. This is essential to counteract the culture of resistance to change. Accordingly, this paper advocates for a pilot project addressing transparency and financial transfer issues. Syrian CSOs and donors frequently discuss these problems, and blockchain technology could offer crucial solutions to them. Moreover, the proposed interventions must be tailored to suit the unique context of Syria and should rely on something other than generic experiences that may not work in Syria. However, it is crucial to remember that success in one country does not guarantee success in another, especially in Syria, with its complex context, various de facto authorities, and other unique factors.

Determine the appropriate type of blockchain for the proposed project, whether public, hybrid, or private. Generally, public and hybrid blockchains are preferred over private ones as the latter may eliminate several advantages of blockchain technology. While a public blockchain enhances transparency, a hybrid blockchain ensures meaningful data management to avoid unconditional data entry, which could result in process failure. Furthermore, personnel and beneficiaries utilizing the technology must be equipped with the needed technical knowledge to prevent potential errors. Additionally, the project design process must also consider various technical issues. One of our interviewees identified the dynamic manner in which blockchain can be implemented citing several key issues: "By implementing a blockchain-based system you ensure a higher level of transparency and authenticity while increasing accountability. That in turn can attract more donors." The same interviewee highlighted the fact that the point on meaningful and adequate data management can be ensured by enacting a system of private blockchain networks between donors and CSOs on the ground. This would ensure that a blockchain system is being used in a manner that achieves both the high level of security and transparency associated with blockchain networks, while keeping data access and/or editing abilities to relevant parties only. Moreover, we noticed based on our interviews that the general view leans towards having the beneficiaries' and CSOs' interactions be conducted through public blockchains to democratize the ease of use as well as data access. The aforementioned ideas all point to the fact that the optimal type of blockchain for each phase, process, and project can be identified separately and implemented accordingly.

Conduct a trial period with limited public access. During this period, project workers can identify potential issues and determine the appropriate mechanisms for addressing them. However, it is not advisable to make this stage public as any failure during this period could damage the perception and adoption of blockchain technology, potentially delaying its future use.

Implement broad application of the technology, accompanied by a comprehensive media and marketing campaign to create awareness about its benefits and potential shortcomings. This step aims to strengthen the desire of organizations to learn about blockchain technology and adapt it to their needs. It is crucial to emphasize the positive impact of blockchain technology and highlight its success stories in the media campaign to gain wider acceptance and incentives to learn more about it.

The second phase involves a comprehensive and ongoing capacity-building process, including the following components:

Provide diverse and continual training to international and Syrian organizations and personnel at different administrative levels. The training should encompass a general and comprehensive understanding of blockchain technology, Decentralized Autonomous Organizations (DAO), smart contracts, Cryptocurrencies, and other technical concepts. Additionally, the training should focus on developing an in-depth understanding of the uses and applications of this technology in Syrian CSOs. These training should be developed through cooperation among CSOs, International donors, private sector and academics. In this way, we could have better idea about the best possible applications.

Establish platforms and communication networks that connect Syrian civil society organizations, blockchain experts, and other stakeholders in the community. Through these platforms, a collaborative effort can be made to promote awareness and mutual learning. This creates an opportunity for each group to understand the other party's reality better, leading to feasible and appropriate solutions. Moreover, such platforms can help identify knowledge gaps and raise awareness within the community, thus accelerating the learning process. Here, we find many opportunities such as Ethereum platforms, who show high interest in utilizing blockchain for the social good. However, CSOs should consider starting this process, since they will be the main beneficiaries.

Focus on long-term results in terms of achieving the projects' goals as well as developing a sustainable blockchain environment for Syrian CSOs. Steps should be taken to establish a community of local blockchain experts and professionals. Education on blockchain technology should not only be limited to training workshops and courses on the usage of existing blockchain applications. There should be meaningful negotiations or lobbying efforts with academic authorities and institutions to implement adequate curriculum changes and provide credible learning materials to students who will later feed into the CSOs workforce. Furthermore, the necessity of creating and nourishing such an academic discourse environment arises from the need for the work efforts to be both applicable and sustainable. Sustainability would arise from ensuring that future blockchain-based solutions would be created to fix the specific issues of the Syrian context and that they are created by those who are struggling with said issues themselves.

