

Abpars token Crowdfunding based on blockchain technology

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Abstract

Infrastructures always had a both locally and globally key role in the economic and social development of countries. Investment in infrastructures, in particular by the private sector in most countries, has always been something to worry about for the governments of these countries and other performers in this area. In Iran as well, the problem of Financing for the improvement of infrastructures especially water infrastructures, including the purification and distribution of drinkable water is one of the problems that has challenged the managers of this field because of the strategic nature of this substance, they are constantly trying to attract more fund(capital) to improve and develop the water quality. Due to the insufficiency of raising capital and its lack of continuity through traditional methods of financing in this area (such as the issuance of bonds for projects by the government), crowdfunding is one of many Approaches that can not only attract more from micro-capitals, but also improve the return rate of capital or investment. In this research, by using the concept of crowdfunding and blockchain technology, we present a conceptual model to fund drinkable water production and distribution projects. in this model, by tokenizing the assets of a water production and distribution project, investors (corporative and micro) attempt to invest through a cryptocurrency trading system and based on the amount of their investment, they are shared in these assets and the profits from it. Also, in the section of water distribution to subscribers (household, industrial and agriculture), according to the amount of their savings or the specified inordinate consumption, they will be awarded with a prize/fine. a model like this can improve the management of water consumption by citizens while raising the capital of various investors in water production better.

Keywords

token, Crowdfunding based , blockchain technology.

1. Introduction

Water is a key and necessary resource for continuation of life, economic development and Environmental sustainability. According to statistics published by the United Nations, it is estimated by 2025, about 66% of the world's population will live in Urban areas, and the current centralized plumbing infrastructure built by installation companies in this area will be insufficient for this amount of population (UN Report, 2020). Water shortage is considered to be one of the obstacles to stable development. so, the need for innovation in order to improve operations and processes in production, distribution and purification area of water in order for the growing population to meet the need for water will be a necessity.

Innovative businesses, not only have the power to generate profits, but they can also solve important environmental problems, consider bigger challenges, and play a greater role in communities. Stability or green approach is a much more complicated subject than coping with climate changes, resources going empty, erosion of regions, and producing wastage and gathering it. The strategy of green business has been linked to the concept of "climatology science", low-cost social responsibility policies, costs and partially marketing for a long time. In the past, many companies defined the short-term benefits of Beneficiaries in form of corporates performance, investment return rate and market behavior, without any attention to non-financial indicators and their relationship with the concept of resilience. Over the last few years, the principles of stability have become one of the main sections of strategies of corporates business (Andoni et al., 2019).

It is anticipated in the next two decades, demand for the most expensive resource which is water, will exceed its supply by more than 40%. In Many reports, including the report from World Bank, entitled "High and Dry: Climate Change, Water and Economy", points out to the cost of water scarcity, which is worsen by climate changes, can have heavy costs as high as significant part of GDP on countries in some areas, which leads to increasing migration and multiplies the risk of conflict. Both scientists and

economists believe that under the current trend, this high tension of water, will threaten about 45% of global GDP by 2050, which Will affect mainly the areas with water shortages and scarcity problem, areas such as the Middle East, Africa and East Asia (World Bank Report).

Water as a resource which is a fundamental pillar in bond between water-energy-food and water-energy-wastage, which has agricultural uses that includes 70% of world's water consumption, and after that, the industry section with 20% and in Urban consumption with 10% of water consumption are the two sections in the next ranks. Energy production takes about 15% of global water consumption, which may increase to 20% by 2035 (OECD, 2016). In order to guide the stable development and growth, considering the aspects relating to water security that are deeply relevant to food and energy security issues, is a vital matter. To Fund the field of water, it is required to investment in water infrastructure, information technology, related institutions and communities.

Considering that the food security is highly dependent on water resources, and the fact that due to population growth, agricultural production will double by 2050, Financing in water section is vital not only for water projects but also for all related sectors, especially the sectors which depend on water and food. According to the 2016 report from the Organization for Economic Co-operation and Development (OECD), the four categories of actions that, in combination together, can be incentive to investment in water security and sustainable growth, are:

- Maximizing the value of current investments in water security area
- Choosing investment paths that reduce water-related risks (minimizing costs over time)
- Ensure synergy and Completion with investments in other sectors
- Increase the scale of financing through risk allocation - attractive Efficiency

Currently, the fundamental economic and environmental existing problem is the multiplication of demand versus the declining scarce resources. This systematic problem requires a holistic and innovative

approach that is implementable in both the private and public sectors, and can also be replicated at the cross-border level, and through it be able to integrate green financing, new technologies and aspects of water ownership.

