

# Conclusion Report



## About this report

This concluding report signifies the end of the third contractual round of the EU Blockchain Observatory and Forum (EUBOF), an initiative by the European Commission. It provides a comprehensive overview of EUBOF's activities, achievements, and impact over the past four years, while also providing insights into future trends and policy actions for blockchain technology in Europe.

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### Note

All mistakes and omissions are the sole responsibility of the authors of this guide.

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# Forewords

## Forewords by the European Commission

In September 2019, the European Commission developed a European Blockchain Strategy to promote blockchain-based innovation and ensure that blockchain technology is used in ways compatible with European values, accelerating the adoption of blockchain technologies and creating a balanced and consistent policy framework for blockchain.

As part of this Blockchain Strategy, the second iteration of the European Blockchain Observatory and Forum (EUBOF) was launched in **May 2020**, followed by the third iteration in November 2022, aiming to be an excellent source of information on blockchain technology and facilitating a robust blockchain ecosystem in the EU. It came together with support to R&I projects through EU funding programs, and other initiatives mobilising stakeholders like the European Blockchain Partnership (EBP) working on the European Blockchain Services Infrastructure (EBSI) and the International Association of Trusted Blockchain Applications (INATBA).

In pursuing these objectives, the Observatory research team engaged in deep-dive analysis into the evolving applications of blockchain technology in various business sectors. The research team published insightful thematic papers that uncover the blockchain use cases in key business sectors including automobile, healthcare, and energy. Through extensive and detailed research, these reports have explored both the opportunities and challenges associated with the application of blockchain technology to each business sector.

Moreover, the research team addressed the sustainability aspects of blockchain and its convergence with key emerging technologies. This endeavour led to the publication of notable thematic papers focused on blockchain and energy consumption and the convergence of blockchain with Virtual Worlds.

Overall, EUBOF successfully published 20 high-quality thematic reports, which deliver valuable information about the evolution of blockchain technology and its application to the experts, academia, and citizens in the EU.

It is also worth noting that the Observatory organised three major hybrid events and more than 30 online and physical workshops to explore a wide range of blockchain technology issues. These gatherings have served as a platform for stakeholders, academia, and policymakers to come together and share their insights, as well as contribute to the creation of a blockchain community in the EU.

The application of blockchain technology is expected to progress further, including convergence with key emerging technologies such as AI, Virtual Worlds, and Tokenisation. The valuable work of the Observatory, including its thematic papers and workshops, will remain an essential resource for stakeholders, academia, and policymakers exploring future advancements in blockchain technology.

Last but not least, we would like to express our deepest appreciation to the Observatory team. Netcompany-Intrasoft SA in consortium with University of Nicosia and Centre for Research and Technology Hellas (CERTH), have worked tirelessly ensure the success of the Observatory project. Working with the team has been a delightful experience and their teamwork has been impressive.

We firmly believe that the Observatory's work has established a robust knowledge base that will support the future development of the blockchain ecosystem in the EU.

**Pierre Marro**

Senior Policy Officer, Directorate-General for Communications Networks, Content and Technology, European Commission

## Forewords by the EU Blockchain Observatory and Forum

It is with great pride and a sense of accomplishment that we present this conclusion report, marking the end of EUBOF's third contractual round. It has been an honour and a privilege for our team, comprising of Netcompany – Intrasoft, the University of Nicosia, CERTH, Crystal Analytics, OpenForum Europe, and White Research, to run the EU Blockchain Observatory and Forum for the last four years. During these four years, EUBOF has been at the forefront of blockchain innovation, fostering dialogue, and building partnerships across Europe and beyond.

Since EUBOF's inception as a pilot project in 2017, and particularly since 2020, our mission has been clear:

“to highlight key developments in blockchain technology, promote informed discussions, and support the growth of a robust blockchain ecosystem. We have worked tirelessly to enhance the understanding of blockchain technology, its applications, and the broader economic ecosystems in which it operates.”

Our achievements are a testament to the dedication and expertise of our team and the active community of experts we have built. We have organized numerous conferences, webinars, and online events, prepared a wealth of thematic and trend reports, and developed a platform that has become a vital resource for the global blockchain community.

One of our most significant accomplishments has been the creation of a network of engaged experts from around the world. This network has been instrumental in mapping projects, initiatives, educational programs, and training, linking stakeholders from the blockchain ecosystem globally. The knowledge and opportunities for innovation and collaboration that have emerged from this network are invaluable.

As we conclude this phase of the EUBOF, we look to the future with optimism. The trends and policy actions we have identified will continue to shape the blockchain landscape. We encourage our colleagues in the European Commission, the European Blockchain Partnership (EBP), and the European Blockchain Services Infrastructure (EBSI) to build on the foundation we have laid. The knowledge base, expertise, network, engagement, and trust we have developed are assets that can significantly support ongoing and future work in the blockchain domain.

We would like to extend our heartfelt thanks to everyone who has contributed to the success of the EUBOF.

Your dedication, insights, and collaboration have been the driving force behind our achievements. Together, we have made significant strides in advancing blockchain technology and its applications, and I am confident that the impact of our work will be felt for years to come.

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## Introduction

This conclusion report marks the end of the third contractual round of the EU Blockchain Observatory and Forum (EUBOF), an initiative launched by the European Commission to monitor and analyze blockchain developments across Europe. Since its inception as a pilot project in 2017, the EUBOF has been dedicated to highlighting key advancements in blockchain technology, fostering informed discussions, and supporting the growth of a robust blockchain ecosystem.

The primary aim of this report is to provide a comprehensive overview of the activities, achievements, and impact of the EUBOF over the past four years. It also aims to outline upcoming trends, policy actions, and insights from key stakeholders, offering a forward-looking perspective on the future of blockchain technology in Europe and beyond.

This report not only reflects on the past achievements of the EUBOF but also sets the stage for future developments in the blockchain ecosystem. It serves as a valuable resource for policymakers, industry leaders, academics, and blockchain enthusiasts, providing a comprehensive understanding of the current state and future potential of blockchain technology in Europe.

## A Guide to the EU Blockchain Observatory and Forum Deep-Dive Reports

The EUBOF has produced a series of thematic and trend reports that provide in-depth analysis and insights into various aspects of blockchain technology. These reports have been instrumental in shaping policy, fostering innovation, and promoting the adoption of blockchain across different sectors.

### EU Blockchain Ecosystem: latest developments

EUBOF's flagship report was first published in 2020. This detailed report explores the current state of the European blockchain ecosystem. It analyzes the current status both regarding the adoption and the regulatory treatment of blockchain and crypto assets in the 27 EU member states, plus the United Kingdom (UK) and Switzerland. An individual factsheet is presented for each country, culminating in an assessment of the regulatory and ecosystem maturity level for all of them. The report highlights Cyprus, Estonia, Malta, and Switzerland as leading countries in blockchain maturity. Cyprus is noted for its educational initiatives and national strategy to foster blockchain, while Estonia's early adoption of crypto asset regulation has made it a hub for blockchain investment. Malta's comprehensive regulatory framework has positioned it as a prime destination for blockchain capital, and Switzerland's robust venture capital ecosystem and regulated digital banking entities underscore its leadership in the sector.

To read the full report, [click here](#).

