Annex.

## Blockchain & Europe's Governance Transformation

**Elements for the Agenda of a European Parliament** *"Europe Governance Transformation Committee"* 

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Forward: At the beginning of each legislature, the European Parliament sets the list of committees and inter-groups. **The European Parliament should set up** a *Europe Governance Transformation Committee* which should debate annually the twin "digital transformation and sustainability transition", i.e., Blockchain & Europe's Governance **Transformation**.

This note offers a dashboard of blockchain themes which the European Parliament should review as part of the mandate of a *"Europe Governance Transformation Committee."* 

- 1. A greener and circular economy.
- 2. Public vs private blockchain (closed system).
- 3. Social equity and financial inclusion.
- 4. Regenerative Finance.
- 5. The Green Finance Taxonomy implementation by Public Banks.
- 6. The Tokenization of Assets (i.e., Carbon Credits).
- 7. Voluntary carbon market transparency.
- 8. Public procurement empowers the "sleeping giants" of the "purchasing power."
- 9. Trade and Commodity Traders.
- 10. Industries supply chain management.
- 11. Supply chain transparency.
- 12. Supply Chain Finance Management.
- 13. Investors' Environmental, Social, and Governance (ESG).
- 14. Governance and participatory democracy action plans with Decentralized Impact

Organisations (DIOs).

- 15. Revolutionize humanitarian aid and digital assets.
- 16. Digital Assets for Humanitarian Cash-based Transfers.
- 17. Dynamic informed digital consent.
- 18. Decarbonize crypto.
- 19. Cybersecurity.
- 20. Taxation of the digital economy.
- 21. The Metaverse strategy.

22. The impact of AI: Opportunities and Risks of Artificial Intelligence.

## Introduction.

It is not easy to shift a paradigm, particularly in a time of "*reshaped global world order*". The challenge is before us: how to empower citizens, how to strengthen democratic processes, how to strengthen our institutions, economic and social distribution, financial transparency, and compliance with the commitments and values that we have in Europe.

All the 17 SDGs goals could benefit from the utilization of blockchain technology and similar disruptive technologies.

Empowerment goes beyond merely retaining power; it signifies being aware of our capacity to play a meaningful role. This aspect is crucial when discussing participatory democracy, accountability, transparency, financial impact, and business management.

## 1. A greener economy

It means growth and job opportunities. Eco-design, eco-innovation, waste prevention, and reusing raw materials can bring net savings of up to €600 billion for EU businesses. Measures to increase resource productivity by 30 percent by 2030 could boost GDP by nearly 1 percent while creating 2 million new jobs. It also benefits the environment and reduces the EU's greenhouse gas emissions, according to the European Commission. However, the commission's statement on the Green Deal suggests it is also politically motivated. A circular economy is an industrial model that is intentionally regenerative. Products are designed to facilitate reuse, disassembly, restoration, and recycling to encourage the reuse of materials. Businesses keep resources in use as long as possible to obtain the maximum value, and then recover and regenerate products and materials at the end of their service lives. Shifting toward a circular economy will involve designing a new sustainable tax system for renewable and non-renewable resources. Sustainable taxation should encourage positive activities and discourage harmful activities. In a sustainable economy, taxes on renewable resources (including labor) are counterproductive and should be abandoned. The resulting loss of revenue could be made up by taxing the consumption of non-renewable resources and undesired wastes and emissions. Such a shift in taxation would promote a circular economy with local low-carbon and low-resource solutions. It would be more laborintensive than manufacturing because economies of scale in a circular economy are limited. Taxes on non-renewable resources could be charged in a similar way to today's VAT, including on imported goods. Also, not taxing labor would considerably reduce tax administration - labor tax is based on many small incomes - and reduce incentives for work in the shadow economy, which accounts for a double-digit percentage of many national GDPs. The growing importance of wind and solar energy, and the rise of electric

vehicles, are all key to the nation's growing need to reduce dependence on fossil fuels, lower carbon emissions, and mitigate climate change. But at the same time, these burgeoning renewable energy industries will soon generate tons of waste as millions of photovoltaic (PV) solar panels, wind turbines, and lithium-ion EV batteries reach the end of their respective lifecycles. Lithium-Ion batteries have been in use since the early 1990s, at first powering laptops, cell phones, and other consumer electronics, and for the past couple of decades EVs and energy storage systems. Recycling of their valuable innards — lithium, cobalt, nickel, copper — is focused on EVs, especially as automakers ramp up production, including building battery gigafactories. Players in the circular economy are determined not to let all that waste go to waste, introducing the concept of "Circular mining". (A. Lanotte, Green Finance: Sustainable Growth and the Circular Economy (TNI Sept 2021).