In Iran, the main problems in project implementation, are lack of government financing capacity, legal restrictions for the bank to accept these projects, legal problems in attracting domestic and foreign resources, lack of growth of markets, institutions and financial instruments in Iran and high cost of money in Financing in Rials. Due to these problems, the use of various sources of financing the non-governmental sector (domestic and foreign) along with government resources to implement these projects is inevitable (Mirshahi and Bayat, 1389).

In 1397, In the area of water purification and distribution in Iran, equivalent to 217 wastewater projects with a total Refining capacity of 2 million and 200 thousand cubic meters per day, along with 114 water supply projects, with a total production capacity of 3 million and 300 thousand cubic meters of water, are being implemented nationally and the completion of these projects, a credit of 670 thousand billion rials is needed. In another view in our country, the average construction cost of each kilometer of water transfer line have been 20,000 million Rials, each kilometer of waste water gathering network, 5,000 million Rials, construction of each cubic meter per second of conventional water purification capacity, 600,000 million Rials and the per capita construction cost of waste water purification is 7.5 million Rials. It is clear that the implementation and completion of complicated and costly water and waste water projects will not be possible without

the necessary investment and funding, which is a significant amount of money.

1.1. Blockchain technology

Blockchain is a digital data structure, a shared and distributed database that records the growing transactions and their chronological order. This data structure is actually a ledger that includes digital transactions, data logging, and system executions. Transactions in larger formats are called blocks, which are time-stamped and encrypted attached to their previous blocks, they form a chain of records that sequence events or determines blockchain (Mattila et al., 2016).

Blockchains are running on digital networks. Data transfer in such networks is equivalent to copying data from one point to another. For example, in domain of a cryptocurrency, this action is equivalent to copying digital coins from one user's electronic wallet to another. The main challenge in this area, lies in the fact that the system would ensure that the coins are spent only once and the spendings wouldn't occur again or multiple times. A traditional way to do this is to use a central verifier such as a bank, which acts as a trusted intermediate, whose job is to maintain the integrity of the ledger and keep the records up to date. But the initial goal of blockchain-based technologies is to eliminate the need for such intermediaries and replace them with a distributed network of digital users who work together to validate transactions and protect the integrity of the ledger. Unlike centralized systems, each member of the blockchain network have their own copy of the ledger or can access it from the cloud service (figure 1). in result, anyone on the network can access the history of information about system transactions (Donnerer, & Lacassagne, 2018).

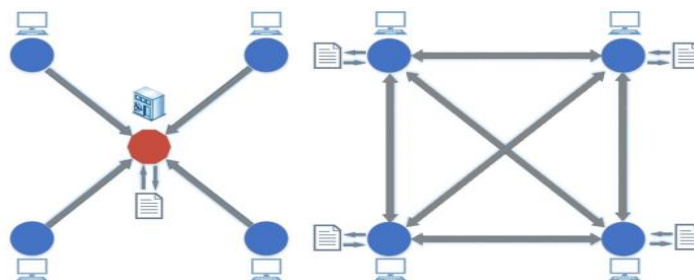


Figure 1- Differences between centralized and distributed transaction systems (Andoni et al., 2019)

1.2. tokenization

Tokenization is the digitization of an asset in which each unit or token represents ownership of a portion of that asset (Uzsoki, 2019). In other words, tokenization is the process of converting rights to an asset into a form of digital token performed by the blockchain platform. Physical segregation of real assets is considered a difficult task, and digital tokens allow buyers and sellers to gain direct ownership. Tokens that represent real estate, like ordinary securities, can be traded on secondary markets.

1.3. Internet of things

The Internet of Things has been able to change the way we interact with each other and with the environment, and gives us a better understanding of what is going on around us. The Internet of Things also has a key role in smartization of our cities and infrastructures. It is anticipated that the number of devices connected to one another through the Internet of Things is going to reach 50 billion by the end of 2020, and increase to 1 trillion devices by 2035. Despite the benefits the internet of things has; Issues like security and confidentiality of data that are frequently generated, dissimilarity of devices, scalability, power efficiency and cooperating ability, standardization of network communication protocols in the use of this technology Are taken into consideration (Stojkoska and Trivodaliev, 2017).