### Central Bank Digital Currencies and the Future of Digital Euro

First published in 2021, the "Central Bank Digital Currencies and the Future of Digital Euro" report, emphasizing the significance of Central Bank Digital Currencies (CBDCs) as the natural evolution of money digitization, asserts that various forms of CBDCs will coexist with traditional money in the near future. Europe, as a major economic force, is strategically positioned to lead the development and deployment of digital currency, with the European Central Bank (ECB) spearheading efforts to ensure price stability and the integrity of the European banking system. The report aims to contribute to the ongoing discourse on the digital euro by providing a comprehensive understanding of CBDCs and exploring design options. It underscores the potential of a digital euro to enhance payment efficiency, foster financial inclusion, and fortify the euro against global economic developments. By considering various design dimensions, such as technological infrastructure, user access methods, and currency management, the report offers decision-makers a structured framework for evaluating design options. Additionally, it addresses regulatory, technological, and end-user experience considerations, alongside potential implications for financial stability and the banking industry. Despite complexities, the report expresses confidence in Europe's ability to pioneer the development of digital currencies, ensuring stability, prosperity, and the protection of fundamental rights for European citizens and businesses.

To read the full report, [click here](#).

## Energy Efficiency of Blockchain Technologies

The "Energy Efficiency of Blockchain Technologies" report, the third thematic report, aims to provide insights into the latest updates and developments within the EU blockchain ecosystem. As part of a series of reports aligned with European Commission priorities, it aims to explore the future of blockchain both in Europe and globally. The report covers various aspects, including demystifying consensus protocols, assessing blockchain energy consumption indices, analyzing blockchain performance, industry perspectives, and strategies for decarbonizing blockchains. It also offers policy recommendations to guide future developments in the energy efficiency of blockchain technologies. With sections delving into consensus protocols, blockchain energy consumption indices, blockchain performance, industry insights, and decarbonization strategies, the report presents a comprehensive overview of the energy efficiency landscape in blockchain technology. Through interviews, data analysis, and policy recommendations, it provides valuable insights for policymakers, industry stakeholders, researchers, and regulators alike, facilitating informed decision-making and sustainable development in the blockchain sector.

To read the full report, [click here](#).

## Demystifying NFTs

This report provides a comprehensive examination of the multifaceted landscape of Non-Fungible Tokens (NFTs). Beginning with an overview and definitions, it traces the historical trajectory of NFTs and explores their diverse range of use cases, shedding light on their growing prominence in various sectors. The report

meticulously analyzes the NFT market and its corresponding marketplaces, offering insights into the dynamics shaping this burgeoning sector. Moving forward, the report delves into the intricate technology underpinning NFTs, elucidating the complexities of the NFT tech stack and discussing the standardization of NFT tokens. Furthermore, it navigates through the challenges and future prospects of NFT adoption, addressing concerns such as the growing volume of NFTs and considerations for money laundering, as well as security threats and vulnerabilities. Industry insights and future prospects are also examined, providing stakeholders with valuable perspectives on the evolving landscape of NFTs. The report concludes with policy recommendations aimed at fostering a robust and sustainable ecosystem for NFTs, positioning itself as a valuable resource for policymakers, industry professionals, and researchers alike.

To read the full report, [click here](#).

## Blockchain Applications in the Healthcare Sector

The fifth thematic report, published in 2022, offers a comprehensive exploration of blockchain applications in the healthcare sector and COVID-19 pandemic management. It highlights blockchain's potential to revolutionize healthcare data exchange, medical credentialing, and pharmaceutical supply chains, while also addressing regulatory, privacy, and ethical implications. The report delves into various applications, such as COVID-19 vaccination certificate status verification and contact tracing, emphasizing the transformative impact of blockchain on healthcare.

Moreover, the report advocates for blockchain's flexible integration with off-chain solutions to ensure compliance with data protection regulations. Interviews with industry professionals underscore practical perspectives on blockchain adoption, emphasizing the transition from innovation to production in domains like big pharma. In its concluding remarks, the report underscores blockchain's ability to foster trust, transparency, and efficiency in the healthcare ecosystem, paving the way for enhanced patient outcomes and data-driven innovations.

Overall, the report presents a compelling narrative on blockchain's potential to reshape healthcare, urging policymakers and standardization bodies to consider the technology's role in healthcare applications and advocate for a regulatory framework that facilitates innovation while protecting patient interests and data privacy.

To read the full report, [click here](#).

## Decentralised Finance

The sixth thematic report, published in 2022, provides a comprehensive exploration of Decentralised Finance (DeFi), marking a paradigmatic shift in financial services provisioning. It elucidates the intrinsic characteristics of DeFi and its operational disparities from traditional finance (TradFi), while navigating the regulatory



landscape governing its operations. The report highlights the exponential growth of the DeFi market, offering insights into its market size and user base evolution. It touches upon important segments such as stablecoins, decentralised lending, decentralised exchanges (DEXs), and other notable concepts like blockchain derivatives and decentralised insurance. Moreover, the report outlines the risks inherent in DeFi, spanning technical, financial, and procedural domains.

Additionally, the report underlines the potential of DeFi to increase security, efficiency, transparency, accessibility, openness, and interoperability in financial services compared to the traditional financial system. It suggests that DeFi could provide substantial opportunities to foster cross-border financial integration, aligning with important policy objectives of the European Union.

However, the report also addresses the challenges and risks associated with DeFi, emphasizing the need for a clear and favourable regulatory framework. Regulatory clarity is essential to enable centralised and decentralised services to coexist without hindering innovation or distorting competition. Policymakers must proactively address regulatory and policy challenges related to the borderless and trustless nature of DeFi applications, as well as legal enforceability concerns regarding smart contracts.

In conclusion, while DeFi holds immense potential to contribute to digital transformation, competitiveness, and financial inclusion in the European economy, it requires a balanced regulatory approach to ensure innovation flourishes while protecting users and maintaining market integrity. Regulatory sandboxes and a technologically neutral approach to regulation are essential for fostering a more regulated and sustainable DeFi ecosystem in the future.

To read the full report, [click here](#).

## Blockchain Applications in the Energy Sector

The inaugural thematic report from the EU Blockchain Observatory and Forum, published in line with the European Commission's priorities, delves into the application of blockchain technology within the energy sector. Offering a comprehensive overview, the report begins by outlining standardisation activities in the sector, paving the way for the exploration of blockchain use cases for energy. From facilitating flexibility services to enabling energy attribute certificates trading and establishing digital identities for energy assets, blockchain emerges as a transformative force in reshaping the energy landscape. The report further provides insights from industry leaders, including representatives from prominent entities such as ENGiE, Elia Group, STEDIN, and Volkswagen, along with an illuminating interview with Micha Roon, Former CIO of the Energy Web Foundation. Drawing from these perspectives, the report culminates in a series of policy recommendations aimed at both EU and Member State levels. These recommendations advocate for standardisation efforts, the inclusion of energy-related use cases in EU blockchain initiatives, and the promotion of regulatory frameworks conducive to blockchain adoption and innovation in the energy sector. Additionally, the report underscores the importance of leveraging blockchain technology to harness the

potential of e-mobility and electric vehicles, emphasizing the need for collaborative policies and regulatory sandboxes to accelerate technological advancements and market integration.

To read the full report, [click here](#).

## EU Blockchain Ecosystem latest developments – v2

The latest iteration of the EU blockchain ecosystem report aligns with the European Commission's strategic objectives. Focused on capturing the multifaceted developments within the blockchain landscape, the report provides a nuanced understanding of the regulatory and market dynamics shaping this domain across Europe.

Europe is progressing towards aligning regulations for crypto assets across its Member States, notably through the proposed MiCA regulation. MiCA, part of the Digital Finance package, aims to balance innovation and risk mitigation. Recent developments, including the European Parliament's endorsement of a draft MiCA framework, mark significant strides in regulatory harmonization. Additionally, initiatives like the DLT pilot regime underline Europe's commitment to an innovation-friendly financial landscape.