#### Transitioning from a linear to a circular economy.

There is no unique definition of a circular economy. The European Commission defines this concept under the EU Action Plan for the circular economy as follows: "In a circular economy, the value of products and materials is maintained for as long as possible; waste and resource use are minimized, and resources are kept within the economy when a product has reached the end of its life, to be used again and again to create further value. The circular economy (CE) is an economy in which economic activities derive value under the conditions that an existing resource stock within the system is continuously recirculated to maintain its maximum value and utility over time and fluctuations in that stock are in balance with the environment, enabling the viable and sustainable use of resources. All activities during product life cycle stages are designed to circulate the resources and support the preservation and regeneration of the biosphere so that hazardous outputs are eliminated, and regional resources are not degraded." Traditionally, economies have referred to a linear pattern of growth ("take-make-consume-dispose") assuming that resources are abundant, available, and cheap to dispose of. Instead, we need a circular model for the economy in which materials and products are reused, repaired, refurbished, and recycled. More efficient resource use will disclose new growth opportunities and job creation: increasing resource productivity by 30% by 2030 could boost GDP by 1% while creating two million new jobs. Moving towards a circular economy is at the heart of the resource efficiency agenda established under the Europe 2020 Strategy for smart, sustainable, and inclusive growth. The circular economy envisions a shift away from such a linear ("take-make-consume-dispose") model to a system where products, components, and materials are reused in new cycles, thus closing the trajectories into loops. In this system, where everything is a resource for something else, the notion of waste disappears. Circularity goes far beyond the concept of recycling. It is a complete system, involving changes in business models and product design, as well as collaboration between suppliers and customers. Because technology is constantly changing, the new paradigm of global competitiveness requires the ability to innovate rapidly. The new paradigm has brought environmental improvement and competitiveness together. It is important to use resources productively, whether those resources are natural and physical or human and capital. Environmental progress demands that companies innovate to raise resource productivity, and that is precisely what the new challenges of global competition demand. (A. Lanotte, <u>EU circular economy plans could cut</u> tax costs for companies (ITR Oct 2019).

One example of a green and circular economy is the production of Bio-ammonia. Bioammonia is manufactured from various raw materials such as corn and woody biomass. It is a colorless compound known for producing a strong odor in its gaseous form. Ammonia can be manufactured artificially through natural gas as well as naturally through biological degradation of organic matter. It is widely used in pharmaceutical, agriculture, refrigerants, textile, and various other industrial & household applications. Bio-based products require less energy. They also release less greenhouse gasses. Thus, they are expected to replace conventional ammonia overall. The Mediterranean area is extraordinarily rich in raw materials such as corn and woody biomass. In this light, the ZES - Special Economic Zones, better known as FTZs, is a "new deal" for the South of Italy which represents a strong push for investments. It is an important political and economic commitment, particularly in the Italian Next Generation EU, better known as PNRR, you will find attached a copy of the national plan prepared by me, on the part of the government which seeks to achieve equality of growth between the North and the South of Italy by encouraging both companies operating in this sector and new ones to invest in the South and so in the Mediterranean area which could be become a "strategic hub" throughout Europe, by implementing Renewable energy communities ("RES communities") linked through a blockchain. (A. Lanotte, The implementation of the Adriatic ZES in Puglia - South of Italy, the transition to renewables, and the implementation of Hydrogen Valley can create a strategic energy hub within the Mediterranean area for the whole of Europe. (Medium Sept 2022).

### **Blockchain for Scaling Climate Action**(WEF, Apr 2023).

Blockchain is one of several emerging technologies being explored to address urgent environmental issues such as biodiversity loss, disaster displacement, and energy grid deficiencies, as well as resource allocation and coordination – all critical parts of this complex, intersectional, intergenerational, and multicultural climate challenge. The defining qualities of blockchains – decentralized, open, and global – make them powerful tools that can provide breadth and depth to the current climate mitigation and adaptation efforts. Yet, as is the case with any technology, there must be consideration of the unintended consequences, technological maturity, and implementation approaches that may impact the people, communities, and natural ecosystems already facing climate inaction. Digital technologies, including blockchain, can provide an enabling infrastructure layer needed to manage (and account for) rapid increases in the speed and scale of global climate action, with integrity and efficiency programmed in from the beginning. Web 3.0 is an evolution of digital infrastructure based on design principles including decentralization, democratized access, direct ownership, open source and interoperable code, verifiability, and incentive design. Based on these new principles, companies are building solutions that integrate blockchains, consensus networks, decentralized data storage systems, privacy technologies, cryptocurrencies, non-fungible tokens (NFTs), decentralized autonomous organizations (DAOs), decentralized finance (DeFi), and ReFi protocols. Web3 systems enable users to have more control over the digital ecosystems, they are active in, as well as a financial stake. However, while blockchain is often promoted as a solution to privacy, transparency, and financial inclusion, it has created concerns about those same challenges. Guidelines for Improving Blockchain's Environmental, Social, and Economic Impact (WEF, Apr. 2023)