This approach would ensure a higher level of applicability, and that the blockchain-based solutions fit CSOs' needs. Moreover, the assurance of following this pathway in parallel with the other pathways is essential for the shift from an "emergency-response-driven mindset" towards that that follows a strategic-thinking-oriented pathway.

Mobilization and advocacy. These operations should target four main actors: Syrian organizations, international organizations, the de facto forces in Syria, and funded governments.

Application and Advantages

The interviewees suggest or mention some blockchain-based projects that have been implemented or can be implemented, such as:

Transparency and data organization: The civil society sector in Syria faces challenges related to corruption, which negatively affects both its response to crises and its acceptance by the local community. For instance, a lack of organized data has resulted in ineffective responses to emergencies, such as the case of earthquake victims, due to dispersed and lost data. One of the most prominent issues caused by this lack of organization is duplication of assistance, whereby some individuals receive more than one form of aid – or the same form from multiple sources – while others receive none. These problems have reduced donor confidence, decreased funding, and increased financial difficulties for Syrian CSOs. This issue was in particular highlighted by one of our interviewees who referenced several cases they faced in the recent earthquake catastrophe that struck Syria and Turkey.

To address these issues, blockchain technology has been used to improve the organization of relief distribution operations and avoid duplication in the northeast as well as in the Zaatari and Azraq refugee camps in Jordan. Several international organizations have already employed blockchain technology to store beneficiary data, which helped them identify nearly 700 families receiving assistance from multiple sources. The decentralized nature of blockchain technology has strengthened cooperation among international organizations to share data, which has contributed to revealing the problem of duplication. Using blockchain technology also enhances transparency and reduces the need for third-party monitoring and evaluation expenses. However, the application of this technology still requires further expansion.

In addition, the interviewees mentioned that institutional data is not preserved. And those saving operations, even if they are carried out, happen randomly and are subject to damage and misuse. As one interviewee says, "I know many organizations, in which a person, after a dispute with the institution, either deleted or confiscated the data." This became more important after the earthquake when a lot of data was damaged. The interviewees highlighted the fact that the increased transparency and data organization as well as the added guardrails against data manipulation or data loss would surely attract more donors.

Money transfer: The second proposed application of blockchain technology is related to money transfers, which presents a solution to the issues faced by Syrian organizations. These issues include delays in receiving transfers, mainly due to examination procedures carried out by donors, high costs of remittances, and the vulnerability of transactions to manipulation. Using stable cryptocurrencies could alleviate these problems by enabling donors to verify that the organization received the transfer and facilitating faster and lower-cost transactions. It should be noted that many cryptocurrency exchange platforms have adopted "know your customer" and "anti-money laundering" policies, increasing donors' confidence in dealing with cryptocurrencies. Nonetheless, the main challenge is the conversion of cryptocurrencies into cash that can be used for buying and selling operations. This problem could be addressed by dealing directly with merchants and paying them with cryptocurrency, but this is not feasible in the short term due to their lack of confidence in these currencies. Nevertheless, some currency traders prefer cryptocurrencies because they offer a way to free up their capital, which is heavily restricted by local authorities. Furthermore, the usage of stablecoins would increase the appeal of blockchain-based cryptocurrencies as they are pegged in value to fiat currencies and are not prone to the price volatility associated with cryptocurrencies in general. Moreover, as per a recent movement by the US State Department, several areas in Northeast Syria are to be excluded from the currently applied sanctions. This exemption would allow cryptocurrency service providers to be present on the ground and be able to open points of service which in turn would facilitate the on-ramping/off-ramping efforts and make the conversion between cryptocurrencies and cash more seamless for CSOs in those areas.

