# CBDC Tracker

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**Abstract**

Numerous countries are investigating and implementing their own versions of central bank digital currencies (CBDC). CBDC represent a new form of electronic money that, unlike well-known cryptocurrencies, are issued by central banks of certain countries. CDBC 2.0 is the second step in the evolution of CBDC issued digitally by one or many central banks using blockchain technology, interoperable and programmable by design. CBDC 2.0 will bring multiple advantages, including fast and cheap cross-border transactions, pseudonymity, personal data protection, and international operability. News and updates in this area arrive every day from different sources. It makes a hard task for financiers or enthusiasts to track the status and analyze historic trends. CBDC Tracker is an open-source project aimed at providing a comprehensive information resource for world-wide CBDC

initiatives. It is intended to become a central point to access information about CBDC in different countries. CBDC Tracker components are: Dashboard, CBDC Information Card, Timelines and Time Slider, News Aggregator, Watchlist Tool.

# 1 Introduction

Central Bank Digital Currencies (CBDC) represent a new form of electronic money that, unlike well-known cryptocurrencies, e.g. Bitcoin or Ether, are issued by central banks of certain countries. As a digital version of bank notes, they provide a risk-free alternative to private bank deposits. The first generation of CBDC had limited interoperability and programmability. The next generation, known as CBDC 2.0, will likely work on a national or supranational level (in the case of the European Central Bank). These currencies could help to automate monetary policies, which would be especially important in case of crisis, like the recent pandemia, giving to states a possibility to support the economy faster and more efficiently. Better traceability would allow nations to curb criminal activities, tax evasion, and drug trafficking. China's central bank is hoping to launch a digitized version of the renminbi, focusing on a centralized, CBDC 1.0 setup. The virtual banknotes, called E-CNY or Digital Currency Electronic Payment (DC/EP), would be partly based on blockchain technology. Sweden's central bank has announced a yearlong blockchain-based e-krona pilot for 2020. The ECB, Canada's central bank, and others are also accelerating their research and development timelines [1].

CBDC 2.0 is the second step in the evolution of CBDCs: a new, most impactful form of money issued digitally by one or many central banks using blockchain technology, interoperable and programmable by design. CBDC 2.0 will enable smart contracts for a broad range of financial operations, they will supplant the need for multiple other digital currencies intended for specific use cases such as mortgages, lending, trade finance, real estate, and so on. The CBDC 2.0 will have to be interoperable on a protocol level. Data exchange and functionality should be easily accessible and transferable from protocol to protocol.

CBDC 2.0 will bring multiple advantages for an average consumer, including fast and cheap cross-border transactions, pseudonymity, personal data protection, and international operability. All the transactions will be recorded to reduce the chance of illicit transactions.

Currently, the responsibility for the monetary system lies under the jurisdiction of nation-states and international agreements. For a digital currency to be adopted in any state, it must first comply with the regulations of the state. A CBDC 2.0 may be issued and decentrally governed either on a national or on a supranational level, across multiple jurisdictions. This implies a different set of legal, monetary, and fiscal policies, some of them automated, required to be codified and put in place across nations. Central banks, while curious about CBDCs, are wary of digital currencies that introduce decentralization of ownership or governance, and that makes traditional centralized governance a challenging task.

Last but not least, the currency will be interoperable on a supranational level, meaning that emerging economies could suffer less from purchasing power inequality [2].

# 2 Goals of CBDC Tracker Project

Numerous countries are investigating and implementing their own versions of CBDC. News and updates in this area arrive every day from different sources. It makes a hard task for financiers or enthusiasts to track the status and analyze historic trends.

CBDC Tracker is a web resource that is intended to become a central point to access information about CBDC in different countries. By collecting the information from several sources and presenting it in a structured way, CBDC Tracker makes it easier for a wide audience to stay tuned to the latest news in the world of CBDC. The project also strives to popularize the idea of CBDC and thus make one more step towards the future of finances.

CBDC Tracker not only depicts the current view of digital currencies status in different countries, but also provides a historical perspective on how the

process evolved. The data used by the project is continuously updated, both manually and automatically. Any user can also subscribe to receive news and updates as soon as they arrive.

It is worth mentioning that CBDC Tracker web app is an open-source project. With this, CBDC Tracker is open for collaboration and contribution to share knowledge and technology for the benefits of the whole community.

