

Progress on the investigation phase of a digital euro

This report presents progress made during the investigation phase of the digital euro project and elaborates on the foundational design options that were recently endorsed by the Governing Council. As regards the design of the transfer mechanism used to validate transactions, the Eurosystem will further explore a digital euro solution, in which transactions would be made online and would be validated by a third party, as well as a peer-to-peer validated solution for offline payments. The Eurosystem will explore options that could allow a digital euro to replicate some cash-like features and enable greater privacy for low-value transactions. Consideration is also being given to incorporating limit and remuneration-based tools in the design of a digital euro to curb its use as a form of investment. Quantitative limits on the holdings of individual users would limit individual take-up and the speed of deposit conversion, while remuneration-based tools could be calibrated to make large digital euro holdings above a certain threshold unattractive compared to other highly liquid and low-risk assets. In general, a number of further steps would need to be taken before a digital euro could be introduced. In the first quarter of 2023, the European Commission will propose a regulation to establish the digital euro, which is expected to help achieve the digital euro objectives. The Eurosystem will continue to actively engage with a large number of stakeholders, including European policymakers, throughout the remainder of the investigation phase. In October 2023 the Governing Council could decide to start a realisation phase to develop and test technical solutions and business arrangements for a digital euro.

The ECB and the euro area national central banks launched the investigation phase of the digital euro project in October 2021.¹ The investigation phase will last 24 months until October 2023 and aims to address key issues regarding design and distribution. This report provides an update on the progress made in the project so far. At the end of the investigation phase the Governing Council could decide to start a realisation phase to develop and test technical solutions and business arrangements for a digital euro. The body in charge of steering the digital euro project is the High-Level Task Force on Central Bank Digital Currency (HLTF-CBDC), which is composed of representatives from the ECB and the national central banks of the euro area.²

¹ See “[Digital Euro project governance & stakeholder management](#)”, ECB, 2022.

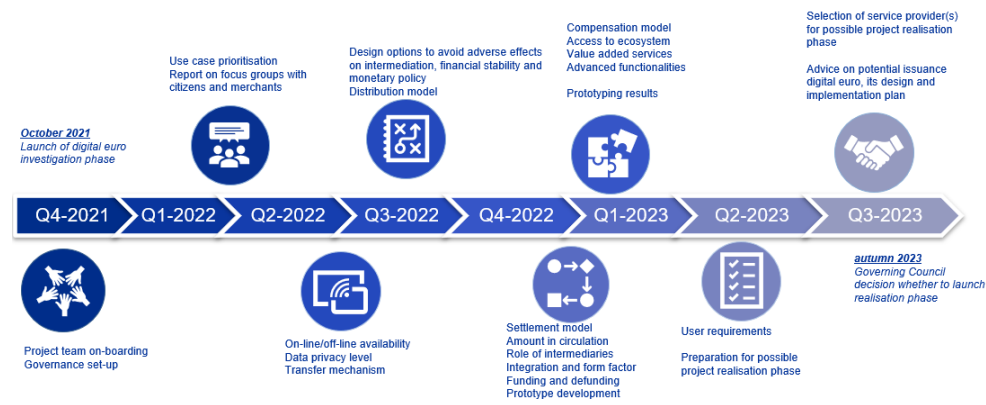
² See “[Designing a digital euro for the retail payments landscape of tomorrow](#)”, ECB, 2021; and “[Digital Euro project governance & stakeholder management](#)”, op. cit.

A digital euro would be an electronic means of payment for retail payments, issued by the central bank and accessible to everyone in the euro area. It would not replace cash but complement it by allowing central bank money (public money) to also be used in digital form.³

A digital euro is a Eurosystem initiative, but it is also a common European project involving a very diverse set of stakeholders.⁴ A collaborative approach is key to the preparation and eventual success of a digital euro. There is active engagement with stakeholders and with society at large. Major design issues and policy-relevant aspects are regularly discussed with the European Parliament and with euro area finance ministers in the Eurogroup. There also is close cooperation with the European Commission to review, at a technical level, a broad range of policy, legal and technical questions.⁵ A regular dialogue on a digital euro has also been established with market stakeholders via the Euro Retail Payments Board (ERPB), so that all market participants, including banks, payment service providers, consumer representatives and merchants, can provide their views on a digital euro.⁶ In the first quarter of 2023, the Commission will propose a regulation to establish a digital euro, which is expected to help achieve the digital euro objectives. The legal framework will also be key when it comes to privacy, which is one of the most important design features of a digital euro.