The European Commission recognizes the potential of DeFi and associated innovations in enhancing financial sector efficiency and transparency. Amidst rising interest in cryptocurrencies, the EU Blockchain Observatory and Forum conducted a study capturing developments across Member States. This updated report highlights regulatory shifts and market dynamics, supporting Europe's goal of a harmonized regulatory framework. To aid regulatory convergence, the report provides concise country-level summaries, enabling informed decision-making.

As Europe navigates the complexities of blockchain regulation and adoption, the report advocates for collaborative efforts to standardize practices, integrate energy-related use cases into EU blockchain initiatives, and foster an innovation-friendly regulatory environment. By leveraging blockchain technology, particularly in areas such as e-mobility and electric vehicles, Europe can unlock new opportunities for technological advancement and market integration, driving progress towards a more sustainable and efficient future.

To read the full report, [click here](#).

## Metaverse

The report on the metaverse addresses the recent surge in debate surrounding this emerging concept. Exploring its technological drivers and potential use cases, the report envisions a future marked by open, user-owned, and interoperable virtual worlds, known as the Open Metaverse. Yet, amidst the excitement, definitive conclusions on the ideal characteristics of metaverses remain elusive. Drawing parallels to the early days of the internet, the report highlights the evolving nature of metaverse technology and its applications.

While the metaverse already influences digital interactions significantly, fully immersive experiences remain on the horizon. The report outlines characteristics that a mature metaverse might embody, ranging from photorealism and immersiveness to data ownership and censorship resistance. While technology may address technical challenges, questions surrounding governance and business models remain pivotal.

Furthermore, the report outlines two potential scenarios for the future metaverse landscape: one dominated by a single mega-metaverse or characterized by numerous niche metaverses catering to specific communities and needs. Governance questions, such as openness and interoperability, will shape the trajectory of the metaverse, with implications for user ownership and competition.

Europe, with its commitment to freedom, justice, and fairness, is poised to lead the global discussion on metaverse governance. By championing policies that support open and equitable access for both private entities and decentralized communities, Europe can foster the development of the open metaverse(s) of tomorrow.

To read the full report, [click here](#).

## Blockchain for Transparent Supply Chains

The report on blockchain for supply chain transparency underscores blockchain's essential role in addressing supply chain challenges. It outlines how blockchain technology improves traceability and integrity across supply chains, aligning with increasing regulatory demands for transparency. Through examples like carbon markets and food traceability, blockchain transforms traditional practices, enhancing efficiency and ensuring compliance with regulations. It emphasizes the urgency of leveraging blockchain to navigate modern supply chain complexities and achieve sustainability.

Policymakers play a crucial role in overcoming barriers to adopting DLT-based climate solutions. The report highlights the lack of tailored frameworks hindering decision-making and implementation. While regulatory pressure propels sustainability efforts, ineffective carbon tracking tools increase the risk of greenwashing. Accelerating adoption requires guidelines on blockchain structures and token standards.

Overall, the report emphasizes the need for policymakers to address these challenges to facilitate the adoption of DLT-based climate solutions and ensure the effective utilization of blockchain technology in achieving transparency and sustainability in supply chains.

To read the full report, [click here](#).

## Smart Contracts

The report on smart contracts delves into the origins, mechanics, and implications of these digital agreements within the blockchain ecosystem. Initially coined by Nick Szabo in 1994, smart contracts automate the

execution of agreements by embedding buyer and seller terms directly into code, facilitating traceable, transparent, and irreversible transactions. These contracts operate within blockchain networks, offering inherent benefits such as trustless execution, enhanced security, cost efficiency, and rapid transaction finality. As foundational elements of the Web 3.0 era, smart contracts unlock a wide array of applications beyond traditional sectors, ranging from data management to cybersecurity and healthcare.

However, challenges persist in the widespread adoption of smart contracts. Legal complexities arise from translating legal language into computer code, requiring a delicate balance of legal and technical expertise to ensure alignment. Moreover, once deployed, smart contracts are immutable, lacking recourse for parties aggrieved by contractual terms. Despite these challenges, the report anticipates resolution over time through the accumulation of contract precedents and the evolution of legal frameworks. Harmonized standards and regulations within the EU may further facilitate the integration of smart contracts into mainstream business practices, aligning with broader data protection requirements and regulatory frameworks.

To read the full report, [click here](#).

## PoW Energy Consumption in the EU

The report on Proof of Work (PoW) Energy Consumption in the EU provides a comprehensive analysis of Bitcoin mining activities and associated energy consumption across EU member states. Through an examination of Bitcoin hashrates from 2019 to early 2022, the report highlights the evolving landscape of mining intensity and energy consumption patterns. Key findings include fluctuations in monthly hashrates, variations in mining intensity among member states categorized as high, medium, and low-intensity mining countries, and the overall energy consumption dedicated to Bitcoin mining.

The analysis underscores the significant role of Bitcoin mining in energy consumption within the EU, with insights into major mining pools, operators, and mining facilities. Figures depicting the evolution of Bitcoin mining percentages, annual hashrates for member states, and comparisons between 2020 and 2021 provide visual representations of the data. The report also examines the breakdown of energy consumption by mining intensity categories, shedding light on the proportion of energy dedicated to Bitcoin mining across different intensity levels.

Overall, the report offers valuable insights into the energy dynamics of Bitcoin mining in the EU, informing discussions and policymaking around sustainable energy practices and blockchain technology.

To read the full report, [click here](#).

## Blockchain Applications in the Automotive Sector

The report on blockchain applications in the automotive sector highlights the potential of blockchain technology to revolutionize various aspects of the automotive industry, particularly within urban and smart city domains. Several promising use cases for blockchain in automotive, including parts authentication, financial applications, connected car tracking, and CO2 emission tracking, are identified. However, the report emphasizes that the exploration of blockchain applications in this sector is still in its early stages.

One of the key findings of the report is the rapid growth of use cases within the automotive sector, which necessitates a multi-faceted approach considering environmental, economic, and social perspectives. It emphasizes the importance of introducing simple yet high-value use cases to the general public and gradually expanding the scope of blockchain applications. Additionally, the report underscores the synergies between blockchain and other technologies like telematics, IoT, and AI, highlighting their potential to enhance safety, security, and efficiency in the automotive industry.

However, the report also addresses legal challenges and regulatory uncertainties surrounding the implementation of blockchain in the automotive sector, particularly in the context of connected and autonomous vehicles (CAVs). Issues related to data processing roles, GDPR compliance, and compatibility with existing legal frameworks are highlighted. The report calls for further research and official guidance to ensure legal certainty and facilitate the widespread adoption of blockchain-enabled solutions in the automotive industry, contributing to Europe's competitiveness in the global market.

To read the full report, [click here](#).

## Decentralised Social Media

The report on Decentralised Social Media examines the evolution of social media platforms, from traditional centralized models to emerging decentralized alternatives, reflecting the progression towards Web 3.0. Highlighted are the diverse technological underpinnings and philosophical motivations behind these platforms, ranging from free software tradition to blockchain-based solutions, each advocating for different degrees of decentralization and user empowerment.

As decentralised social media gains traction, they introduce novel paradigms that redefine power distribution within digital ecosystems. While offering benefits like data control, privacy, and freedom of expression, they also present challenges such as regulatory uncertainties, content moderation, and user safety. Despite these complexities, decentralised social media platforms are emerging as a legitimate alternative to centralized platforms, with growing user awareness and adoption.