# 3 Attributes of CBDC

Though different CBDC projects significantly vary in purpose, structure, technology and other parameters, we were able to identify a list of most common attributes. The list can be used to filter or partition CBDCs into several classes. Further research and development may bring more attributes.

The current CBDC attributes list used by CBDC Tracker is the following:

- **Country/Region** - name of a country or a region where a certain CBDC project has been started.
- **Announcement Year** - year of the first mentioning of a project.
- **Central Bank(s)** - name of a central bank or banks responsible for a project.
- **Digital Currency** - name of a digital currency (may be unknown for some projects).
- **Status** - current (or historic) status of a CBDC:
  - **Research**: Countries that published multiple research reports about CBDC and start experimenting
  - **Development**: Countries in the midst of launching a digital currency as a small-scale pilot or moving towards a large-scale launch
  - **Pilot Countries**: piloting CBDC for domestic interbank or international use-cases in a real environment with a limited number of parties

  - **Launched**: Countries officially launched a digital currency and issued tokens for transactions
  - **Cancelled**: Countries cancelled or decommissioned a CBDC

- **Retail/Wholesale** - a CBDC can be either wholesale (e.g. for inter-bank transactions only) or retail (intended to be used by persons).
- **Structure** - a CBDC can be either a token or an asset.
- **Technology** - name of a technological platform behind a CBDC.
- **Programmability** - does a CBDC support programmable logic (e.g. smart contracts).
- **Interoperability** - does a CBDC support integration with other digital currencies.
- **Governance structure** - who has rights to control a CBDC (can be a central bank, a consortium, etc.)
- **Centralization** - is a CBDC based on centralized or decentralized principles.
- **DLT / non-DLT** - is a CBDC built on top of distributed ledger technology.
- **Main motivation/goals of the CBDC** - why a certain central bank or government have started a CBDC project.
- **Remuneration** - does a CBDC support any kinds of remunerations for participants.
- **International access** - does a CBDC allow to be accessed from outside a country it has been issued by.
- **Caps/Limits** - are there any limits (e.g. max capitalization) connected to a CBDC.
- **Emission amount** - current amount of emission if available.
- **Offline payments** - does a CBDC support offline payments.

- **Anonymity** - does a CBDC support anonymous transactions.
- **Distribution** - a distributon scheme or principles of a CBDC.
- **Link to announcement** - a URL of where a CBDC has been announced.
- **Link to site of project** - a URL of an official website of a CBDC (if available).
- **Links to social networks** - URLs of official social network pages of a CBDC (if available).
- **Description** - a free-form description of a CBDC.

# 4 Dashboard

The dashboard is what you see first when you open the CBDC Tracker web site. The main components of the dashboard are (fig. 1):

- World map with colors showing the current CBDC status in each country.
- Data table that supports sorting and control of visible columns. This preferences are stores in your browser and will be used when you return to the site.
- Filters panel.
- Latest news.
- Time slider.

The data table is the main component of the dashboard. It contains data rows for each CBDC with configurable columns. Some of the columns are fixed and cannot be hidden: Digital Currency, Country/Region, Central Bank(s), Announcement Year, Status, Update rate.