Digital euro project timeline

Tentative - timing subject to change



This report presents progress made during the investigation so far. The report first outlines the key objectives and use cases for a digital euro. It then elaborates on the foundational design options, including the transfer mechanism, online/offline

³ The Eurosystem’s cash strategy aims to ensure that banknotes remain widely available and widely accepted as a competitive, reliable payment instrument and store of value that can be owned and used directly by all consumers. See “[The Eurosystem cash strategy](#)”.

⁴ Further information on stakeholder engagement is available on the [ECB’s website](#) and in a [letter of 14 July 2021](#) from Executive Board member Fabio Panetta to Irene Tinagli, Chair of the Committee on Economic and Monetary Affairs of the European Parliament, concerning the Governing Council’s decision to launch the investigation phase of a digital euro.

⁵ For more information, see “[ECB intensifies technical work on digital euro with the European Commission](#)”, press release, ECB, 19 January 2021.

⁶ For more details on engagement with the ERPB, see the information on stakeholder engagement on the [ECB’s website](#) and “[ERPB engagement in the digital euro investigation phase](#)”, ERPB Secretariat, November 2021.

availability, privacy, and tools to control the amount of digital euro in circulation. These constitute the first set of design options approved by the Governing Council following engagement with stakeholders. Several further design options will be approved over the course of the investigation phase. At the end of the investigation phase, the overall design of a digital euro will be holistically reviewed. Finally, this report outlines the main next steps in the digital euro project. Agreement on this first set of design options provides the necessary stability for the investigation to proceed with the analysis of further design choices. The approval of these initial design options does not prejudice the decision on moving to a realisation phase, expected in October next year, nor the ultimate decision on whether to issue a digital euro.

1 A digital euro for what and for whom

Payments are undergoing a potentially disruptive transformation as people are increasingly paying digitally instead of using cash. Cash cannot be used in e-commerce, and many people also prefer to use cashless payments in physical stores.⁷ The trend towards making purchases online and towards contactless payments accelerated further during the coronavirus pandemic. Bringing central bank money into the digital era is a logical step as payments become increasingly digitalised.⁸

A digital euro would preserve the role of public money as the anchor of the payments system in the digital age. It would ensure the smooth coexistence, convertibility and complementarity of the various forms that money takes. People need to have confidence that private money can always be converted into central bank money. By providing a monetary anchor, central bank money plays a key role in maintaining a well-functioning payment system, financial stability and, ultimately, trust in the currency. This in turn is a pre-condition for preserving the transmission of monetary policy, and hence for protecting the value of money.

A digital euro would also contribute to Europe's strategic autonomy and economic efficiency by offering a European means of payment that could be used for any digital payment, would meet Europe's societal objectives and would be based on a European infrastructure. It would accompany the ongoing digital transition by leveraging synergies with the private sector. For instance, allowing intermediaries to offer innovative services based on the digital euro would make it easier for payment solutions to be quickly scaled up to cover the entire euro area and for smaller firms to offer more technologically advanced services at competitive prices.

⁷ For more information, see [Study on the payment attitudes of consumers in the euro area \(SPACE\)](#), ECB, December 2020.

⁸ See ["The case for a digital euro: key objectives and design considerations"](#), ECB, July 2022.

A set of use cases⁹ for a digital euro has been identified by examining whether a use case can support the policy objectives of a digital euro and targets an important market segment to facilitate network effects. Physical stores are the most important market segment for digital payments, accounting for more than 40 billion transactions in the euro area in 2019.¹⁰ E-commerce payments are less numerous but are expected to continue to grow rapidly in the coming years. In addition to the size of these segments, it is noteworthy that they are served by a multitude of payment solutions, often with only domestic reach, and have so far been dominated by non-European providers and technologies. Thus, the introduction of a digital euro could potentially contribute to more harmonisation of payment solutions and strengthen European strategic autonomy (two policy objectives). Moreover, in the future, digital solutions for person-to-person payments could also make this an increasingly relevant market segment for a digital euro.