The transition towards decentralised social media platforms signifies a shift towards a more democratic and user-centric digital space. However, its long-term success hinges on addressing inherent vulnerabilities and advancing innovations in security, moderation, and user experience. In essence, while decentralised social media is still in its infancy, its potential to reshape the digital landscape is significant, marking the beginning of a transformative journey with promising yet uncertain outcomes.

To read the full report, [click here](#).

## The current state of interoperability between blockchain networks

The report on The current state of interoperability between blockchain networks highlights the pivotal role of blockchain interoperability in driving returns on investment and bolstering global science and tech-diplomacy efforts. It enhances trust and efficiency in collaborations, amplifies data-sharing value, and fuels innovation in sectors like climate change, finance, and healthcare. Furthermore, blockchain interoperability fosters new business models, particularly in the creator economy, by enabling seamless value and content transfer across networks. This spurs growth in creative industries, empowering creators to monetize content while retaining control over their intellectual property.

Yet, achieving blockchain interoperability faces daunting challenges, including complex architectures and governance structures. Collaboration among stakeholders is crucial to establishing common standards. Ethical development is key as blockchain interoperability advances. Addressing privacy, security, and governance concerns is vital to ensuring equitable benefits distribution. Through responsible practices, blockchain interoperability can realize its transformative potential while safeguarding ethical principles and stakeholder interests.

To read the full report, [click here](#).

## Blockchain-Enabled Virtual Worlds

This report explores the Open Metaverse, examining its current state, potential impact, and the various considerations that will shape its evolution. It analyses various aspects of the Open Metaverse, covering political, economic, social, technological, legal, and environmental considerations. It emphasizes the necessity of international cooperation for standardized regulations, the influence of economic conditions on its adoption, and the pivotal role of advanced technologies like blockchain, VR, and AR. Legal challenges, including data privacy and digital rights, are also scrutinized, alongside the environmental implications of the Metaverse.

One of the key findings of the report is the potential of the Open Metaverse to revolutionize industries such as education, entertainment, business, healthcare, and real estate. However, it also identifies significant challenges, including interoperability, privacy concerns, and the digital divide. The report suggests that integrating Web 3.0 principles and establishing comprehensive regulatory frameworks are essential for a user-centered Metaverse. The report touches upon the EU's potential role in shaping the Metaverse, especially in legal and regulatory aspects. The GDPR's global standard for data privacy and the MiCA regulation for digital assets and cryptocurrencies are identified as critical frameworks for the Metaverse's future.

To read the full report, [click here](#).

## Digital product passport: a blockchain-based perspective

The report aims to reflect on the latest trends and developments in blockchain technology and discuss its future in Europe and globally. The report acknowledges contributions from various industry experts and stakeholders, emphasizing the importance of collaboration and feedback in shaping its content. It also includes a disclaimer noting that the views expressed do not necessarily reflect the official opinion of the European Commission.

The report is structured into several chapters, each focusing on different aspects of Digital Product Passports (DPPs) and related regulations. It begins with an introduction to the concept of DPPs, their objectives, benefits, and potential challenges, particularly in the context of the circular economy. Subsequent chapters delve into practical applications of blockchain technology in various sectors, such as textiles, batteries, and consumer electronics, highlighting specific projects and case studies. The report also explores the role of blockchain in enhancing transparency, traceability, and security in supply chains, and discusses best practices and lessons learned from implementing DPPs. The final sections provide references and web sources for further reading, as well as detailed interviews with industry experts who share their insights and experiences with blockchain-based DPPs.

To read the full report, [click here](#).

## Blockchain & Intellectual Property Management

At a time when digital innovation is at the forefront of policy discussions, the management and protection of intellectual property (IP) has become a critical challenge for creators, businesses, and legal entities alike. This report by the EU Blockchain Observatory and the EU Blockchain Forum looks at the transformative potential of blockchain technology in revolutionising IP management. The technology promises to solve long-standing problems, such as proof of ownership, enforcement of rights, and distribution of royalties with efficiency and transparency.

Blockchain's decentralisation, immutability, and transparency provide a robust framework for the secure and accessible management of IP rights. By implementing smart contracts, blockchain facilitates automated transactions, including the payment of royalties. This automation not only lowers costs but also minimises the potential for disputes, creating a more efficient process for all parties involved.

Non-fungible tokens (NFTs) that use blockchain technology provide a unique mechanism for asserting ownership and linking rights declarations to digital assets. The uniqueness and indivisibility of NFTs make them an ideal tool for representing ownership of unique digital and real-world assets. In our report, we introduce emerging standards, such as EIP-2981, which aim to standardise NFT royalties and demonstrate the industry's efforts to create interoperable and fair compensation mechanisms for creators.

However, the integration of blockchain into IP management faces challenges. In this report, we identify and present key hurdles, such as the need for comprehensive legal frameworks that recognise and enforce blockchain transactions, the standardisation of different blockchain platforms to ensure interoperability, and the technical scalability required for widespread adoption.

Despite these challenges, the report is optimistic about the future of blockchain in IP management. It calls for a collaborative approach between policymakers, technologists, IP owners, and IP users to create an environment conducive to innovation while protecting creators' rights. The development of supportive

regulatory frameworks, together with advances in blockchain technology will be crucial to realising the full potential of blockchain for the management of intellectual property.

In conclusion, the report highlights the significant opportunities that blockchain offers for improving the efficiency, transparency, and fairness of IP management. It encourages continued research, development, and cross-sector dialogue to overcome the existing challenges and fully exploit the benefits of these technologies.

To read the full report, click [here](#).

## EU Blockchain Ecosystem Developments v3

The third version of the European Blockchain Observatory and Forum Ecosystem Report provides a comprehensive reference for the state of blockchain and cryptocurrency across 32 countries, including the 27 EU member states, Liechtenstein, Norway, Switzerland, the United Kingdom, and for the first time Ukraine. The report is structured into two levels of analysis: country-level overviews and cross-country comparative assessments. At the country level, the report includes detailed factsheets for each nation, covering key metrics, policy and regulatory initiatives, educational and research activities, the entrepreneurial environment, and user communities. Expert interviews further enrich these profiles. The cross-country analysis examines the entrepreneurial ecosystem, academic initiatives, and regulatory maturity, providing insights into the size of the blockchain industry, the number of companies, funding levels, and the state of education and training programs.

The report highlights a steady increase in the establishment and funding of blockchain companies across Europe, with notable growth in the United Kingdom, Switzerland, and Germany. The analysis reveals a robust increase in investment activity, particularly in Germany, Austria, and France which showed significant funding growth, reflecting varied stages of blockchain adoption and a broader shift towards an innovative financial technology ecosystem in Europe. The report underscores the dynamic nature of the crypto market, with public interest closely mirroring market volatility, peaking during the 2021 bull run and declining following major market disruptions. Regulatory maturity is assessed through a three-stage model, with countries progressing from no specific legislation to comprehensive frameworks for digital assets and national blockchain strategies. The report concludes that both regulatory and ecosystem maturity are advancing, driven by positive externalities and synergies within the single European market, with smaller agile countries initially leading the way, followed by larger nations capitalizing on developed regulations and ecosystem synergies.

To read the full report, click [here](#).

## Trend Reports

In total, our team has prepared 18 Trend Reports, examining the latest developments in the blockchain space, regarding legislative and regulatory interventions, market as well as technological advancements, in Europe and beyond. All Trend reports are available [here](#).