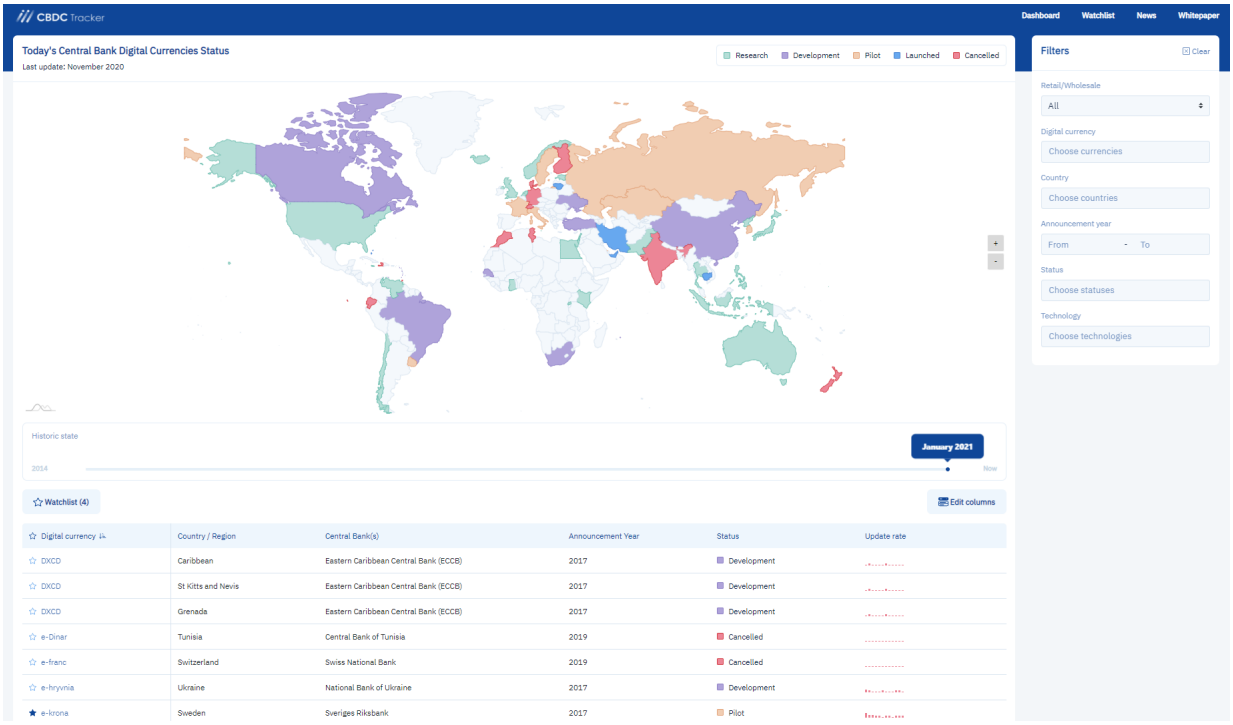


Figure 1: Dashboard

The Update rate column is a graphical representation of a CBDC activity for the last 12 months. It is in a form of a bar chart where each bar represents the monthly activity (the number of news plus the number of updates) for a CBDC.

# 5 CBDC Information Card

Each CBDC has it's own page (fig. 2) accessible from the dashboard when you click on any row in the data table. On the CBDC page you can see:

- A complete list of CBDC attributes.
- News related to this CBDC.
- Timeline.