The Internet of Things is considered to be the main technology and solution to solve issues related to water saving and management. This technology has attracted attention through digitalization and creating intelligence in system of water management, to solve the problem of water insecurity and as a global goal for sustainable development purposes (Robles et al., 2015).

2. Reviewing the literature

The use of blockchain technology and tokenization in recent years has been considered as a way of crowdfunding. Saji et al., 2019 have proposed a financial model for crowdfunding for startups in which

a new mechanism of blockchain technology is introduced to place investors, entrepreneurs and stakeholders together through a safe way. The authors expect a model like this to create a self-sustaining, publicly accessible business environment in which people with different needs work alongside each other. In this model, individuals are allowed to tokenize both their tangible and intangible assets, and the right of ownership of these assets will be in form of tokens (Saji et al., 2019).

Tian et al., 2019 have introduced a conceptual framework as a new financing tool for infrastructure projects using tokenization based on blockchain technology. They pointed at the benefits which the tokenization in financing infrastructure projects has, such as transparency, increased access to alternative sources of funding, and liquidity, and listed the obstacles to implement such a tool. Eventually, the authors have come to the conclusion that tokenizing the infrastructure can be significantly useful for the infrastructure of the transportation system, and of course they have also pointed out that there is a kind of delay and interruption in the regulatory system and making technical changes to increase the applications of this technology (Tian et al., 2019).

One of the areas in which the use of blockchain technology can lead to the improvement of various processes is the field of energy and in particular the electricity industry (Andoni et al., 2019). decision-makers in energy sector and energy installation companies have emphasized that blockchains can provide solutions for challenges in the energy industry. The German Energy Agency claims that blockchain technologies have the potential to improve the efficiency of current operations in the field of energy and its processes, and can accelerate the development of internet of things infrastructures and digital applications and help to create innovation in Peer-to-peer energy transactions and decentralized production. Industry stakeholders, installation companies and energy decision makers have been very interested in blockchain technologies. Blockchain technologies can be used for and influence a variety of applications in

the operations fields and business processes of energy companies. The following can be pointed out:

- **Billing issuance:** blockchains and smart contracts and smart measurement can make automatic issuance and payment of billings for distributed consumers and manufacturers happen. Energy installation companies may take advantage of the potential the micropayments have in energy, Payment solutions during consumption, or payment platforms.
- **Sales and marketing:** ways of Selling may vary based on the way of consumption of energy by the consumer, their individual preferences, and environmental concerns. Blockchain technologies in combination with artificial intelligence techniques such as machine learning, can identify consumer consumption patterns and provide the possibility of supplying the energy products in accordance to consumer needs.
- **Transactions:** Distributed blockchain-based trading platforms may apply fundamental changes to common market practices such as wholesale market management, transactions of commodity trades, and risk management.
- **Automation:** Blockchains can improve the control of decentralized energy systems and microgrids. Following local energy markets formed by peer-to-peer energy trading systems or distributed platforms, can dramatically increase self-production and self-consumption of energy, which can affect revenue streams and tariffs in this area.
- **Sharing Resources:** Blockchains can be used to provide solutions for sharing resources between multiple users (types of energy or data).
- **Transparency:** Unchangeable records and transparent processes can greatly improve auditing and compliance control.

Andoni et al., 2019 in their research have systematically reviewed the various applications of blockchain in the energy field. According to the

classification done by them, the use of blockchain can be classified into eight larger groups according to their purpose and field of activity: 1) measurement / billing and security; 2) cryptocurrencies, tokens and investments; 3) decentralized energy trading; 4) green certificates and carbon trading; 5) network management; 6) Internet of things, smart devices, automation and asset management; 7) electrical electronic mobility; 8) and general purpose initiatives and Consortiums.

2.1. Uses of blockchain technology for the water industry

Dogo et al., 2017, in their research, which is published as a chapter in the book titled application of artificial intelligence in the Internet of Things, has examined the impact of blockchain technology and the Internet of Things on water management. They have addressed the Feasibility study use of these technologies in areas such as storm water management, water quality monitoring and reporting directly to consumers and other stakeholders, as well as payments and smart contracts to sustainably face the challenges related to the world water crisis in the continent of Africa. The authors eventually concluded that synergy between blockchain and the Internet of Things will bring socio-economic benefits as well as technologies such as greater security and transparency, reduced operating costs, and overall process efficiency. In 2020, Kaur and Oza, discuss the subject of using tokens and blockchain technology in wastewater purification, according to the ERC20 standard, which is designed for Ethereum based cryptocurrencies, by providing a blockchain-based multi-organizational classification for smart cities. In the model they offered, the issuance and achievement of token credits based on the amount of hazardous wastewater as a by-product in waters and the strict monitoring of the standards of water quality by the Internet of Things is discussed. The goal of their research was to create a business environment with equal opportunities for all organizations to obtain token credits based on the amount of purified wastewater done by them.