Other potential projects: many interviewees suggest different use cases such as using blockchain in governance, property rights, and managing the data of the health sector. However, the above examples are the most mentioned by the interviewees, which indicate their importance and applicability.

Conclusion

This study represents a preliminary effort toward exploring the current uses as well as potential of blockchain technology in the operations of civil society organizations in Syria. To the best of our knowledge, it is the first of its kind conducted in the Syrian context, intending to assess the capacity and preparedness of Syrian CSOs to adopt such technologies in their work. Our findings indicate that while current conditions may not support the immediate implementation of blockchain technology, a readiness and pressing need exists for its adoption. This is particularly relevant given the challenging circumstances surrounding the funding landscape and the escalating threat of corruption, both of which pose significant risks to the long-term sustainability of Syrian CSOs.

In light of the preceding, we put forth three intervention strategies to optimize the potential benefits of blockchain technology in the Syrian civil society context. These strategies are 1) effective marketing of successful experiences, which we view as the most crucial strategy; 2) capacity-building processes that facilitate mutual learning between blockchain specialists and Syrian civil society workers; and 3) advocacy efforts aimed at donors, primarily targeting a shift towards a results-oriented and indicator-based funding mechanism, rather than one that prioritizes creativity and innovation.

Furthermore, the study sheds light on the significance of knowledge challenges and their underlying causes, which we consider the most critical obstacle to implementing blockchain technology at the CSOs level. Based on our findings, we recommend prioritizing intervention efforts in the northwest region of Syria while adopting a hybrid blockchain model. However, we should consider the project's unique nature and alignment with the most appropriate values for the Syrian context before deciding which type of blockchain is the best.

In conclusion, it is essential to highlight the imperative of expanding the scope of research on blockchain technology, both in terms of methodological approaches and inquiry areas. One critical line of inquiry pertains to examining the variations in the adoption and utilization of blockchain technology across different sectors within Syrian CSOs. Accordingly, we recommend conducting specialized studies to investigate the specific applications of blockchain technology in various sectors, such as health, education, relief organizations, and others.

Furthermore, there is a pressing need to take the stance of the de facto governing bodies in the area of usage of blockchain-based applications, as stances vary wildly across authorities due to several factors, including the openness for new innovation, technical infrastructure guaranteed by such authorities, religious considerations, and lack of support for censorship-resistant technologies.

Based on our research, we recommend conducting a comparative study of the usage of blockchain technology and its various applications in several conflict zones (i.e., the Russian invasion of Ukraine, The ongoing conflict in the Middle East, The ongoing Syrian war, etc.) to test the applicability and commonalities in utilization of said technology across different geographic locations and geopolitical situations. This would represent a vital step to push the field of studying blockchain technology in conflict zones further and expand its literature.