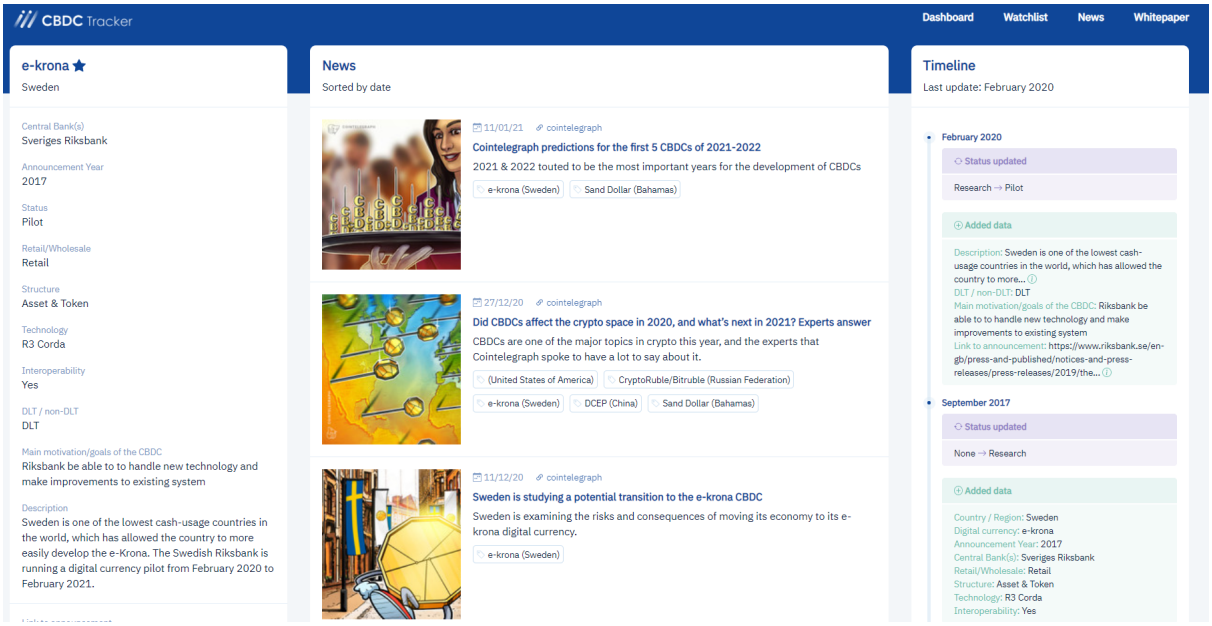


Figure 2: CBDC Information Card

# 6 Time Dimension

The internal data model of CBDC Tracker is not just a static list of digital currencies and their attributes. Instead, it looks like a series of updates where for each attribute value there is a corresponding timestamp (month and year). This structure gives us possibility to attach time dimension to all the depicted results and show how CBDCs adoption evolves throughout the world.

## 6.1 Data Updates Timeline

For every CBDC we can view a detailed timeline where data updates and especially status changes are visually placed on the time axis. We can see when a story of a certain CBDC begins and what happened to it until nowadays (see fig. 3 for example).

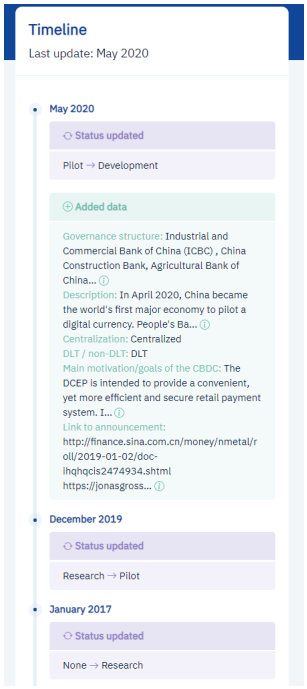


Figure 3: Timeline

## 6.2 Time Slider

Another interesting feature is the time slider control. Using it you can drag the time thumb to anywhere in the past and immediately see the picture (the world map and the data table) at this point of time (fig. 4).


Figure 4: Time slider

# 7 News Aggregator

News are regularly loaded to CBDC Tracker from multiple open sources. Depending on the approach that is used by the source (static pages, REST

API, GraphQL, etc.) the corresponding news iterator is selected. The algorithm loops through the latest news until it finds an article that has already been handled during the previous invocation.