2-2. Digitalizing water

The Water Credits Project, which is developed by Smart4tech, is an innovative strategy and technology-based startup, a combination of green financing, circular economics and technological thinking.

The project includes a monetary incentive program which is driven by technology for water consumers. This technology is based on a number of indicators, including water use performance, innovation, community participation, as well as non-water related measurements. The main goal of this project is to improve water efficiency, improve resilience and advancement of innovation in this sector. Given the complexity of this industry, the project brings together a number of public and private organizations.

This strategy will have great importance in achieving sustainable development goals related to the water industry, innovation, infrastructure, sustainable cities and communities, responsible consumption and production, environmental measures and partnerships. This program develops a strategic platform for cooperation with public-private incentives, local tax programs, along with further development of green financial instruments, including water bonds. The key purpose of the Smart Water Credits project is to improve water use efficiency and create incentives for the private and public sectors (urban and industrial consumers), Utilization of behavioral economics aspects as incentives for synchronization, innovation and partnership. Technology is used as part of this concept, as a solution. It is expected of a private blockchain to be used to optimize the recording of current and future information, Smoothing the audit process, and report compliance. Also display environmental effects (including sustainability indicators and international scoring indicators) if needed, to provide the decision makers with the aggregate data they need, to change market behavior (Poberezhna, 2018).

Using blockchain technology as an independent validator and a reliable source of shared information will help the market with the transparency it needs and will help it with Accountability.

The country of Australia is recognized as one of the world leaders in water resources management and in particular in using water markets and transactions as a tool to divide water between consumptions which are each other's competitors. These consumptions include urban, industrial, environmental and agricultural. As governments in general, are facing the climate changes and increasing competition among water consumers, they are changing the way of how they manage their water resources, many have turned to water markets and water trading. China has recently started the water trading. The European Union has also compiled protocols, and the United States has been provided with the opportunities to build a simple trading platform in California, Nevada's surface waters, and Texas water markets.

In addition to water credits, the use of blockchain technology in the existing water trading system can be considered as part of an integrated solution. In early 2017, a startup company called Civic Ledger conducted a feasibility study to solve issues related to transparency in the Australian water market, as well as boosting trading confidence by increasing the volume and reliability in water trading. The development of a peer-to-peer trading platform based on blockchain technology was one of the results of this feasibility study for the Civic Ledger, which - called the Water book of registration licensed a safe and transparent transaction to provide water entitlements and allocated share in water markets, Increases the participation of the irrigation sector and strengthens the overall efficient allocation of water resources.

In order to obtain maximum results in the shortest possible time, cooperation and utilization of integrating solutions in both the public and private sectors seems necessary. The concept of smart water credits and blockchain integration by Smart4tech company, alongside the water trading system can be a perfect example of innovative thinking in future areas for collaboration that its goal is to consider the systematic problem of water scarcity.

3. The conceptual model of tokenizing based on blockchain and the Internet of Things in the water industry

In this section, we will present a conceptual model for using blockchain technology and the Internet of Things in the country's water industry. This model has performers who interact with one another and there are water, token and data flows among them.

- Water and waste water Companies:** In fact, they are the main suppliers of purified and drinkable water for various household, agricultural and industrial sectors, and based on the savings of different sectors and also their contribution in purification of wastewaters (industrial sector), they provide the drinkable /purified water for the mentioned sectors.
- Token exchange system:** This system is responsible for tokenizing the water for different sections based on the data sent by the consumption measurement system. Consumers become indebted or creditors from the tokens which are allocated to them. If they go in debt, they must obtain the token using a backup currency (such as Rials) and pay it back to the system.
- consumption measuring system based on internet of things:** The purpose of this system is to measure the amount of water which is consumed in various sectors and calculate the tokens that each sector must receive or they owe. The data of this system is sent to the token exchange system. Also, another task of this system is to check the quality of purified water by industrial consumers and the more water they purify, the more tokens it will calculate for them.
- Agricultural consumers:** Due to the high consumption in this sector, in exchange for reducing wastewater emission (less water consumption), the system will calculate tokens and they can receive it in form of rials. If their consumption goes higher than the specified amount, they will be indebted to the token exchange system, which must be paid back in Rials.
- Industrial consumers:** In addition to consuming water, industrial consumers can purify the wastewater produced by themselves and receive tokens in return from the token exchange system. The received token will eventually be converted into Rials and deposited in the consumer's bank account.
- Household consumers:** just like in the agricultural sector, in exchange for reducing wastewater emission (less water consumption), they will receive tokens from the system. If the consumption goes higher than the specified amount, they will be indebted to the token exchange system.