Climate change is one of the most pressing challenges facing the world today. Extreme weather events, biodiversity loss, infrastructure degradation, and other negative impacts on the environment and society will increase if humanity does not take effective action. Addressing this challenge requires a combination of mitigation measures, such as reducing greenhouse gas emissions, and adaptation measures, for example, preparing for and adapting to the already inevitable impacts. It is crucial that individuals, businesses, and governments all take action to address climate change to create a more sustainable future. The blockchain industry is no exception, and this report aims to help effective decisionmaking in the industry. Blockchain has the potential to revolutionize the energy sector by enabling the creation of decentralized, efficient, and secure systems for managing energy production, distribution, and consumption. Through smart contracts, blockchain can facilitate peer-to-peer trading of energy, making it easier for individuals and businesses to generate and sell renewable energy to their neighbors. This can lead to the more efficient use of renewable energy sources and reduce reliance on centralized energy providers. Additionally, blockchain can support the integration of emerging technologies such as electric vehicles and smart batteries for energy storage, providing more flexible and resilient energy systems.

## 2. Public vs private blockchain (closed system).

It is a key issue with a concern for the vulnerable and no one left behind a public blockchain is fundamentally a single consolidated source of truth significant, in the context of inclusivity and the core democratic values of Europe. The governance structures employed by EU blockchain initiatives and how they impact operations and conflicts must be reported. The European Union's blockchain strives to integrate a host of public applications, like holding citizens' digital identities and wallets, tracing and verifying goods, storing licenses to transfer between countries more easily, and more. Europe's blockchain undertaking will also provide opportunities for private innovation through startups and small and mediumsized businesses building applications on top of the infrastructure overall. (<u>European Union</u> <u>launches institution to build blockchain infrastructure across the continent</u>, June 2023).

It is important to note that blockchain technology "has the potential to both contribute to the problem of climate change and help address it", as acknowledged by the World Economic Forum (source: "Guidelines for Improving Blockchain's Environmental, Social and Economic Impact" Wef April 2023). Blockchain technology has the potential to both contribute to the problem of climate change and help address it.

Blockchain is a shared, immutable ledger that facilitates the process of recording transactions and tracking assets in a business network. An asset can be tangible (such as a house, car, cash, or land) or intangible (including intellectual property, patents, copyrights, and branding). Anything of value can be tracked and traded on a blockchain network, reducing risk, and cutting costs for all involved. Businesses run on information. The faster it is received and the more accurate it is, the better. Blockchain is an ideal information tool because it provides immediate, shared, and completely transparent information stored on an immutable ledger that only permissioned network members can access. A blockchain network can track orders, payments, accounts, production processes, and much more. And because members share a single view of the truth, they can see all details of a transaction end to end, giving them increased confidence and opening new efficiencies and opportunities. Blockchain's advantages include: 1. security; 2. the presence of a decentralized network in which smart contracts can operate to streamline and optimize processes; 3. traceability, meaning users can follow the path of each product from manufacturing to its destination market; 4. cost-effectiveness; 5. improved speed and efficiency; and 6. transparency of transactions. These advantages can help achieve interoperability between participants and allow multiple users to access the same data simultaneously. A permissionless blockchain can offer enhanced monitoring of transaction flows, which is particularly important for revenue, customs, and other regulatory agencies. The basic initial layer of the technology must be permissionless to grant access to all the stakeholders. The blockchain could, at some level, be permissioned, giving access to some stakeholders and protecting some data. In other words, anyone could access the ledger to check the correctness of transactions or see if the data entered is consistent. Because these blockchains are wide open, anyone can use them without creating any additional infrastructure. There are some notable advantages to permissionless blockchains. The speed and certainty of the technology can bring noticeable benefits to the tax administration's daily operations. It can also provide the opportunity to set indicative directions regarding the regulation and use of smart contracts. The creation of a digital single market can empower all relevant parties thanks to the implementation of a large-scale, innovative, and groundbreaking system that offers benefits in the form of fairer taxation, efficient reporting tools, transparent and streamlined information, and the capacity for precise calculation of taxes. The digital single market can be established on a blockchain-based network -