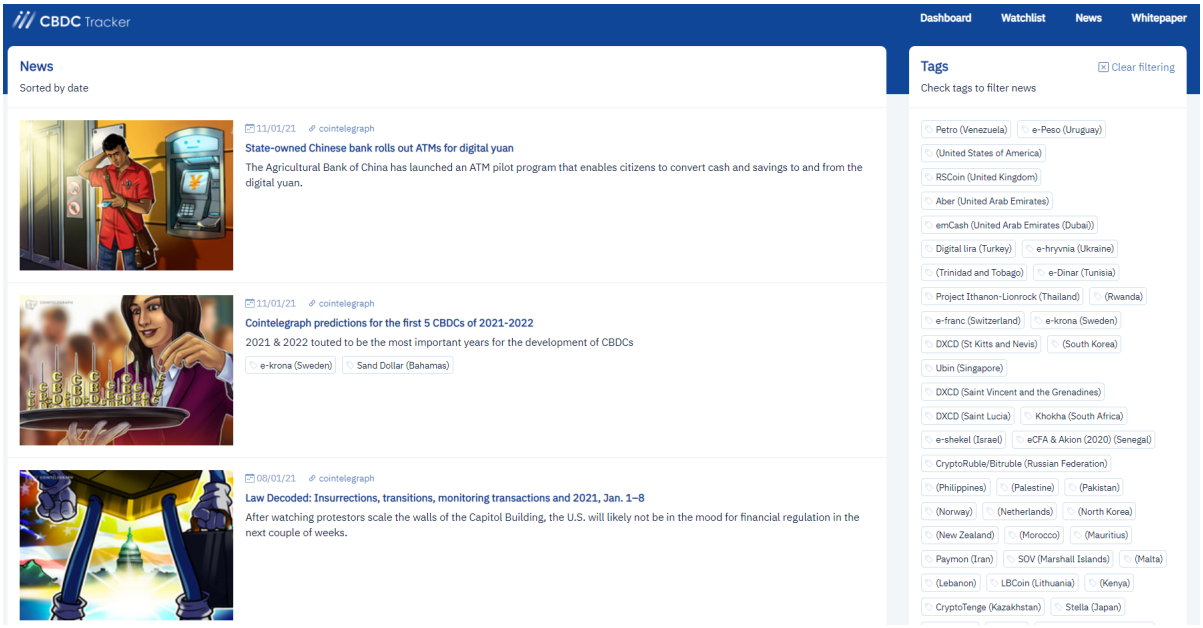


Figure 5: News page

The new articles are then processed by the news data extractors, which are configured according to the source article page structure. News general data, such as title, date, abstract, etc., along with its URL and source is then stored to CBDC Tracker database. The extracted data is also labeled with currency tags, which is currently done by searching for CBDC related keywords within an article content. A news can be related to several digital currencies.

In CBDC Tracker web app news are shown on the Dashboard (the latest news), on CBDC info cards and on the special News page (fig. 5).

# 8 Watchlist Tool

The watchlist tool allows you to select one or more CBDCs of interest by clicking on star icons in the data table. Then you can open the Watchlist page and see information for only the selected CBDCs (fig. 6). Watchlist is stored in your browser. When you return to the site, you can use the same watchlist.

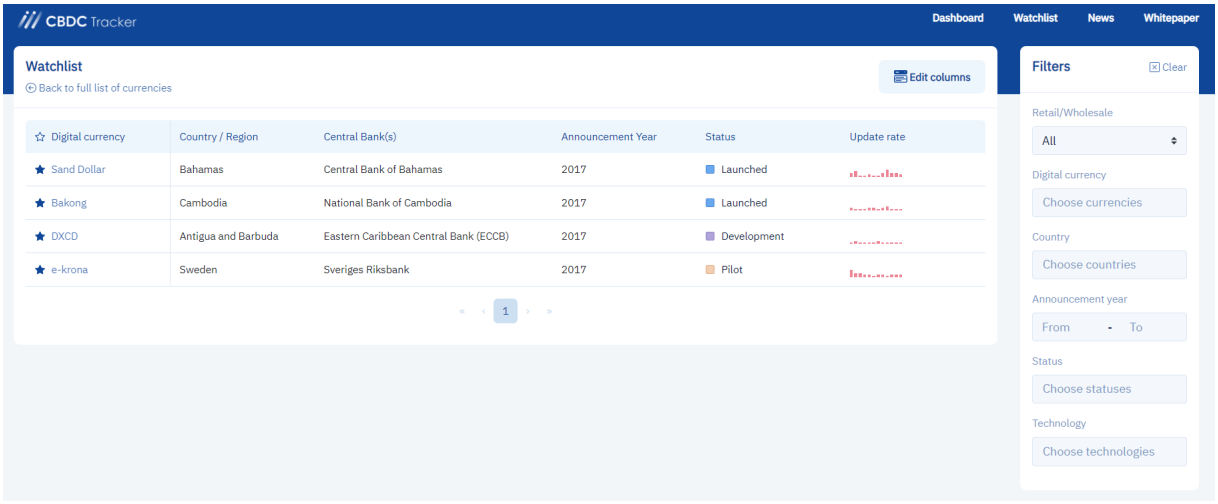


Figure 6: Watchlist

# 9 Integrating with CBDC Tracker as a Data Source

CBDC Tracker provides an API that can be used by external resources to access CBDC-related data. With this API CBDC Tracker can serve as a common data source for financial analytics or content resources. The main advantages when using CBDC Tracker API include timely updates of data and news, historic data views, consistent data structure, data preparation with built-in algorithms that will evolve in further versions.

CBDC Tracker API includes the following endpoints:

- Digital currencies data retrieval API.

- News feed API.
- Timeline API.

API specifications are available at CBDC Tracker GitHub project.

# 10 Future Works

CBDC Tracker is an evolving project as well as all CBDCs are. In the near future the team of project contributors will continue to add new features. Here are some of them that are planned:

- Exchange rates and other dynamic CBDC data (when available).
- More analytics and charts.
- Embeddable widgets to be placed on partner sites.

# References

[1] Kaj Burchardi, Igor Mikhalev, Bihao Song, and Steven Alexander Kok. Get ready for the future of money. https://www.bcg.com/en-nl/publications/2020/get-ready-for-the-future-of-money.

[2] Kaj Burchardi and Igor Mikhalev. Central bank digital currencies need decentralization. https://www.coindesk.com/central-bank-digital-currencies-need-decentralization.