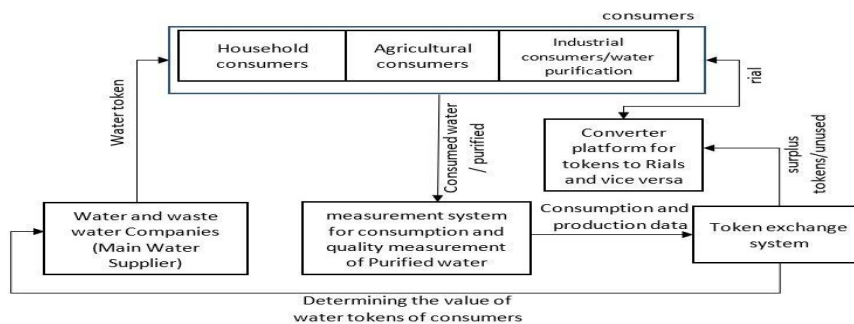


Figure 2 - Overall framework of system of production, distribution and payment of water consumption on the based on Blockchain technology and the Internet of Things

3.1. Using the water token in water projects in Iran (abpars token)

Abpars token is owned by Pars Central Plateau Water Supply Cooperative. This cooperative, operates in the field of desalination of Oman Sea water and its packaged and volumed sale of produced water. The token holder, in addition to having a cooperative share (one share per token) and its benefits (possibility of membership, participation in meetings and voting, receiving company profits according to the articles of association), and will also obtain the Priority right to use one cubic meter of water per year for one hundred years in the location of the project (Chabahar) (the terms of use of this right and the manner of presentation and other related matters will be published in a separate document at the utilization time of the project). The return on the shares of this project in the stages of capital increase is guaranteed by Tech Vest Technology Investors Company and the repurchase of tokens is guaranteed by Pars Central Plateau Water Supply Cooperative Company in accordance with the company's articles of association. The initial offering of this token was done in two phases, each of which was in accordance with the approvals of the cooperative company assembly in order to increase capital and attract resources to Execute the program to achieve the goals set by the company. At this phase, approximately three million and thirty thousand tokens in the amount of 1,000 billion Rials were offered to the new and old shareholders of the company to attract capital. In the next phase, the company offered approximately six million and eight hundred thousand tokens. At that time, it was anticipated that the required capital in the next phase would be about 2,500 billion rials. Token holder, in addition to having cooperative share (one share per token) and its benefits (possibility of membership, participation in meetings and voting, receiving company profits according to the articles of association), obtained the priority right to use one cubic meter of water per year for one hundred years, in the location of the project (Chabahar).

3-2. Advantages of water distribution and consumption system based on Abpars token:

- **Keeping records**

using blockchain technology and using tokens such as abpars tokens can help companies active in the field of water to settle their accounts and clearing operations more efficiently than current management methods. All the information including consumption and transaction data can be automatically stored in an unchangeable registration book.

Blockchain and smart contracts have the potential to help water companies and government agencies access up-to-date data including market share, consumption patterns, manage utility bills for consumers, and more features. Managing records on a blockchain platform can greatly reduce the costs of keeping and maintaining the records.

- **Trasure of Reporting / Compliance Report/ Auditing**

Blockchain and the abpars token-based system can be used to maintain the details of the steps required by the existing regulations. Recording the history of actions and their outputs in an unchangeable form in a blockchain platform can create a sequence of audits for regulators and facilitate compliance with them. Such a change could greatly reduce the amount of time and effort the financial institutions assign in preparing regulatory reports while improving the quality, accuracy, and reliability of the process. Blockchain can provide features such as unchangeability, speed and transparency of information, in which stakeholders can be part of an up-to-date process and receive temporary information and reports.