specifically, a DLT in which all the stakeholders, including revenue agencies, customs, peripheral tax offices, and other agencies, will have defined roles. Each entity will function in line with its respective field of responsibilities - for example, by giving consensus (that is, by effectively checking and monitoring the streamlined information in the digital value chain) in matters of indirect and direct taxation. Key issues include the identification and definition of the market, the access and exit points on the value chain, and the target data needed for tax purposes. Tax or other competent authorities thus receive necessary data, which is transmitted by counterparties via the blockchain. AI-run mechanisms can help collect relevant information to issue tax returns or similar acts and can eventually establish a profile of the taxpayers. Because of the resulting decentralization, the digital transformation of the public authorities may alleviate most of the tax and administrative task burdens for external stakeholders, including companies. In addition to being cost-effective and timesaving, the digital chain will bring transparency to the entire tax process while granting its users autonomy and security. Innovation companies and multinational enterprises are also moving items of value across blockchain networks. The process of tokenization - that is, converting the rights to an asset into a digital token within a blockchain, with one token representing an intangible asset or a defined portion thereof - plays a considerable role in the exchange of information. For example, the use of blockchain for issuing digital invoices allows value-embedded assets to be sent across multiple network participants, ensuring that all parties receive the same information at the same time. Everything is recorded on the distributed and decentralized ledger, which increases trust and transparency between counterparts. Lifting responsibilities from the companies that have been granted access to a public and permissioned blockchain allows both taxpayers and authorities to focus on their respective businesses and obligations. They can also anticipate their future objectives and projects by using smart contracts. (A.Lanotte, T.Fernandez-Leenknecht"Blockchain and Smart Contracts in Tax", TNI Oct 2021)

### 3. Social equity and financial inclusion.

Large-scale deployments of blockchain technologies have the potential to promote social equity and financial inclusion. Future efforts should focus on developing more scalable, highly interoperable, **net-zero-focused blockchain-based** solutions that are accessible, user-friendly, and aligned with the needs and values of diverse communities. Furthermore, international corporate tax rules are based on principles developed in the early 20th century and partially adapted over time. But they are no longer fit for purpose in today's context and are unsuitable for a globalized and digitized economy. Tax revenues are not being allocated to countries in a fair way, and harmful tax practices are allowed to continue to the detriment of public finances and fair competition. In this light developing adequate principles and rules for taxing the digital economy has become a fundamental task for the European Union and other international regulators to modernize fiscal policies and adapt them to present

and future needs. (A.Lanotte, "<u>Toward a Digital Supply Chain and a Digital Taxation</u>", TNI Jan 2023).

## 4. Regenerative finance.

ReFI seeks to create a financial system that not only sustains itself but also generates a positive social and environmental impact and DeFi which aligns with this vision by leveraging blockchain technology to build decentralized financial systems that are open, transparent, and accessible to all, holding tremendous promise in addressing inequalities and empowering underserved or underbanked populations, enabling access to a wide range of financial services such as lending, borrowing, and investment, DeFi promotes financial inclusion and equal opportunities for all. Businesses run on information. The faster it is received and the more accurate it is, the better. Blockchain is an ideal information tool because it provides immediate, shared, and completely transparent information stored on an immutable ledger. A blockchain network can track orders, payments, accounts, production processes, and much more. And because members share a single view of the truth, they can see all details of a transaction end to end, giving them increased confidence and opening new efficiencies and opportunities. This, together with some other features, creates a new digital ecosystem in which green finance can flourish. (A.Lanotte, DeFi and the future of Finance Medium Dec 2022).

# 5. <u>The Green Finance Taxonomy implementation by Public Banks.</u>

Public Banks as the EIB party to the Aarhus Convention should be monitored by a Blockchain for UN Charter Values and SDGs ecosystem. The European Investment Bank (EIB) has issued a blockchain-based digital bond powered by environmentally-incentivized node infrastructure. (EIB issues its first-ever digital Climate Awareness Bond and Swedish Krona transaction June 2023).

# 6. <u>The Tokenization of Assets (i.e., Carbon Credits).</u>

By establishing a voluntary market on which best practices in terms of virtuous ESG positions might be traded to raise funds to reinvest in the circular business models, achieve sustainability, and foster conditions for a more digital and sustainable ecosystem. Innovative companies and multinational enterprises are also moving items of value across blockchain networks. The process of tokenization converting the rights to an asset into a digital token within a blockchain, with one token representing an intangible asset or a defined portion — plays a considerable role in the exchange of information. Everything is recorded on the distributed and decentralized ledger, increasing trust and transparency between counterparts. Lifting responsibilities from the companies that have been granted access to a public and permissionless blockchain allows the entire ecosystem to focus on its respective businesses and obligations. They can also anticipate future objectives and projects by using

smart contracts (A. Lanotte, <u>The Tokenization of Assets for a Decentralized Future in</u> <u>Europe</u>, TNI Feb 2023).

### 7. <u>Voluntary carbon market transparency.</u>

Utilizing blockchain technology can contribute to transparency and accountability, ensuring that the necessary certifications and obligations are met under legal and contractual frameworks.