# EUBOF Key Achievements

## Conferences and Webinars

Since 2020, the EU Blockchain Observatory and Forum has organised a series of high-impact events aimed at fostering dialogue and knowledge exchange within the blockchain community. These events have included:

- **More than 3 major conferences:** These conferences brought together policymakers, industry leaders, academics, and blockchain experts to discuss the latest developments, challenges, and opportunities in the blockchain space. The conferences served as a platform for networking, collaboration, and the dissemination of cutting-edge research and insights.



- **Over 30 webinars and online events:** Our webinars covered a wide range of topics, from technical aspects of blockchain technology to its applications in various sectors. These online events provided an accessible platform for stakeholders to engage with experts, ask questions, and stay informed about the latest trends and innovations.

Videos from our webinars and online events are available [here](#).

## Publications and Research

The EUBOF has been prolific in producing high-quality publications that have contributed significantly to the understanding and advancement of blockchain technology. Our key publications include:

- **30 Thematic Reports:** These reports delve into specific areas of blockchain technology, providing in-depth analysis and insights. Topics have ranged from decentralized finance (DeFi) and central bank digital currencies (CBDCs) to blockchain applications in healthcare and energy efficiency.
- **20 Trend Reports:** Our trend reports identify and analyze emerging trends in the blockchain ecosystem. These reports have covered themes such as smart contracts, blockchain for supply chain transparency, and the metaverse, offering valuable foresight into the future directions of blockchain technology.
- **Several Research Papers:** In addition to thematic and trend reports, we have published numerous research papers that explore various aspects of blockchain technology, its applications, and its impact on different sectors.

## Expert Network and Community Building

One of the most significant achievements of the EUBOF has been the development of a robust and engaged network of blockchain experts. This network has been instrumental in driving our mission and includes:

- **A diverse panel of experts:** Our expert panel comprises leading blockchain professionals from around the globe, including academics, industry leaders, and policymakers. This diverse group has provided invaluable insights, contributed to our publications, and participated in our events.
- **Active community engagement:** We have built and animated a vibrant community of blockchain enthusiasts and stakeholders. Through our events, publications, and online platforms, we have facilitated knowledge sharing, collaboration, and the exchange of ideas.

## Collaboration & Promotion of EU Initiatives and Projects

The EUBOF Team identified opportunities for collaboration between the Observatory and other European and International projects and organisations to maximise the scope of activities and gain additional knowledge from these external collaborations. Organisations and collaborations include:

**European Blockchain Partnership (EBP):** established among the EU Member States, Norway and Liechtenstein whereby these countries formally committed to working together in a Joint Declaration.

**INATBA:** the International Association for Trusted Blockchain Applications serves as the bridge between public and private entities in the blockchain ecosystem. INATBA maintains a permanent and constructive dialogue with public authorities and regulators for global convergence of regulatory approaches. In doing so, INATBA works to promote an open, transparent and inclusive global model of governance for blockchain and other distributed ledger technology infrastructures that reflect the shared interests of Member and Advisory Board stakeholders. In line with the goal of reaching global blockchain adoption, INATBA supports the development of a constructive dialogue between technology providers, citizens' associations, the public sector, and governments to accelerate the development and adoption of trusted blockchain and DLT applications in specific sectors.

**EBSI:** The European Blockchain Services Infrastructure (EBSI) aims to leverage the power of blockchain for the public good. EBSI is an initiative of the European Commission and the European Blockchain Partnership.

**EU Regulatory Sandbox:** The sandbox establishes a pan-European framework for regulatory dialogues to increase legal certainty for innovative blockchain solutions. Funded by the Digital Europe Programme and delivering on the SME strategy, the sandbox is running from 2023 to 2026 and will annually support 20 projects including public sector use cases on the European Blockchain Services Infrastructure. Projects will be chosen through calls for expression of interest. Every year, the most innovative regulator participating in the sandbox will also be awarded a prize.

**ONTOCHAIN:** Under the European Commission Next Generation Internet initiative, ONTOCHAIN was launched in September 2020. The initiative will provide funding to internet innovators for developing Blockchain-based knowledge management solutions that address the challenge of secure and transparent knowledge management as well as service interoperability on the Internet.

**INFRACTAIN:** INFRACTAIN is a privately driven non-profit organization with public sector support created by the emerging blockchain-industry. INFRACTAIN is a cross-industry effort aiming to push the adoption curve of blockchain by sharing expertise, participating in blockchain projects, disseminating information on operational blockchain use cases and creating an international ecosystem.

**TrustChain:** Under the European Commission Next Generation Internet initiative, TrustChain is launched in January 2023. TrustChain aims to create a portfolio of Next Generation Internet protocols and an ecosystem of decentralized software solutions that reach the highest standards of humanity such as those chartered by the United Nations including the respect of human rights, ethics, sustainability, energy efficiency, our care for the environment and our respect for the World's cultural history. TrustChain will tackle several challenges pertaining to trustworthy and reliable digital identity, to resilient, secure and reliable data pathways, to economics and trading of data, to energy efficiency for data storage, transport and sharing, to seamless services and data flows. A new trustworthy data governance and sharing model will be developed in line with the European regulatory framework and taking into account European values while ensuring Trusted Data Ecosystems.

**CHAISE:** the core mission of CHAISE is to develop a strategic approach on blockchain skills development for Europe. CHAISE will deliver future-proof training solutions, in order to tackle blockchain skill shortages and to respond to the current and future skill needs of the European Blockchain workforce.

**EUIPO:** The EUIPO is getting closer to ensuring product authenticity by creating a new ecosystem in which all parties have a common stake and an immutable bond in the blockchain. Together with IP rights holders, customs authorities and transport and logistic operators we have successfully demonstrated the anti-counterfeiting blockchain infrastructure viability using multiple products journeys. This exercise involved all parties in tracking and validating product authenticity and provenance, from foreign manufacturing sites down to EU-based local distribution centres.

**DAP:** Democratising Academic Publishing (DAP) explores the concept of decentralised scientific publishing with shared governance based on blockchain. The project aims to improve the quality of publication review, automate, valorise and objectify it, thus simplifying scientific communication, while the application of Blockchain technology ensures confidence in the quality and authenticity of the data.

**BC100+:** BC100+ is an initiative that brings together a variety of organisations across different sectors. The initiative's main goal is to raise awareness about the potential of blockchain for social impact and sustainability. BC100+ explores the potential of blockchain technology to address systemic issues such as inequality, poverty, and climate change by rebuilding trust, empowering communities, asserting accountabilities, and re-distributing value on the global level. With its core features, blockchain technology could play a role in the acceleration of much-needed changes within our global food system, energy infrastructure, and biodiversity

protection among other issues. At the core, BC100+ intends to promote quality debate, raise awareness and clarify the opportunities of blockchain's role in realising the UN Charter Values and the 2030 Agenda.

**World Metaverse Council:** The World Metaverse Council is a platform leading the dialogue for an equitable and inclusive life in the metaverse. The WMC is the first world body bringing metaverse creators, developers, etc., together globally. The aim is to develop a world where humans and their avatars enjoy freedom of speech and freedom from fear and want. WMC aims to promote the development of friendly relations between metaverses and to form a common standard for metaverses everywhere.

**Club of Venice:** The Club of Venice is an informal group of Europe's most senior and experienced government communications professionals. Founded in 1986, it convenes several times each year to provide members with an opportunity to discuss issues of mutual interest, share experiences and best practice, and offer mutual support.