Bibliography

- Alzoubi, Zedoun. "Syrian Civil Society during the Peace Talks in Geneva: Role and Challenges." *New England Journal of Public Policy* 29, no. 1 (2017). <https://scholarworks.umb.edu/nejpp/vol29/iss1/11>.
- Baharmand, Hossein, Naima Saeed, Tina Comes, and Matthieu Lauras. "Developing a Framework for Designing Humanitarian Blockchain Projects." *Computers in Industry* 131 (2021): 103487. <https://doi.org/10.1016/j.compind.2021.103487>.
- Bricout, Aymeric, and Vincent Auez. "Solving Humanitarian Aid Inefficiencies with Blockchain Technology." Frankfurt School, August 2020. <https://doi.org/http://explore-ip.com/2020-Blockchain-for-Humanitarian-Aid-Systems.pdf>.
- Charities Aid Foundation. "Block and Tackle: Using Blockchain Technology to Create and Regulate Civil Society Organization.", no. 6 (July 2016): 1–20.
- Dubery, Jérôme. "Blockchain and Environmental Civil Society Organizations." *Global Environmental Governance in the Information Age*, 2019, 102–22. <https://doi.org/10.4324/9781315109596-6>.
- Dutta, Saugata, and Kavita Saini. "Blockchain and Social Media." *Blockchain Technology and Applications*, 2020, 101–14. <https://doi.org/10.1201/9781003081487-6>.
- Fan, Wenxin. "Peng Shuai: Who Is the Chinese Tennis Star, and Where Is She?" *The Wall Street Journal*. Dow Jones & Company, December 20, 2021. <https://www.wsj.com/articles/peng-shuai-what-to-know-about-the-missing-chinese-tennis-star-11637324061>.
- Friedman, Nicola, and Jarrod Ormiston. "Blockchain as a sustainability-oriented innovation?: Opportunities for and resistance to Blockchain technology as a driver of sustainability in global food supply chains." *Technological Forecasting and Social Change* 175 (2022): 121403.
- Carl Torrence. "How Can Ngos Raise Funding by Implementing Blockchain Technology?: Blog." *Candid Learning*, August 26, 2021. <https://learning.candid.org/resources/blog/how-can-ngos-raise-funding-by-implementing-blockchain-technology/#:~:text=Blockchain%20technology%20may%20be%20the,efficiency%20in%20NGOs%20fundraising%20operations>
- Giulio, Coppi, and Fast Larissa. *Rep. Blockchain and Distributed Ledger Technologies in the Humanitarian Sector*. London, UK: HPG Commissioned Report, 2019.
- Halamka, John D, Gil Alterovitz, William J. Buchanan, Tory Cenaj, Kevin A. Clauson, Vikram Dhillon, Florence D. Hudson, et al. "Top 10 Blockchain Predictions for the (near) Future of Healthcare." *Blockchain in Healthcare Today*, 2019, 1–9. <https://doi.org/10.30953/bhty.v2.106>.
- Hala System. "Holding War Criminals Accountable with Immutable Evidence on the Ethereum Blockchain." *Consenys*, 2019, 2–29.
- Howie, Thomas. "New Blockchain and Big Data Projects by Civil Society Innovators." *Disrupt & Innovate*, March 15, 2018. <https://disrupt-and-innovate.org/civil-society-agree-blockchain-and-big-data-collaborations/>.