Technology-Neutral	Guidance/Clarifications	Dedicated, Tailor-Made Frameworks	Adapting Existing Policies
Same risk, same rules – "substance over form."	Clarity over whether and how the assets fall within regulators' remit.	"Blockchain acts." New roles/new actors.	Updating rules to cater to tokens.
European Commission U.K. Financial Conduct Authority (FCA) U.S. regulators Swiss Financial Market Supervisory Authority	German Federal Financial Supervisory Authority (BaFin) clarification on tokens. U.K. FCA's policy statement on cryptoassets. U.S. SEC's digital assets framework. European Regulation on Market for Crypto-Assets (MiCAR).	French blockchain order and digital assets providers. German draft Electronic Securities Act (eWpG-E) and crypto-securities registries. Luxembourg recognition of DLT security transfers. Liechtenstein trusted technology verifying authorities.	European Commission's update for financial rules for cryptoassets. The French Autorité des marchés financiers 2020 analysis of application of financial regulations to security tokens. Swiss DLT proposal.
<i>Data source</i> : Iota Kaousar Nass No. 19 (2021).	, "Understanding the Tokenisat	ion of Assets in Financial Market	s," Going Digital Toolkit Note

Table 1. Non-Mutually Exclusive Approaches

# Table 1 source: (A. Lanotte, <u>The Tokenization of Assets for a Decentralized Future in</u><u>Europe</u>, TNI Feb 2023).

Emissions trading systems (ETS) have proven to be an effective and efficient form of carbon pricing and are an important climate policy instrument, with the ability to mitigate climate change on a large scale. Achieving the Paris Agreement climate targets will require the widespread use of carbon pricing. An ETS caps and reduces emissions through tradable allowances that induce emissions reductions at the lowest total cost to society. The most potent tool in combating climate change is a price on carbon and the use of advanced technology such as blockchain and AI (machine learning) to shape virtuous and more sustainable circular business models.

Market Elements	ETS Carbon Markets	International Carbon Markets	Voluntary Carbon Markets
Description	Mandatory participation for large emitters. Some allow limited amount of international Clean Development Mechanism credits.	The Clean Development Mechanism was the first major international market under the Kyoto Protocol. Emissions reductions transferred across countries.	Independent markets for non- regulated entities to voluntarily reduce emissions. Variety of industry-created standards.
Status	Covers 8% of global emissions, growing to 14% with the launch of the China ETS.	Large market, currently stagnating. Article 6 of the Paris Agreement aims to reignite international markets.	Mainly used for corporate social responsibility activities. Attractive for small projects.
Regulation	Highly regulated, with robust monitoring, reporting, and verification.	U.Nrecognized accounting methods, such as gold-standard accounting.	Low to no regulation, different accounting methods with varying degrees of rigor.
Liquidity	Highly liquid. In 2018 more than \$200 billion traded in the Western Climate Initiative and Regional Greenhouse Gas Initiative, and EU ETS.	Medium liquidity. Average of \$14 billion traded per year since 2006.	Low liquidity. In 2018 nearly \$300 million traded.
Carbon prices	Range from \$5.70 to \$31.50/ metric ton of carbon dioxide- equivalent emissions (tCO <sub>2</sub> e).	Range from \$0.20 to \$0.40/tCO <sub>2</sub> e.	Range from \$0.10 to \$70/tCO <sub>2</sub> e.

## Table 2. Three Types of Carbon Markets

# Table 2 source: (A. Lanotte, <u>The Tokenization of Assets for a Decentralized Future in Europe</u>, TNI Feb 2023).

The twin green and digital transformations are a key priorities. To realize the green potential, digital technologies need investment and legislation that encourages them to flourish. For this to happen, important world events like the annual World Economic Forum in Davos, Switzerland, or the 2023 U.N. Climate Change Conference, The 28th session of the Conference of the Parties (COP 28) to the U.N. Framework Convention on Climate Change will convene from November 30 to December 13 in Dubai, must look at digital and climate action together, rather than as separate policy areas.

## 8. Empower the "sleeping giants" of the "purchasing power."

The Commission should provide a strategy for Blockchain & Public Procurement.

# 9. Overview of Trade & Business.

Commodity Traders are the last bastion of wild capitalism and Multinationals and banks are already very present in the field of trading and shipping platforms.