**EU Web3.0 Summit:** EW3S is a meta-platform coordinated by blockchain-related NGOs to facilitate open dialogue between Web3 and policymakers in Europe to help innovations flourish. It is an exclusive invitation-only event, that will foster a continuous dialog and knowledge exchange between European's regulators, policymakers, and Web3 to develop a resilient ecosystem for Web3. EW3S is organized by the Institute for Global Transformation, Brussels, and the Institute for Cognitive Modelling, Brussels in partnership with Blockchain for Europe and the German Marshall Fund of the United States.

**MIPRO Conference:** MIPRO is the Croatian Society for Information, Communication and Electronic Technology. Basic goals of MIPRO include interdisciplinary consideration and solution of economic, informational, cultural, educational, technical, scientific and other problems inherent to microprocessors, electronics, and their application in informational and production process systems; protection and forwarding of ecological, national, social and professional interests and goals; cooperation with local self-government and local administration for the accomplishment of economic and other goals; additional and special education of members and others; publication and propaganda of informational technologies; cooperation with other relative societies; organisation of International Convention MIPRO and of other conventions.

This is only an indicative list of the projects, initiatives, and organisations that EUBOF has worked within the last four years, aiming to establish continuous trust and exchange within the EU and global blockchain ecosystem and to raise awareness about the blockchain technology potential applications and use cases.

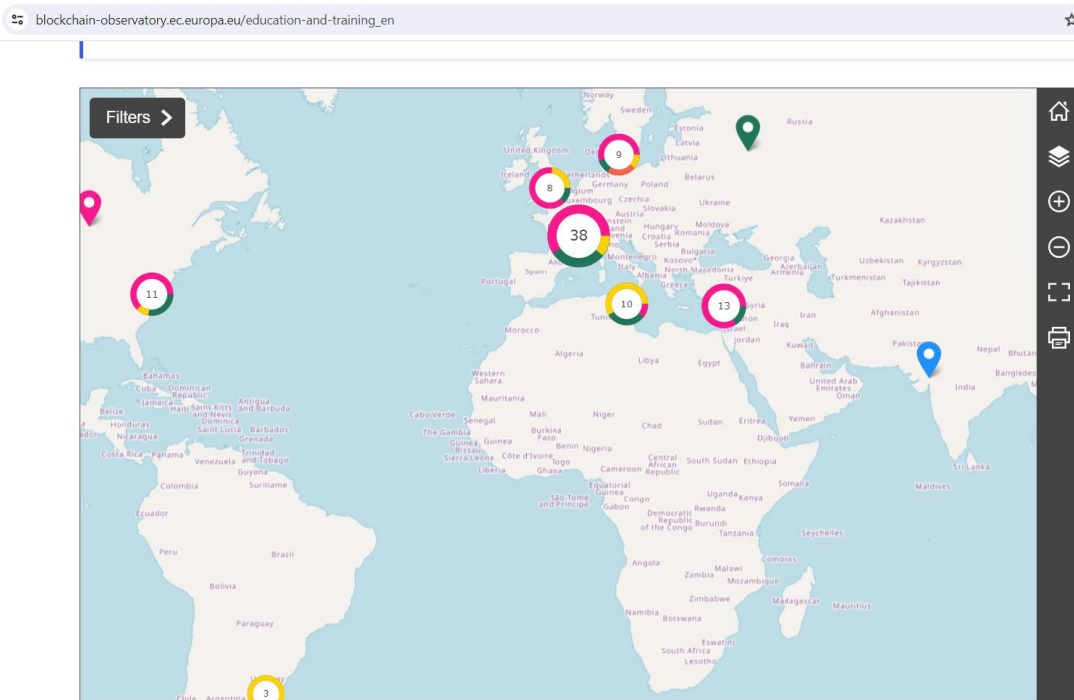
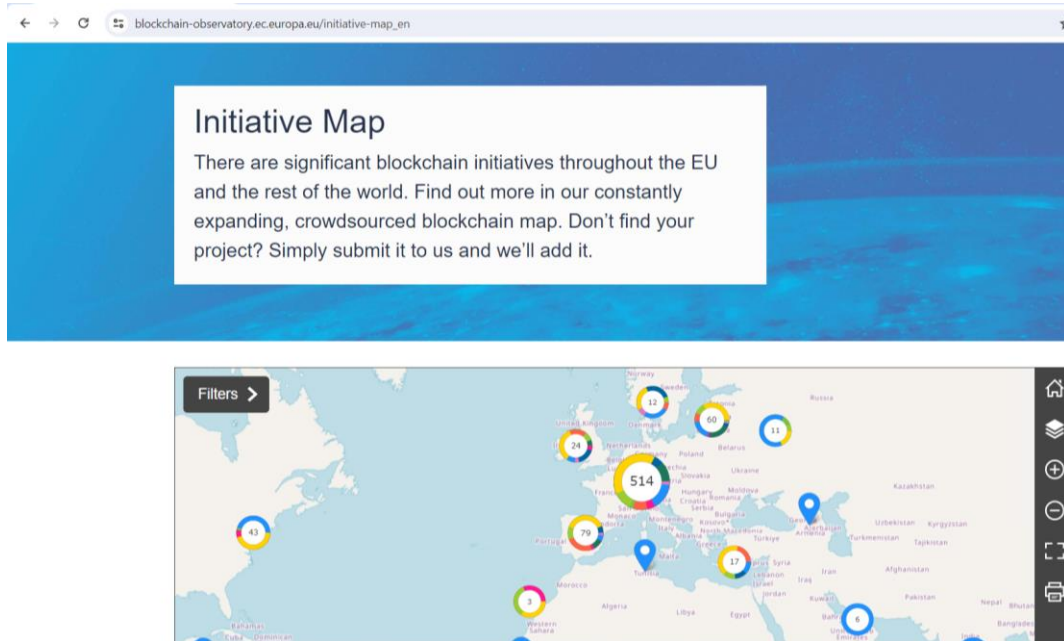
Other collaborations include local initiatives, projects, and stakeholders in education which increases awareness of blockchain technology, implementation of blockchain education, and career opportunities in the space.

## Mapping and Linking Initiatives

The EUBOF has played a crucial role in mapping the blockchain landscape and linking various stakeholders. Our efforts in this area include:

- **Mapping projects and initiatives:** We have identified and documented key blockchain projects and initiatives across Europe and beyond. This mapping exercise has provided a comprehensive overview of the blockchain ecosystem, highlighting innovative projects and best practices.
- **Educational programs and training:** We have mapped educational programs and training opportunities related to blockchain technology. By linking stakeholders with these resources, we

have supported the development of skills and knowledge necessary for the growth of the blockchain ecosystem.



## Platform Development

A cornerstone of our achievements has been the development of a platform for the blockchain community. This platform has:



- **Facilitated knowledge sharing:** Our platform has become a central hub for the blockchain community to share knowledge, insights, and best practices. It has enabled stakeholders to stay informed about the latest developments and trends in the blockchain space.
- **Promoted innovation and collaboration:** By providing a space for stakeholders to connect and collaborate, our platform has fostered innovation and facilitated the development of new blockchain applications and solutions.