- Huillet, Marie. "Hong Kongers Use Blockchain to Save Evidence of Anti-Authoritarian Struggles." Cointelegraph. Cointelegraph, May 27, 2021. <https://cointelegraph.com/news/hong-kongers-use-blockchain-to-save-evidence-of-anti-authoritarian-struggles>.
- IBM. "What Is Blockchain for Social Good?" IBM. Accessed February 27, 2022. <https://www.ibm.com/topics/blockchain-for-good>.
- Khan, Kashif Mehboob, Junaid Arshad, and Muhammad Mubashir Khan. "Secure Digital Voting System Based on Blockchain Technology." Research Anthology on Blockchain Technology in Business, Healthcare, Education, and Government, 2021, 1280–90. <https://doi.org/10.4018/978-1-7998-5351-0.ch071>.
- Liao, Rebecca. "Why Governments and Ngos Are behind on Blockchain (and How to Fix That)." Institute for Global Change. Tony Blair institute for global change, June 14, 2021. <https://institute.global/policy/why-governments-and-ngos-are-behind-blockchain-and-how-fix>.
- Maccabiani, Nadia. "A Blockchain-Driven e-Participation for Substantial Democracy." University of Brescia, 2021, 1–10. <https://doi.org/http://ceur-ws.org/Vol-2781/paper6.pdf>.
- Mackey, Tim K., Tsung-Ting Kuo, Basker Gummadi, Kevin A. Clauson, George Church, Dennis Grishin, Kamal Obbad, Robert Barkovich, and Maria Palombini. "'Fit-for-Purpose?' – Challenges and Opportunities for Applications of Blockchain Technology in the Future of Healthcare." BMC Medicine 17, no. 1 (2019). <https://doi.org/10.1186/s12916-019-1296-7>.
- Maghribi, Reem. "Supporting Syrian Civil Society Organizations." Konrad-Adenauer-Stiftung, June 2020. <https://www.kas.de/documents/266761/6686921/Supporting+Syrian+Civil+Society+Organizations.pdf/e6d42d56-12aa-5a71-cd81-5454083b3a37?version=1.4&t=1610714082418>.
- Nelson, Paul. "PRIMER ON BLOCKCHAIN: How to Assess the Relevance of Distributed Ledger Technology to International Development." USAID, 2019.
- Nikolakis, William, Lijo John, and Harish Krishnan. "How Blockchain Can Shape Sustainable Global Value Chains: An Evidence, Verifiability, and Enforceability (Eve) Framework." Sustainability 10, no. 11 (2018): 3926. <https://doi.org/10.3390/su10113926>.
- Patil, Anchal, and Vipulesh Shardeo. "Humanitarian Logistics Performance Improvement Model Using Blockchain Approach." Department of Management Studies Indian Institute of Technology Delhi, March 2021, 1–12. <https://doi.org/http://www.ieomsociety.org/singapore2021/papers/193.pdf>.
- Peter, Viktor, Juan PAREDES, Moisés ROSADO RIVIAL, Eduardo SOTO SEPÚLVEDA, and Diego A. HERMOSILLA ASTORGA. *Blockchain meets energy: digital solutions for a decentralized and decarbonized sector*. German-Mexican energy partnership (EP) and florence school of regulation (FSR), 2019.
- Rehman, Ehsan, Muhammad Asghar Khan, Tariq Rahim Soomro, Nasser Taleb, Mohammad A. Affi, and Taher M. Ghazal. "Using Blockchain to Ensure Trust between Donor Agencies and Ngos in under-Developed Countries." Computers 10, no. 8 (2021): 98. <https://doi.org/10.3390/computers10080098>.

- Roberts, Daniel. "What Daos Can Do: \$6.75m in Ethereum for Ukraine." Decrypt. Decrypt, March 5, 2022. <https://decrypt.co/94386/ukraine-dao-millions-in-ethereum-shows-what-dao-can-do/>
- Rugeviciute, Aiste, and Afshin Mehrpouya. "Blockchain, a Panacea for Development Accountability? A Study of the Barriers and Enablers for Blockchain's Adoption by Development Aid Organizations." *Frontiers in Blockchain* 2 (2019). <https://doi.org/10.3389/fbloc.2019.00015>.
- Salzano, Francesco, Lodovica Marchesi, Remo Pareschi, and Roberto Tonelli. "Integrating Blockchain technology within an Information Ecosystem." *arXiv preprint arXiv:2402.13191* (2024).
- Schmidt, Kai, and Philipp Sandner. "Solving Challenges in Developing Countries with Blockchain Technology." Frankfurt School, October 2017, 1–22. <https://doi.org/https://www.semanticscholar.org/paper/Solving-Challenges-in-Developing-Countries-with-Schmidt-Sandner/a20d8c027d38316ca28aed7b8423ee0581abbc1d>.
- Shang, Qiuyun, and Allison Price. "A Blockchain-Based Land Titling Project in the Republic of Georgia: Rebuilding Public Trust and Lessons for Future Pilot Projects." *Innovations: Technology, Governance, Globalization* 12, no. 3-4 (2019): 72–78. https://doi.org/10.1162/inov_a_00276.
- Shu, Jiangang, Xing Zou, Xiaohua Jia, Weizhe Zhang, and Ruitao Xie. "Blockchain-based decentralized public auditing for cloud storage." *IEEE Transactions on Cloud Computing* 10, no. 4 (2021): 2366–2380.
- Tanaka Nyamadzaw. "21. When Blockchain Meets Civil Society." CIVICUS Global Alliance, October 17, 2018. <https://www.civicus.org/index.php/media-resources/news/civicus-at-25/3563-when-blockchain-meets-civil-society>
- Thylin, Theresia, and Maria Fernanda Duarte. "Leveraging Blockchain Technology in Humanitarian Settings – Opportunities and Risks for Women and Girls." *Gender & Development* 27, no. 2 (2019): 317–36. <https://doi.org/10.1080/13552074.2019.1627778>.
- Tsukayama, rainey Reitman and Hayley. "16 Civil Society Organizations Call on Congress to Fix the Cryptocurrency Provision of the Infrastructure Bill." Electronic Frontier Foundation, August 6, 2021. <https://www EFF.org/deeplinks/2021/08/16-civil-society-organizations-call-congress-fix-cryptocurrency-provision>.
- World Bank. "How Crypto Technologies Could Revolutionize Development." Accessed February 22, 2022. https://www.worldbank.org/en/news/podcast/2021/12/22/how-crypto-technologies-could-revolutionize-development-the-development-podcast?cid=ECR TT_worldbank_EN_EXT.
- Yang, Rebecca, Ron Wakefield, Sainan Lyu, Sajani Jayasuriya, Fengling Han, Xun Yi, Xuechao Yang, Gayashan Amarasinghe, and Shiping Chen. "Public and private blockchain in construction business process and information integration." *Automation in construction* 118 (2020): 103276.