The unique design of some blockchain platforms can provide powerful yet lightweight systems with the following key and important capabilities:

- Low-cost scalability across multiple networks
- Proper data separation for industry-level security
- Flexible redundancy between vertices with accessibility

- integration of Data
By creating a valuable distributed data holder using a network of computers, each with a copy of the registration book instead of a central authority, regulators will be able to monitor the status of allocations, water permits, and transactions and validate the reachability of resources in the moment and have no need to follow standard regulated reporting processes.
- Issuing bonds on the blockchain platform
Blockchain technology and financing through the sale of token (such as AbPars token) will facilitate the Processes related to the issuance of green debt securities by providing a common space for various intermediaries which are involved in verifying the requirements, issuance and compliance of securities and the final trading of bonds.

4. Conclusions and context of future studies

Financing in water projects in its various sectors from production to distribution, collecting and purification is one of the important challenges of this industry. another important subject is water management through smart measurement of manner of its consumption. In this study, a new model based on blockchain technology and internet of things, for investment and consumption management through water tokenization and smart measurement of consumption on the internet of things platform was presented. In addition to better consumption management, this model can help facilitate the payment of consumer bills without the need for intermediaries such as banks by applying dynamic water values to various consumer tokens. also, it is possible to help finance water projects with these tokens, in this regard, the abpars token, which is designed to finance the fresh water project in Chabahar, was introduced. Implementation of this model in other energy fields such as production and distribution of gas and electricity, as well as focusing

on the necessary legal and regulatory infrastructure to use these technologies in the mentioned areas above, can be used as a basis for future research to improve the Revenue model and consumption management issues.

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"توکن آب پارس" تامین مالی جمعی مبتنی بر فناوری زنجیره بلوک

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چکیده

زیرساخت‌ها همواره نقشی کلیدی در توسعه اقتصادی و اجتماعی کشورها چه در مقیاس محلی و چه در مقیاس جهانی داشته‌اند. سرمایه‌گذاری در زیرساخت‌ها، به طور خاص توسط بخش خصوصی در اکثر کشورها، همواره یکی از دغدغه‌های دولتمردان این کشورها و دیگر بازیگران این حوزه بوده است. در ایران نیز مسأله تأمین مالی برای بهبود زیرساخت‌ها به ویژه زیرساخت‌های آبی، شامل تصفیه و توزیع آب آشامیدنی یکی از مسائلی است که مدیران این حوزه را که به دلیل استراتژیک بودن این ماده، همواره به دنبال جذب سرمایه بیشتر جهت توسعه و بهبود کیفیت آب و توزیع آن هستند، با چالش مواجه کرده است. با توجه به عدم کفایت جذب سرمایه و مستمر نبودن آن از طریق روش‌های مرسوم تأمین سرمایه در این حوزه (نظیر انتشار اوراق قرضه برای پروژه‌ها توسط دولت)، تأمین سرمایه جمعی یکی از راهکارهایی است که می‌تواند ضمن جذب بخش بیشتری از سرمایه‌های خرد، سرعت بازگشت سرمایه را نیز بهبود دهد. در این پژوهش، با استفاده از مفهوم تأمین مالی جمعی و فناوری بلاکچین به ارائه یک مدل مفهومی جهت تأمین مالی پروژه‌های تولید آب آشامیدنی و توزیع آن می‌پردازیم. در این مدل، با نشانه‌گذاری شدن دارایی‌های یک پروژه تولید و توزیع آب، سرمایه‌گذاران (شرکتی و خرد) از طریق یک سامانه معاملاتی رمزی اقدام به سرمایه‌گذاری در آن کرده و بر اساس میزان سرمایه‌گذاریشان در این دارایی‌ها و سود حاصل از آن سهم می‌شوند. همچنین در قسمت توزیع آب به مشترکین (خانگی، صنعتی و کشاورزی) بر حسب میزان صرفه جویی یا مصرف بیش از حد تعیین شده به آنها جایزه / جریمه تعلق می‌گیرد. چنین مدلی می‌تواند ضمن جمع‌آوری بهتر سرمایه انواع سرمایه‌گذاران در تولید آب به بهبود مدیریت مصرف آن توسط شهروندان منجر گردد.

کلمات کلیدی

توکن، مبتنی بر تامین مالی جمعی، فناوری بلاک چین.