### 10. Industries supply chain management.

Labor exploitation and environmental degradation can be addressed through greater traceability and accountability provided by blockchain. By being part of the blockchain network, trade unions can gain insights into what is happening within employment relationships. This access to information empowers associations to fulfill their roles effectively and advocate for the rights and interests of workers. Blockchain and smart contracts have interesting characteristics to cope with the industrial transition to a circular economy. Blockchain is useful to address informational challenges, for example, the recording and traceability of production loops in multi-tiered supply chains while smart contracts can automate certain processes. It is known that a blockchain is useful in the realtime tracking of items in traditional supply chains. In the case of a circular economy, blockchain can be a useful tool for organizing, analyzing, and managing complex networks in reverse logistics, that is, the tracing of outputs that become inputs for recycling or remanufacturing processes (Wang et al., 2020). Table 1 summarizes areas where blockchain functions as an essential technological tool for circular supply chain management. The circular economy is highly dependent on technological innovation coupled with organizational and social change. Moreover, the amount of information required for every circular process increases to the point that information becomes a relevant cost, if not the most relevant one. Therefore, the European Union considers legislative and innovation hubs to mobilize the potential of digitalization of product information and facilitate the screening of green solutions via digital passports, tagging, and watermarks. In addition to that, the European Union is promoting using digital technologies for tracking, tracing, and mapping resources (European Commission, 2020a). In the same vein, consumers also require trustworthy and accurate information to select reusable, durable, and repairable products; and to authenticate if the products they are acquiring are compliant with the circular economy. The circular economy involves numerous stakeholders, for instance, companies, innovators, academia, and policymakers. Each actor defines the roadmap and contribution to climate neutrality while searching to occupy a leadership position. For the above reasons, the information in the circular economy should flow organically and systemically. In a circular economy, the centralization of data collection, data processing, and data sharing would represent an obstacle to efficiency. Information in silos could make it very cumbersome to discern who needs what. The above reasons make a sound case for distributed ledger technologies, such as blockchain. Unlike traditional databases, blockchains do not record data using central controllers. Instead, blockchains are distributed ledgers that decentralize permanent digital records or transactions. In a blockchain, data entries are stored across nodes in a network, rather than in a specific location. The transactions append to a tamper-proof time-stamped block. Blockchain uses cryptographic methods and incentivized consensus to create trust between nodes in the network such that when transactions are added to a block and validated by the network, every node maintains an identical copy of the blockchain (EBSI, 2021), relieving the need to rely on centralized controllers. (A.Lanotte - M.Carmona, Harnessing Blockchain and Decentralized Finance in the Post-COVID-19 European Union: The Case of the Circular Economy IGI Global June 2022).

Blockchain and smart contracts have essential characteristics to cope with the industrial transition to a circular economy. Blockchain is useful in addressing data challenges (for example, the recording and traceability of production loops in multi-tiered supply chains), while smart contracts can automate important processes. Blockchain can be used to track items in traditional supply chains in real time. In a circular economy, blockchain can be used to organize, analyze, and manage complex networks in reverse logistics – that is, the tracing of outputs that become inputs for recycling or remanufacturing processes (Wang et al., 2020). Some examples of live projects that are already providing similar innovative solutions include <u>Real Items</u>, the largest Web3 platform for tracing products across all stages of the supply chain, with more than 11.5 million products already on-chain, as well as the Recycle-to-Earn blockchain protocol created by the <u>Zero Waste Foundation</u>, which aims to establish the decentralized incentive structure needed to achieve high-performance recycling on a global scale. (source: "Blockchain for climate action" European Commission).

Key areas of applying block chain	Traditional supply chains	Circular economy supply chains
Reducing the costs of checking financial flows	$\checkmark$	$\checkmark$
Increase speed in physical interactions and communications	$\checkmark$	~
Risk control of data	$\checkmark$	~
Better resource management reducing waste	$\checkmark$	~
Identification of suppliers, trace and benchmark supplier performance	~	~
Procurement: tracking of the life cycle of products	$\checkmark$	~
Audit operations	$\checkmark$	~
Material management in the logistics process	$\checkmark$	~
Reverse logistics: obtain accurate information about the time, location, quality and conditions of materials, products and waste for recycling, refurbishment, re-use, etc.		~
Green product management: monitor products to measure greenhouse gas emissions, allow customers to differentiate between green products and non-green products.		~
Reusing waste across different circular supply chains		$\checkmark$

Table 1: Blockchain and product tokenization in a circular economy. source: selfelaborated based on Wang et al. (2020) and Narayan & Tidström (2020).