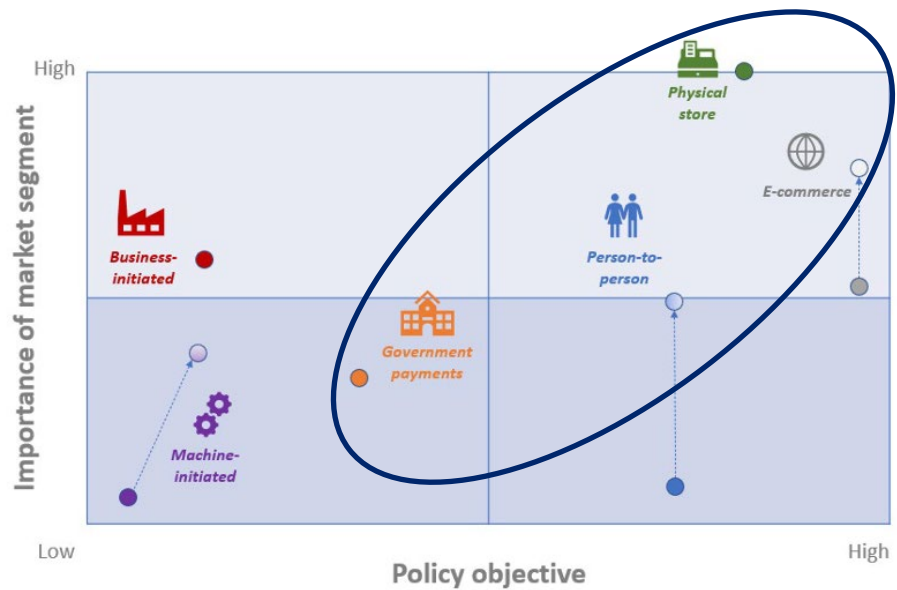
Given their importance now and in the future, payments in e-commerce and physical stores, as well as person-to-person payments, are natural candidates for prioritisation among the possible use cases of a digital euro.¹¹ The digital euro could also be used for payments between governments and individuals, for example to pay out public welfare allowances or to pay taxes. Focusing on these payment segments first does not mean closing the door to new trends and emerging needs. Emerging use cases will be monitored with a view to potential coverage in subsequent releases. Machine-initiated payments are monitored in an open manner, also taking into account that the European private sector may develop solutions in this regard.

⁹ Each digital euro “use case” describes a payment segment that a digital euro could serve. For instance, digital euro could be used by individuals to pay other individuals (person to person, P2P), to pay e-retailers for online purchases (e-commerce) or for purchases made in a physical shop (point of sale, POS). Digital euro could also be used by businesses to pay individuals (business to person, B2P) or to pay other businesses (business to business, B2B). Finally, digital euro could be used for payments to/from government (e.g. to pay tax or receive welfare payments) or for machine-initiated payments (i.e. fully automated payments initiated by a device or software based on predetermined conditions).

¹⁰ For further information, see “[Global Payments 2021: All in for Growth](#)”, Boston Consulting Group, October 2021; “[7 B2B Ecommerce Trends You Need to Follow for 2022 and Beyond](#)”; BigCommerce, 2021; “[Shift of cash to debit card continues](#)”, De Nederlandsche Bank, April 2020; [Study on the payment attitudes of consumers in the euro area \(SPACE\)](#), op. cit.; “[E-commerce sales in Western Europe beat expectations](#)”, eMarketer, September 2021; “[E-commerce statistics for individuals](#)”, Eurostat, 2022; “[How e-commerce share of retail soared across the globe: A look at eight countries](#)”, McKinsey, March 2021; “[Is E-commerce good for Europe?](#)”, Oliver Wyman, 2021; “[Cash is losing ground](#)”, Sveriges Riksbank, October 2020; and “[The transformation of the European payments landscape](#)”, SWIFT, October 2018.

¹¹ See also Panetta, F., “[A digital euro that serves the needs of the public: striking the right balance](#)”, introductory statement at the Committee on Economic and Monetary Affairs of the European Parliament, Brussels, 30 March 2022.

Prioritisation of use cases



Note: The arrows indicate the future relevance of the use cases (e.g. person-to-person payments are expected to become a more important market segment in the future).

