*Research article*

# Can Central Bank Digital Currencies be green and sustainable?

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# Supplementary

## Annex

**Table A.1.** Dataset jurisdictions where retail CBDC is being explored, total reserves, Environmental Performance Index, electricity prices for businesses and households, renewable electricity production and $CO_2$ emissions.

| Jurisdictions Where Retail CBDC Is Being Explored | Country/jurisdiction/monetary area | Total reserves (including gold, in U.S. dollar at current prices) | Environmental Performance Index | Electricity prices for businesses (kW/h, in U.S. dollar) | Renewable electricity production (% of total electricity production) | CO2 Emissions (metric tons per capita) | Electricity prices for households (kW/h, in U.S. dollar) |
|---|---|---|---|---|---|---|---|
| **Where** | Bahamas | 2609.42 | 56.2 | 0.301 | 0 | 6 | 0.31 |
| **central** | China | 3306839.41 | 28.4 | 0.088 | 23.93 | 7.8 | 0.076 |
| **banks (CBs)** | Eastern Caribbean | 1681.89 | 50.82 | 0.053 | 6.36 | 2.9 | 0.052 |
| **have** | Ghana | 9916.92 | 27.7 | 0.09 | 50.89 | 0.6 | 0.073 |
| **launched or** | India | 576298.15 | 18.9 | 0.117 | 15.34 | 1.6 | 0.078 |
| **piloted (or** | Jamaica | 4520.48 | 45.6 | 0.284 | 10.26 | 2.1 | 0.327 |
| **soon will)** | Nigeria | 35563.95 | 28.3 | 0.048 | 18.2 | 0.5 | 0.03 |
| | Uruguay | 15126.76 | 37.4 | 0.119 | 88.56 | 1.9 | 0.249 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Where CBs have performed proofs of concepts or prototypes (or soon will)** | Bahrain | 4774.9 | 42 | 0.077 | 0 | 22 | 0.048 |
| | Bhutan | 976.26 | 42.5 | 0.02 | 99.99 | 1.3 | 0.015 |
| | Brazil | 324673.45 | 43.6 | 0.148 | 73.97 | 1.9 | 0.168 |
| | Euro Area | 1184866.32 | 61.9 | 0.457 | 28.72 | 5.5 | 0.47 |
| | Hong Kong | 424025.43 | 28.4 | 0.175 | 0.28 | 7.8 | 0.183 |
| | Hungary | 41218.69 | 55.1 | 0.383 | 10.58 | 4.6 | 0.111 |
| | *Iran* | 7685.46 | 34.5 | 0.046 | 5.1 | 7.1 | 0.002 |
| | Israel | 194231.43 | 48.2 | 0.172 | 1.89 | 6.3 | 0.165 |
| | Japan | 1227573.26 | 57.2 | 0.234 | 15.98 | 8 | 0.243 |
| | Kazakhstan | 35076.05 | 40.9 | 0.063 | 8.87 | 11.3 | 0.047 |
| | Korea | 423365.99 | 46.9 | 0.099 | 72.8 | 11 | 0.109 |
| | Laos | 1216.46 | 30.7 | 0.102 | 86.37 | 2.6 | 0.031 |
| | New Zealand | 14399.55 | 56.7 | 0.296 | 80.08 | 6.2 | 0.186 |
| | Norway | 72077.38 | 59.3 | 0.205 | 97.71 | 6.7 | 0.189 |
| | Russia | 581709.96 | 37.5 | 0.076 | 15.86 | 11.2 | 0.052 |
| | Sweden | 64288.79 | 72.7 | 0.205 | 63.26 | 3.2 | 0.433 |
| | Thailand | 216500.53 | 38.1 | 0.139 | 8.54 | 3.7 | 0.141 |
| | Turkey | 123735.14 | 26.3 | 0.189 | 31.96 | 4.8 | 0.081 |
| | Ukraine | 28505.93 | 49.6 | 0.108 | 4.38 | 3.8 | 0.039 |
| | United States | 706644.22 | 51.1 | 0.146 | 13.23 | 13 | 0.174 |
| **Where CBs are in advanced stages of research and development** | Australia | 56701.9 | 60.1 | 0.296 | 13.64 | 14.8 | 0.234 |
| | Canada | 106952.38 | 50 | 0.1 | 63.01 | 13.6 | 0.123 |
| | Indonesia | 137222.36 | 28.2 | 0.073 | 16.25 | 2.1 | 0.095 |
| | Singapore | 296628.74 | 50.9 | 0.315 | 1.82 | 7.7 | 0.236 |
| | Mauritius | 7792.81 | 44.8 | 0.118 | 22.72 | 2.9 | 0.132 |
| | United Kingdom | 176409.97 | 77.7 | 0.449 | 24.84 | 4.6 | 0.493 |