### 11. Supply Chain Transparency.

The United Nations Economic Commission for Europe (UNECE) has also highlighted the potential use of blockchain technology to improve supply chain transparency, facilitate maritime trade which accounts for over 80 percent of global trade by volume, manage road transport, and so on (UNECE, 2020). The goal is to provide valid and actual support to all the relevant stakeholders. As well as mathematical and statistical tools to evaluate the needs in terms of imminent cash flow throughout the supply chain. But most importantly, to forecast solid plans of credit in case of future material investments. Utilizing blockchain technology allows for greater trade accuracy and a shorter settlement process. Today, we have commercial banks, payment institutions (such as Swift), investment banks, hedge funds, private equity, and a host of others. They all carry out various functions. For example, providing businesses with access to capital, underwriting deals, holding deposits, lending money, confirming transactions both, and exchanges, etc. Blockchain will solve identity management issues, and smart contracts will streamline the process. Blockchain can also improve the real-time visibility of the transaction to institute regulatory and customs oversight. Supply chain management involves the flow of goods and products from the initial stage to the final stage. Being a major part of many industries, the proper functioning of a supply chain is crucial for businesses. Supply chain management is not a one-person job to do and thus, there are different entities that are taking part. Smart contracts in the supply chain can record ownership rights while the products are transferred through the supply chain. Everyone in the network can track the location of the product at any given time. The final product can be checked at each stage throughout the delivery process until it reaches the end customer. If an item is lost in, the process, smart contracts can be used to detect its exact location. Moreover, if any stakeholder fails to meet the contract terms, it would be transparent for the entire system to see. Smart contracts bring transparency to the overall supply chain system. In addition, smart contracts have certain advantages for many industry sectors. For example, reducing overhead costs, providing transparency, and saving time. While they are more reliable, secure, efficient, and trustworthy as compared to paper contracts, care needs to be taken to avoid the risks of code corruption.

Table 5.			
Building blockchain portals in	trade facilitation for	key	stakeholders

Key stakeholders	Sector	Key technical design needs	
National Customs	Public	Interactive portal for:	
		Data authentication	
		Trade valuation	
		<ul> <li>Payment processing</li> </ul>	
		<ul> <li>Notification alerts to/from other agencies</li> </ul>	
Agriculture authority	Public	Interactive portal for sanitary and phytosanitary certification and validation	
Ministry of Trade	Public	A portal for approval/authentication of trade information	
Health authority	Public	Interactive interface for sanitary and phytosanitary certification and authentication	
Standards authority	Public	A portal for delivery of authorizations, dassifications and tariff line verification	
Revenue authority	Public	A portal for tariff lines, receipt and processing of payments, alerts to other agencies	
Shipping agencies	Private	A communication and authentication portal to traders, forwarders, bankers and authorities	
Banking institutions	Private	A payment processing and communication portal to traders and other stakeholders	
Clearance/forwarding agencies	Private	A verification portal for trader-specific data, real time trade flow, tracking of consignments and declarations	
Traders	Private	A portal for access to service providers, payment processing, consignment tracking, self-declarations, certifications and credentials, and notifications alert system	

Source: UNCTAD.

# Table 3 source: "Global Report on Blockchain and its Implications on Trade Facilitation Performance", UNCTAD June 2023

### 12. Supply Chain Finance Management.

The most considerable application of blockchain, in the form of a distributed ledger technology (DLT), has the potential to transform well-established financial institutions and bring lower costs, faster execution of transactions, improved transparency, auditability of

operations, and other benefits. Particularly relevant will be the disruption of payments for banks, as well as for customers, by reducing the cost and time taken to transfer money1. Blockchain is set to impact the world's financial sector. The technology is ready to allow faster and more cost-effective processing of financial transactions. This is done through a decentralized, distributed ledger that grants its users with autonomy, and security. The power of eliminating intermediaries is the ability to lower transaction costs and take back control from powerful financial intermediaries. Blockchain has the potential to displace any business activity built on transactions occurring on traditional corporate databases. Which is what underlying every financial service function. Any financial operation that has low transparency and limited traceability is thus vulnerable to disruption by blockchain applications. For all these reasons, fintech is a new industry leveraging technology to improve activities in finance. With a focus on a more accessible service to the public.

**Supply Chain Finance**, on the other hand, is one of the most revolutionary tools available to the fintech industry. Its main contribution is the simplification of the integration of physical and financial flows. This is due to blockchain technology and IoT. As well as the automation of the process, leveraging artificial intelligence (AI) and Big Data Analytics. Furthermore, these technologies can help reduce many supply chain financial risks. Among them, we can find operational risks. For instance, the risk of double financing or the risk of not obtaining the desired output. As well as acting as a real propulsion engine for all the operational aspects. Governments, financial services companies, and fintech startups form an ecosystem. All the participants of this ecosystem face different challenges and opportunities. Which allows for a more dynamic and complex landscape along with its continuous evolution. In addition, the financial service industry is moving from the exploration phase to the application phase. It is therefore particularly important for financial institutions and experts to understand the role of disruptive technologies, to take advantage of this financial revolution.