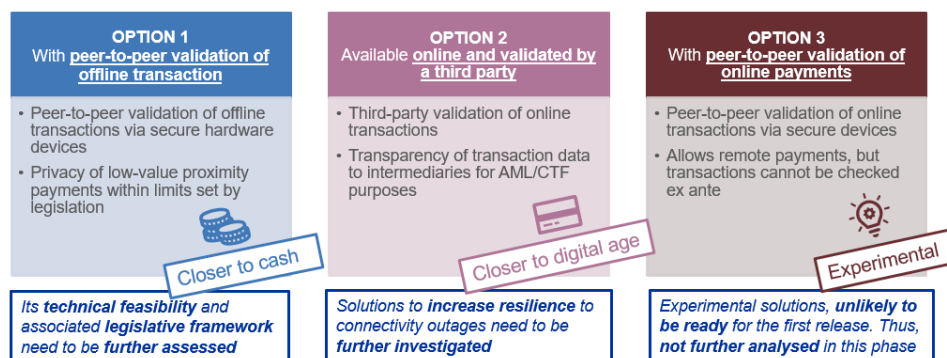
2 Foundational design options

2.1 Transfer mechanism

The Eurosystem has carefully investigated how to design the transfer mechanism used to validate transactions.¹² The Governing Council approved further exploration by the Eurosystem of a digital euro solution in which transactions would be made online and would be validated by a third party (“online third-party validated solution”). The Governing Council also approved the continued exploration of a peer-to-peer validated solution for offline payments (“offline peer-to-peer validated solution”). A potential peer-to-peer validated solution for online payments with no third party involved is a more experimental alternative. While it deserves monitoring, it does not warrant further dedicated analysis in the investigation phase.

¹² See Panetta, F., “The digital euro and the evolution of the financial system”, introductory statement at the Committee on Economic and Monetary Affairs of the European Parliament, Brussels, 15 June 2022.

Core elements of the three options



The Governing Council approved the pursuit of an online third-party validated solution as part of the first digital euro release. This covers the broadest set of high-level use cases, is considered to be able to support Eurosystem policy objectives, and leaves room for flexibility in other design decisions related to the digital euro. However, it will be important to further investigate solutions to increase its resilience to connectivity outages.

It has also been concluded that an offline peer-to-peer validated solution should be developed. However, the time to market for this solution is more uncertain because of its dependence on technological innovation, regulatory changes and security risk tolerance. The development of a third-party validated solution for online payments should not be delayed in case the timely delivery of a peer-to-peer validated solution for offline payments proves to be unfeasible.

2.2 Privacy

Privacy is one of the most important design features of a digital euro, and designing a digital euro that respects the right to privacy is required by law.¹³

In a public consultation conducted by the ECB in 2020, 43% of respondents ranked privacy as the most important aspect of the digital euro (well ahead of other features) in order to maintain trust in payments in the digital age.¹⁴ Focus group participants also said they would appreciate options that gave them control over their personal data.¹⁵

As part of the investigation phase, various options to address the trade-off between retaining a high degree of privacy and other important public policy objectives have been investigated. These have been also discussed with

¹³ See “Digital euro Privacy options”, ECB, 2022.

¹⁴ See “Eurosystem report on the public consultation on a digital euro”, ECB, April 2021.

¹⁵ See “Study on New Digital Payment Methods”, Kantar Public/ECB, 2022.

European policymakers, given the associated political considerations and the fact that legislators will eventually have to decide on these issues.¹⁶

Full anonymity is not considered a viable option from a public policy perspective.¹⁷

It would raise concerns about the digital euro potentially being used for illicit purposes (e.g. money laundering and the financing of terrorism). In addition, it would make it virtually impossible to limit the use of the digital euro as a form of investment – a limitation that is essential from a financial stability perspective.

In a baseline scenario, compatible with the current regulatory framework, a digital euro would provide a level of privacy equal to that of current private sector digital solutions.¹⁸

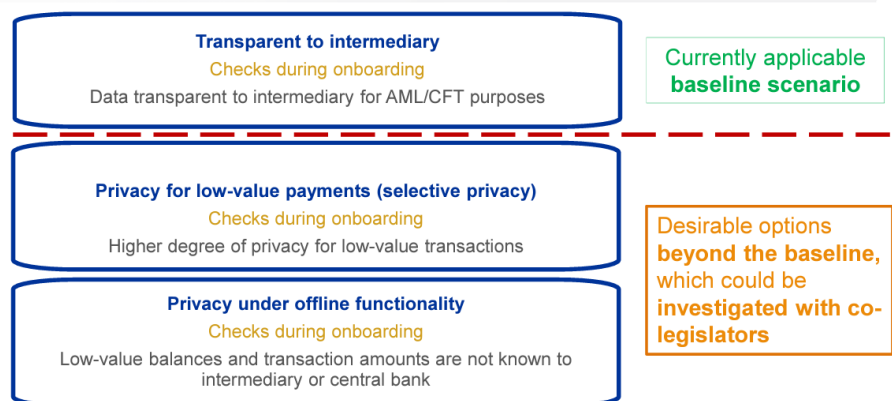
Users would need to identify themselves when they start using the digital euro, and intermediaries would perform customer checks during onboarding. Personal and transaction data would only be accessible to intermediaries for the purpose of ensuring compliance with anti-money laundering and combating the financing of terrorism (AML / CFT) requirements and relevant provisions under EU law. User data obtained by intermediaries during the onboarding process would remain with the respective intermediary and would not be shared with the Eurosystem or with other intermediaries, unless this was required by regulation or necessary to perform digital euro related tasks.