Annex I: Terminology

Blockchain: A distributed database of records or public ledger of all digital events that have been executed and shared among participating parties. Mostly, blockchains are decentralized and employ advanced cryptographic methods to ensure the network's security.

Smart Contracts: Code that runs on blockchains, intended to digitally facilitate, verify, or enforce the negotiation and execution of the terms of an underlying legal contract designed to fulfill common contractual conditions comprising payments and legal obligations. Smart contracts are self-enforceable and require no intervention from third parties and the terms of a contract cannot be altered after being deployed on a blockchain without verified consensus.

NFT: A non-fungible token is a cryptographic asset on a blockchain containing unique identifying information and codes that separate them from one other. As such, each NFT has its own set of characteristics making it unique from other blockchain-based assets.

Syrian CSOs: All of the organizations who work within or for Syria and define themselves as Syrian, even if they are registered outside. Organizations can be non partisan, non governmental and nonprofit, and can encompass any organization or civil initiative engaged in public affairs, whether in the humanitarian sector or in advocacy efforts.

Cryptocurrency: A digital asset that is created, stored, and used on blockchain systems in various ways depending on the used consensus algorithm (PoW, PoS, PoSt, etc.) and is secured using advanced cryptographic methods (namely asymmetric cryptography).

Hash Function: A one-way mathematical function that is used to secure several aspects of blockchain architectures, from securing decentralized consensus to securely storing data. The input of a hash function is virtually impossible to deduce from its output.

Private Key: A string of characters used in asymmetric cryptography, most notably in blockchain wallets, to allow users to access their on-chain data, funds, addresses, etc. The most common hash function currently used in blockchain systems is the SHA256 functions, as such, the private keys generated from it are 256 bits long (64 hexadecimal characters).

Public Keys: Generated through the same hashing function as a private key, public keys are derived from the private key after hashing it through the desired hashing function resulting in a key pair. The public key represents an address on the blockchain that can be shared with other parties openly; unlike the private key.

Consensus Algorithm: Means of reaching a decentralized consensus to facilitate the process of technical decision-making in a fully decentralized environment such as blockchain networks without the need to resort to a central authority, while rendering the dangers of the Byzantine Generals Problem (BGP) obsolete.

The Byzantine Generals Problem (BGP): A prominent, formerly unsolvable, problem in Computer Science which conceded the impossibility of creating decentralized, peer to peer, computer networks without central authority or unit with higher privileges than other components/nodes participants due to the inability of verifying the correctness and authenticity of information without said central unit/authority.