## Communication and Outreach

The EUBOF has also been a major communication channel for Europe to set out its vision and ambition on the international scene. Our communication efforts have included:

- **Promoting European actors:** We have highlighted the contributions of European blockchain actors, showcasing their innovations and achievements on a global stage.
- **Engaging with multiple stakeholders:** We have reinforced European engagement with a wide range of stakeholders, including policymakers, industry leaders, academics, and the broader blockchain community.
- **Online (organic) engagement with the community:**

Social media account	Followers/Subscribers
Twitter	14,9k followers
LinkedIn	11k followers
YouTube	880 subscribers

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## Awards and Recognition

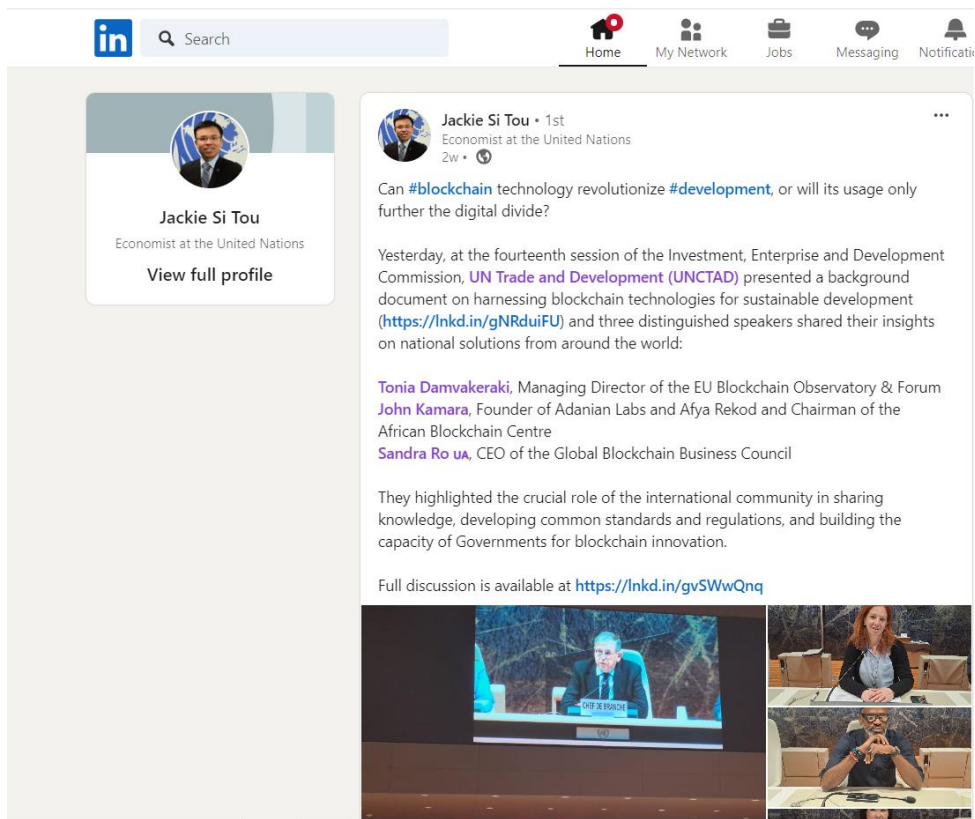
**INATBA Awards 2023** – Most exciting Educational Initiative: EUBOF’s Academic Partner, the University of Nicosia, was awarded the Most Exciting Programme in Education for their META 511 Course.



**INATBA Awards 2024** – Partnership Excellence Award: EUBOF was awarded the honorary award from the INATBA Board of Directors, for Partnership Excellence as an acknowledgment of the support provided to INATBA.



UNCTAD 14<sup>th</sup> Session – Invitation to EUBOF to represent the EU:



## Upcoming Trends

As we look to the future, several emerging trends are poised to shape the blockchain landscape. These trends reflect the evolving nature of technology and its increasing integration into various sectors and reflect a dynamic and rapidly evolving landscape. As CBDCs, the convergence of blockchain with AI, and other emerging trends continue to develop, they will drive innovation and create new opportunities across various sectors. Here, we highlight some of the most significant upcoming trends that are expected to drive innovation and adoption in the blockchain ecosystem.

- **Convergence of Blockchain with Artificial Intelligence (AI):** The convergence of blockchain technology with artificial intelligence (AI) is a significant trend with significant potential. This integration can enhance the capabilities of both technologies, leading to innovative applications and solutions. Key areas of convergence include:
  - **Data Security and Privacy:** Blockchain can provide a secure and transparent framework for AI data, ensuring data integrity and privacy. This is particularly important in sectors such as healthcare and finance, where data security is paramount.
  - **Decentralized AI:** Blockchain can enable decentralized AI networks, where AI models and data are distributed across a blockchain network. This can reduce the risk of data monopolies and promote collaborative AI development.
  - **Smart Contracts and Automation:** AI can enhance the functionality of smart contracts by enabling more complex and adaptive contract conditions. This can lead to more efficient and automated processes in various industries.
- **Decentralized Finance (DeFi):** DeFi continues to grow, offering decentralized alternatives to traditional financial services such as lending, borrowing, and trading. The DeFi ecosystem is expected to expand, with new protocols and applications emerging.
- **Interoperability:** The ability of different blockchain networks to communicate and interact with each other is crucial for the growth of the blockchain ecosystem. Efforts to enhance interoperability, such as cross-chain protocols and standards, are expected to continue.
- **Sustainability and Energy Efficiency:** As concerns about the environmental impact of blockchain grow, there is a push towards more sustainable and energy-efficient blockchain solutions. Innovations in consensus mechanisms and the use of renewable energy sources are key areas of focus.

## Policy Actions

The EUBOF has made several recommendations to support policymaking and accelerate blockchain innovation and adoption in the EU. These include:

- Promoting European actors and reinforcing European engagement with multiple stakeholders.
- Mapping key initiatives in Europe and beyond.
- Monitoring developments, analyzing trends, and addressing emerging issues.
- Serving as a global knowledge hub on blockchain.
- Inspiring common actions based on specific use cases of European interest.
- Representing a major communication opportunity for Europe to set out its vision and ambition on the international scene.



One of the most notable advancements in the industry is the strides taken in regulatory and legal frameworks. The European Union has been at the forefront of landmark pieces of legislation such as the Markets in Crypto-Assets (MiCA) regulation and the Digital Operational Resilience Act (DORA). MiCA has been pivotal in setting a harmonized regulatory standard for crypto-assets, issuers, and service providers, focusing on consumer protection, transparency, and market integrity. This legislation represents a significant step toward legal clarity and operational safety in digital finance. Similarly, DORA has addressed the critical aspects of digital operational resilience, ensuring that the financial sector can effectively respond to ICT-related disruptions and threats, thus safeguarding market stability and integrity. These legislative frameworks have not only enhanced the robustness of the financial and technological infrastructure but have also fostered an environment conducive to innovation and growth within the blockchain domain.

# Annex

## List of EUBOF Expert Panel members

- Ad Kroft
- Agata Ferreira
- Agne Kazakauskaite
- Alex Nascimento
- Alexi Anania
- Almudena de la Mata Muñoz
- Amit Joshi
- Anastasios A. Antoniou
- Anca Bogdana Rusu
- Andrès Chomczyk Penedo
- Anna Burzykowska
- Anton Hasselgren
- Antonio Lanotte
- Arnaud Le Hors
- Ash Costello
- Bettina Schneider
- Bianca Hanuz
- Blaž Podgorelec
- Bo Hembæk Svensson
- Burkhard Blechschmidt
- Carlos Pastor Matut
- Catarina Ferreira da Silva
- Charalambos Savvides
- Chris Pilling
- Christian Aranha
- Christian Miccoli
- Christof Ferreira Torres
- Claudia Di Bernardino
- Claudia Sandei
- Cristina Carrascosa Cobos
- Daniël Du Seuil
- Daniel Szegö
- David Galindo
- David Magård
- Debora Di Giacomo
- Demetrios Tseas
- Dennis Post
- Dominic Briggs
- Dominique Simon
- Erick de Moura
- Eugenio Reggianini
- Ezechiel Copic
- Federico Panisi
- Frederik De Breuck