The Eurosystem will also explore two options that go beyond this baseline scenario .¹⁹

These could allow the digital euro to replicate some cash-like features and enable greater privacy for low-value/low-risk payments.

Privacy options

From user perspective



¹⁶ See “Digital euro Privacy options”, op. cit.; and “A digital euro that serves the needs of the public: striking the right balance”, op. cit.

¹⁷ See “A digital euro that serves the needs of the public: striking the right balance”, op. cit.

¹⁸ ibid.

¹⁹ See “Digital euro Privacy options”, op. cit.

The “selective privacy” option would allow greater privacy for low-value/low-risk payments.²⁰ Users would need to identify themselves when first starting to use the digital euro, but simplified due diligence checks could apply, enabling a higher degree of privacy for low-value/low-risk payments. At the same time, higher-value transactions would remain subject to standard controls. It would also be important to ensure that large payments are not split into many smaller ones to circumvent checks.

The “offline functionality” option would enable greater privacy for low-value offline payments in close physical proximity.²¹ These are payments where the payer and payee are not connected to the internet and, by design, need to be in close physical proximity when making a transaction (just like paying with cash). While customers would be subject to customer checks during onboarding, real-time information about holdings, balances and transaction amounts would only be known by them and not by third parties, such as financial intermediaries or banks. By limiting offline payments to low-value payments and to situations where the payer and payee are in close physical proximity, the risk of illicit use could be contained. At the same time, people could benefit from greater privacy. In addition, enabling an offline functionality may also be beneficial for financial inclusion, given the lack of internet coverage in large remote areas in certain euro area countries.

Further work is needed to explore how the two options could be enabled in the regulatory framework (e.g. how to exempt low-value/low-risk digital euro transactions from certain AML/CFT obligations).²² In this context, the Eurosystem is in discussions with the Commission and European Data Protection Authorities. Given that a digital euro is not yet explicitly foreseen in Union legislation, a regulatory framework should be set up to establish and regulate essential aspects of the digital euro, including with a view on privacy, for instance, data protection, AML / CFT.

As approved by the Governing Council, the Eurosystem is committed to provide for highest levels of privacy within the regulatory framework. The Eurosystem has no interest in exploiting individual payment data for any purpose.²³ This stands in contrast to the monetisation of individual payment data by private companies. The availability of data visible to the Eurosystem will be limited to only that what is necessary to perform its tasks or is required by regulation. To this end, the digital euro solution shall be designed in a way that aims to minimise the Eurosystem’s involvement in the processing of users’ data.

²⁰ *ibid.*

²¹ *ibid.*

²² *ibid.*

²³ See Panetta, F., “[Central bank digital currencies: defining the problems, designing the solutions](#)”, contribution to a panel discussion on central bank digital currencies at the US Monetary Policy Forum, 18 February 2022.

2.3 Tools to control the amount of digital euro in circulation

The Eurosystem will pay close attention to financial stability considerations.²⁴

If held by users in large amounts, a digital euro could result in a structural substitution of bank deposits, which in turn could have implications for monetary policy, financial stability, and the allocation of credit to the real economy.

Any undesirable consequences for monetary policy, financial stability and the allocation of credit to the real economy that may result from the issuance of digital euro should be minimised in advance by design.²⁵ Any potential risks emerging from the introduction of a digital euro should be contained both in normal times and in times of financial stress. The ECB has been discussing these aspects in detail over the past few months in interactions with market participants and EU institutions.²⁶ Analysis by ECB staff also suggests that adequately designing and calibrating central bank digital currency (CBDC) safeguards could help to counteract potential adverse effects of a CBDC on bank runs.²⁷

The intention is to incorporate limit and remuneration-based tools in the design of a digital euro to curb its use as a form of investment.²⁸ On the one hand, quantitative limits on digital euro holdings of individual users could limit individual take-up and the speed at which bank deposits are converted into digital euro. On the other hand, remuneration-based tools could be calibrated to make large digital euro holdings above a certain threshold unattractive compared to other highly liquid low-risk assets.