**Table A.2.** Descriptive statistics.

|  | N | Minimum | Maximum | Average | Standard deviation | Variance | Skewness | Kurtosis |
|---|---|---|---|---|---|---|---|---|
|  | Statistician |  |  |  |  |  |  |  |
| Total reserves (including gold, in U.S. dollar at current prices) | 34 | 976.26 | 3306839.41 | 306229.7159 | 616919.83969 | 380590088601.474 | 3.859 | 17.422 |
| Environmental Performance Index | 34 | 18.90 | 77.70 | 44.9476 | 13.69240 | 187.482 | 0.272 | 0.157 |
| Electricity prices for businesses (kWh, U.S. dollar) | 34 | 0.020 | 0.457 | 0.17032 | 0.115720 | 0.013 | 1.048 | 0.353 |
| Renewable electricity production (% of total electricity production) | 34 | .00 | 99.99 | 31.6291 | 32.23611 | 1039.167 | .970 | −0.548 |
| CO2 emissions (metric tons per capita) | 34 | .5 | 22.0 | 6.209 | 4.7778 | 22.827 | 1.360 | 2.253 |
| Electricity prices for households, (kWh, U.S. dollar) | 34 | .002 | .493 | .15868 | .128202 | .016 | 1.193 | .961 |
| N valid (per list) | 34 |  |  |  |  |  |  |  |

Source: Own elaboration based on data from Table A.1 and analyzed using IBM SPSS Statistics 28.

**Table A.3.** Residual statistics.

|  | Minimum | Maximum | Average | Standard deviation | N |
|---|---|---|---|---|---|
| Predicted value | 28.6164 | 70.3548 | 44.9476 | 10.67464 | 34 |
| Residual | -16.90876 | 19.89273 | .00000 | 8.57519 | 34 |
| Predicted value | -1.530 | 2.380 | .000 | 1.000 | 34 |
| Residual deviation | -1.848 | 2.175 | .000 | .937 | 34 |

Source: own elaboration based on data from Table A.1 and analyzed using IBM SPSS Statistics 28.

**Table A.4.** Ranking % of total CBDCs that could be considered "green" by jurisdiction, from highest to lowest.

| Country/jurisdiction/monetary area | % of total reserves considered "green" after model application | Total reserves considered "green" after model application (including gold, in USD at current prices) |
|---|---|---|
| **Euro Area** | 70.36 | 83367877.94 |
| **United Kingdom** | 70.33 | 12407482.11 |
| **Sweden** | 60.71 | 3903161.51 |
| **Australia** | 58.46 | 3314876.09 |
| **Bahamas** | 54.88 | 143206.59 |
| **New Zealand** | 54.21 | 780551.34 |
| **Norway** | 53.00 | 3819950.71 |
| **Jamaica** | 52.97 | 239443.26 |
| **Singapore** | 52.86 | 15681108.37 |
| **Japan** | 51.79 | 63580156.06 |
| **Uruguay** | 48.92 | 740029.04 |
| **United States** | 48.82 | 34497137.02 |
| **Canada** | 48.71 | 5209609.36 |
| **Hungary** | 46.77 | 1927861.40 |
| **Korea** | 46.65 | 19752100.89 |
| **Bahrain** | 45.76 | 218492.99 |
| **Hong Kong** | 45.31 | 19211909.98 |
| **Brazil** | 44.51 | 14452690.58 |
| **Israel** | 43.22 | 8393849.54 |
| **Turkey** | 40.40 | 4998367.72 |
| **Thailand** | 39.32 | 8513296.84 |
| **Russia** | 38.80 | 22567519.34 |
| **Mauritius** | 38.57 | 300584.13 |
| **China** | 38.45 | 127155316.50 |
| **Kazakhstan** | 37.65 | 1320701.22 |
| **Laos** | 37.15 | 45190.46 |
| **Ghana** | 34.81 | 345219.15 |
| **India** | 34.12 | 19665144.52 |
| **Indonesia** | 34.00 | 4665562.02 |
| **Bhutan** | 33.55 | 32754.46 |
| **Ukraine** | 32.63 | 930216.80 |
| ***Iran*** | 31.18 | 239619.35 |
| **Eastern Caribbean Central Bank** | 30.93 | 52018.03 |
| **Nigeria** | 28.62 | 1017840.53 |

Source: own elaboration based on data from Table A.1 and analyzed using IBM SPSS Statistics 28.