- Galia Kondova
- György Balázs
- Ingrid Vasiliu-Feltes
- Iñigo Moré
- Ioannis Revolidis
- Ioannis Vlachos
- Irina Albita
- Ishan Roy
- Ismael Arribas
- Ivona Skultetyova
- Iwona Karasek-Wojciechowicz
- Jacob Boersma
- Jai Ramaswamy
- Jan Klesla
- Jānis Graubiņš
- Jed Grant
- Jeffrey Bandman
- Jim Mason
- Jolanda ter Maten
- Jonas Gross
- Jörn Erbguth
- Joshua Ellul
- Katherine A. Foster
- Koen Vingerhoets
- Konstantinos Votis
- Kristina Lillieneke
- Lan van Wassenaer
- Leïla Nassiri-Jamet
- Lisa Trujillo
- Luca Boldrin
- Manuel Machado
- Marcin Piotr Pawłowski
- Marcin Zarakowski
- Marcus M. Dapp
- Maria Grazia Vigliotti
- Maria Minaricova
- Mariana de la Roche
- Marina Niforos
- Marta Geater-Piekarska
- Martin Pospěch
- Matthew Niemerg
- Michael Kolain
- Michal Geci
- Michèle Finck
- Miquel Gouarre Baro
- Nadia C. Fabrizio
- Nadia Filali
- Nasir Zubairi
- Nicolas T. Courtois
- Nina-Luisa Siedler

- Patrick Hansen
- Pedro Roseiro
- Philipp Sandner
- Ramesh Ramadoss
- Robbert Greenfield
- Robert Herian
- Sandra Uwantege-Hart
- Scott Stornetta
- Sergio Gonzalez Miranda
- Stefan Beyer
- Stefan Junestrand
- Stefan Kai Loesch
- Suzana Mesquita de Borba Maranhão Moreno
- Tadej Slapnik
- Tim Weingärtner
- Urko Larrañaga Piedra
- Valeria Portale
- Vlado Stankovski
- Wendy Charles
- Xenofon Kontouris
- Yannis (Ioannis) Karamitsos
- Zara Zamani
- Laura Kajatzi
- Dr Leonardo Marques

## A to Z guide

- **Bitcoin:** A cryptocurrency, the first and most renowned application (use case) of blockchain technology, specifically within the realm of financial services.
- **Blockchain:** A tamper-proof, shared digital ledger that records transactions in a decentralized peer-to-peer network. The permanent recording of transactions in the blockchain permanently stores the history of asset exchanges that take place between the peers (participants) in the network.
- **CBDC:** A Central Bank Digital Currency is a form of digital money that is issued by a central bank.
- **Centralization:** When a single entity, such as a bank or land registry, maintains control over transaction records and data.
- **Consensus Mechanism:** A consensus mechanism is a way to achieve agreement on a single data value among distributed processes or systems. In the context of blockchain, it's a set of rules or protocols that decide on the validity of the information added to the ledger.
- **Consortium Blockchain:** It is used by organizations to enable private transactions among a circle of trusted participants, often spanning different corporate entities and geographical locations.
- **Cryptography:** A set of techniques and algorithms that ensure the security and integrity of data stored and transmitted on a blockchain network. It plays a crucial role in maintaining the decentralized, transparent and tamper-proof nature of blockchain systems.
- **Decentralization:** Eliminates the need for gatekeepers and the vulnerabilities of single points of failure
- **DeFi:** Decentralized Finance
- **Digital Signatures:** Digital signatures are used to authenticate valid transactions.
- **dPoS:** Delegated Proof of Stake, a type of consensus mechanism that is a democratic version of PoS. Stakeholders vote for a few delegates who manage the blockchain on their behalf.
- **Hash Function:** A mathematical function commonly used to verify the integrity of data, by transforming identical data to a unique, representative, fixed-size digest.
- **Hybrid Blockchain:** It combines elements of both private and public blockchains. It attempts to use the best features of both worlds to cater to specific business needs.
- **Interoperability:** The ability of blockchain networks to communicate with each other, sending and receiving messages, data, and tokens
- **Ledger:** A ledger is a distributed, tamper-proof record, of all transactions that have ever taken place on the blockchain. It is a shared, synchronized database that is maintained by a number of computers (nodes). This means that no single entity has control over the ledger, and it is extremely difficult to alter or forge entries. The ledger is a crucial component of blockchain technology because it allows for secure and transparent transactions. Anyone with access to the ledger can view the entire history of transactions, which makes it impossible for any participant to cheat or double-spend. This transparency is essential for building trust in the system.
- **Virtual Worlds (Metaverse):** The product of a technology-driven shift with generalized impact through persistent and adaptable digital experiences.
- **Mining:** The trust system in Bitcoin relies on computing power. Transactions are grouped into blocks, and it takes a lot of computing effort to prove (or "confirm") these blocks. However, once confirmed, they require only a little effort to verify as "proven". This validation process is known as mining. Mining generates new bitcoins in each block, in the same way that a central bank prints new money.
- **MiCA:** Markets in Crypto-Assets (MiCA) is a regulation in EU law, designed to bring clarity to the crypto-assets market. It is intended to help streamline distributed ledger technology (DLT) and virtual asset regulation in the EU whilst protecting users and investors. With MiCA, the EU has become the first leading jurisdiction globally to roll out a detailed regulation framework for the sector.
- **Nick Szabo:** A computer scientist, who conceptualized 'bit gold', a decentralized digital currency that, although it was never realized, foreshadowed the structure of Bitcoin.
- **NFTs:** Non-Fungible Token, is a type of digital asset distinct in its uniqueness and non-interchangeability with other digital tokens.

- **Node:** A node is a device, typically a computer, that runs the blockchain's software and maintains a copy of the blockchain's transaction history. Nodes are responsible for validating transactions, ensuring their authenticity and adherence to the blockchain's rules. They also play a crucial role in broadcasting new transactions to the network and ensuring the integrity and consistency of the blockchain's data.
- **Permissioned Blockchain:** In permissioned blockchains not anyone can join the network. Permission is provided to certain identifiable participants to join the network. They often have a level of privacy and control that is not present in permissionless systems. This can be particularly useful for consortia of businesses that wish to transact privately.
- **Permissionless Blockchain:** In permissionless blockchains, there are no gatekeepers, and all transactions are public. This type of blockchain supports an environment where anyone can create an address and begin interacting with the network.
- **PoW:** Proof of Work, a type of consensus mechanism used by Bitcoin, where miners solve complex mathematical puzzles to validate transactions and create new blocks. The first one to solve the puzzle gets to add the block to the blockchain and is rewarded with cryptocurrency.
- **PoS:** Proof of Stake, a type of consensus mechanism where participants 'stake' their cryptocurrency as a form of security. Validators are chosen to create a new block based on the amount they stake and other factors. It is more energy efficient than PoW.
- **PoA:** Proof of Authority, a type of consensus mechanism where transactions and blocks are validated by approved accounts, known as validators. It is faster and more energy-efficient but less decentralized.
- **Private Blockchain:** Private blockchains are not open to the public and participation requires an invitation or permission. They provide more control over the participants and transactions.
- **Public Blockchain:** Public blockchains such as Bitcoin and Ethereum are decentralized platforms that anyone can access and participate in. They are open for anyone to join, transact on, and participate in the consensus process.
- **Satoshi Nakamoto:** A pseudonym for the individual or group of individuals who introduced the concept of Bitcoin in a 2008 paper.