A wide set of tools will be included in the design of a digital euro so that the appropriate tools and parameter setting can be defined closer to the time of issuance and remain flexible in the future. A decision on how to combine and calibrate these tools could be taken closer to the possible introduction of a digital euro, taking into account the economic and financial environment at that point in time. It is not possible to anticipate today which financial environment would prevail during the possible operation of a digital euro in the future, including the broader monetary policy environment (e.g. interest rates, level of excess reserves) and the potential availability of alternative digital means of payment.²⁹

²⁴ See “[The digital euro and the evolution of the financial system](#)”, op. cit.

²⁵ *ibid.*

²⁶ See, for example, “[The digital euro and the evolution of the financial system](#)”, op. cit.; “[Potential impact of a digital euro on the financial system and the use of cash](#)”, ECB, July 2022; “[5th meeting of the Digital Euro Market Advisory Group \(2022\)](#)”, ECB, June 2022; and “[2nd ERPB Technical Session on Digital Euro](#)”, ECB, June 2022.

²⁷ See Panetta, F., “[More than an intellectual game: exploring the monetary policy and financial stability implications of central bank digital currencies](#)”, opening speech at the IESE Business School Banking Initiative Conference on Technology and Finance, 8 April 2022; and Adalid, R., Álvarez-Blázquez, A., Burlon, L., Dimou, M., López-Quiles, C., Martín, N., Meller, B., Muñoz, M., Pennesi, F., Radulova, P., Šilová, G., Soons, O. and Ventula, A., “[Central bank digital currency and bank intermediation](#)”, *Occasional Paper Series*, No 293, ECB, May 2022. Research by a group of central banks, including the ECB, also finds that the impacts of CBDCs on bank disintermediation and lending could be manageable for the banking sector; see “[Central bank digital currencies: executive summary](#)”, BIS, 30 September 2021. These impacts are likely to be limited for most plausible levels of CBDC take-up if the system has the time and flexibility to adjust.

²⁸ See “[Potential impact of a digital euro on the financial system and the use of cash](#)”, op. cit.

²⁹ See “[The digital euro and the evolution of the financial system](#)”, op. cit.

Within the overall holding limit, a specific limit for offline holdings could be applied. This would allow the maximum amount of digital euro in circulation to be controlled and should not pose significant technical challenges. The Governing Council has approved the possible application of different limits for online and offline use and the potential permitting of temporary deviations from the holding limit.

Additional functionalities could avoid negative effects of holding limits on user experience.³⁰ One such tool could be the “waterfall” functionality, under which funds in excess of the digital euro holding limit would be transferred automatically to a linked commercial bank account. The “waterfall” tool has been approved by the Governing Council.

3 Next steps

The investigation phase explores design and distribution options for the digital euro to meet the needs of end users. A number of steps will need to be taken before a digital euro can be introduced, including analysis of how financial intermediaries could provide front-end services that build on a digital euro, how digital euro would be distributed to users and how payments would be settled. It is also important to agree on a suitable compensation model and to decide who should be able to access the digital euro ecosystem and when. In addition, a prototyping exercise will explore potential digital euro user interfaces.³¹ Overall, the next design decisions will have to be made on the settlement model, the distribution model, the role of intermediaries, and funding / defunding.

The Eurosystem will continue to actively engage with a large number of stakeholders throughout the remainder of the investigation phase.³² This includes the European Commission, the European Parliament and the finance ministers of the euro area countries. In addition, broad engagement with market stakeholders will ensure that a digital euro meets users’ needs.

The Governing Council will decide in autumn 2023 whether to start a realisation phase to develop and test the appropriate technical solutions and business arrangements necessary to provide a digital euro. This phase could last around three years. A decision on the possible issuance of a digital euro may only come later, also depending on legislative developments regarding a regulation to establish and govern essential aspects of the digital euro that will be discussed by the European Parliament and the Council of the EU, upon a proposal by the European Commission.

³⁰ See “[Potential impact of a digital euro on the financial system and the use of cash](#)”, op. cit.

³¹ See Question 8 “What is the timeline for introducing a digital euro?” in “[FAQs on the digital euro](#)”, ECB, 2022.

³² See “[Stakeholder engagement](#)”, ECB, 2022.