Trustless Systems: A trustless system is one that does not require imposed trust in a third party as a condition for participation. Wherein other systems with imposed trust the distrust or disapproval of the role of an intermediary with higher privileges than other participants in a system (i.e., a centralized authority like a Central Bank or a national government) would disqualify one from participating in the system in the first place.

Annex II: Current Use Cases

Current blockchain use-cases by CSOs in Syria:

Building Blocks Program – AlZaatari and Azraq Camps: The use of blockchain technology to distribute humanitarian aid amongst the Syrian refugees of AlZaatari Camp in Jordan. The pilot program was sponsored by the World Food Program (WFP) and has been implemented in AlZaatari and Azraq camps for Syrian refugees in Jordan. The project bypassed the obstacles normally present in traditional means of delivery of humanitarian aid (e.g., long financial transaction times, distribution methods that are reliant on cards and/or paper documents, delays in distribution, etc.) by utilizing an on-chain system running on a variation of the Ethereum blockchain. Within this system, each beneficiary has an allocated fund on their public address through which they can purchase the goods they need from WFP and USAID supermarkets within the camps, and the beneficiaries can pay for their groceries through a retina scan that would trigger the private key associated with the wallet to which the funds are located.

Hala Systems 2019: Hala Systems project has two main components, the first of which is an early warning system (Sentry) which is focused on providing civilians living in airstrikes-targeted regions with the means of warning signals to be able to take any available precautions to protect themselves when the danger of an airstrike is imminent. According to the project's data, this has reduced the lethality of airstrikes against civilians in Syria by 20-30% in the year of 2018. The aforementioned effort utilizes a joint data collection set comprising of human observers, sensors, data collectors, media sources, etc within a portal dubbed Insight, which allows both for the collection of the needed data to efficiently utilize it within the early warning system, as well as creating a reliable record of human rights violations committed against civilians in Syria. The aforementioned efforts utilize several blockchain features such as the immutability and transparency of blockchain networks, allowing for the creation of a tamper-proof and public ledger of data by hashing this data onto the Ethereum blockchain.

Preserving Cultural Heritage: Creating 3D designs of historical buildings either by scanning them or creating reconstructions of them to preserve them as NFTs in a blockchain-based metaverse to preserve the historical and cultural heritage of this war-torn region. As the MENA region is rich in its historical heritage and at the same time suffering from long political and military turbulence that have either blocked access to some of the most notable historical sites or resulted in the destruction of several of them (e.g., the destruction of several historical monuments in Palmyra by ISIS), multiple efforts has been made by several initiatives to preserve the heritage on chain. Some initiatives are working on creating 3D scans and full digital versions of certain historical sites in Syria, mainly in the north and northeast, to create a visual database of the region's historical and cultural heritage. Furthermore, some projects are trying to reconstruct 3D models of the sites that have been fully or partially destroyed. The end goal of these projects is to create an on-chain metaverse that contains these sites in their 3D form as Non-Fungible Tokens (NFTs); utilizing the immutability and high-durability features of blockchain systems.

About Us

PeaceRep is a research consortium based at Edinburgh Law School. Our research is rethinking peace and transition processes in the light of changing conflict dynamics, changing demands of inclusion, and changes in patterns of global intervention in conflict and peace/mediation/transition management processes.

PeaceRep.org

PeaceRep: The Peace and Conflict Resolution Evidence Platform | @Peace_Rep_ | peacerep@ed.ac.uk

University of Edinburgh, School of Law, Old College,
South Bridge, EH8 9YL

PeaceRep is funded by UK International Development from the UK government



PeaceRep: The Peace and Conflict Resolution Evidence Platform
peacerep@ed.ac.uk | <https://peacerep.org> | @Peace_Rep_

University of Edinburgh, School of Law, Old College, South Bridge EH8 9YL

PeaceRep is funded by UK International Development from the UK government.