The application of blockchain, in the form of a distributed ledger technology (DLT), has the potential to transform well-established financial institutions and tax administrations by simplifying complex processes such as annual tax returns, VAT/GST, immovable property sales taxes, including the introduction of a Digital Euro, ensuring faster execution of transactions, improved transparency, auditability of operations, and possibly lowering costs (after a first implementation phase). It is therefore high time for the EU to create the conditions for a "Digital Single Market," as a corollary, with "decentralized" responsibilities. The "Digital Single Market" can be established on a blockchain-based network, a public "permissioned" distributed ledger, in which all the stakeholders, in particular Revenue Agencies, Customs, peripheral tax offices, and agencies or similar will have a defined role. Each entity will function according to their respective fields of responsibilities, for example by giving consensus, in other words by effectively checking and monitoring the information streamlining throughout the "Digital Value Chain," in matters

of indirect and direct taxation. Tax or other competent authorities the necessary information to proceed is thus transmitted. AI-run mechanisms may help collect relevant information to issue tax returns or similar acts. And eventually, establish a profile of the taxpayer. The Digital Transformation of Public Authorities may lift most of the tax and administrative task burdens for external stakeholders such as companies. That is considering the "decentralization" and "tokenization" of the process. The digital chain of events will bring transparency to the entire process while granting its users autonomy and security. That is in addition to cost-effectiveness and time-saving.

**Supply Chain Finance** is the set of solutions that allows a company to finance its working capital, leveraging not only its economic, financial, or business characteristics but also the role it plays within the supply chain in which it operates (production chain). Some examples of SCF are listed as follows:

- Advanced Reverse Factoring (ARF) (with platform): like Reverse Factoring, it is based on the opportunity for suppliers to have their invoices paid exponentially quicker (approximately 7-10 days) and at cheaper rates, as suppliers receive liquidity at a cost commensurate with the risk of the buyer, who presents the suppliers to the financial institution. The innovation of the ARF is the fact that the disbursement of the credit takes place in the presence of more operational information (e.g., data on the operational performance or sustainability of the suppliers), against a lower risk and a consequent reduction in the cost of the loan. It is based on a technological platform where electronic invoices form the mainstream of digital information flows. It is on a permissioned blockchain, in which relevant stakeholders can monitor the entire process. And where smart contracts are enabled. The electronic invoices are relating to the customer-supplier relationship transaction and allow the supplier to select which invoices to discount.
- **Inventory Finance**: traditionally, it refers to the short-term financing of stocks through a credit line. More recently, solutions are also identified as Inventory Finance, in which a Logistics Service Provider purchases goods from a supplier. It is often in partnership with a financial institution. It owns the goods for the duration of transport and storage. That is optimizing trade receivables and payables of the supplier and his customer.
- **Dynamic Discount**: a technological solution that allows the customer to pay in advance for a discount by the supplier on the invoice amount proportional to the days in advance, dynamically agreed upon for each transaction. Payments can be brokered by financial providers.
- **Invoice Auction**: a "marketplace" for the advance invoice based on a technological platform that allows third parties with available funds (financial institutions, companies, and individual investors) to invest in invoices issued by companies, according to an auction mechanism between several buyers.

• **Purchase Finance**: conceptual extension of the Invoice Discount (advance invoice) to all documents that belong to the Order Cycle and that precede invoicing (on all, Purchase Orders, Order Confirmations, or Transport Documents and Shipping Notices).

# (A.Lanotte - L.Savastano, "<u>Will Supply Chain Evolve with the Digital Disruption?</u>" Fintech Review Sept 2021).

## 13. Environmental, Social, and Governance (ESG).

This is a set of criteria that investors use to evaluate companies' sustainability performance, including their impact on the environment, society, and governance practices. In recent years, the importance of ESG has grown as concerns about sustainability and social responsibility have increased. At the same time, blockchain technology has emerged as a promising tool for ESG reporting, providing a secure and transparent way to store and share data. By integrating blockchain into ESG reporting, companies can enhance their credibility and transparency, and investors can make more informed decisions. The complexity of global supply chains often compounds the difficulty of monitoring and collecting this data. Fortunately, blockchain technology offers a promising solution to this challenge, providing an immutable and trustworthy system of record-keeping that can significantly enhance sustainability reporting. There are three primary applications of blockchain technology for ESG reporting:

- Firstly, blockchain serves as a gateway for collecting data from various sources, such as digital identity tools and Internet-of-Things sensors, which can facilitate secure and transparent data transfer to the blockchain network. Sensitive data can also be protected using one-way encryption.
- Secondly, smart contracts can be used for periodic audits, automating the process of verifying that the reported data matches the data stored on the blockchain. This feature can also be used to automate inventory management, resource replenishment, billing, and data exchange.
- Thirdly, blockchain-based tokenization can be used to track items in the supply chain to their origin, enabling real-time detection of bottlenecks and ESG mismatches.

By leveraging these tools, companies can significantly enhance their ESG reporting capabilities, and demonstrate their commitment to sustainability and transparency.

According to the European Environmental Agency, a circular economy is a part of the green economy that more widely addresses human welfare, lifestyles, and consumption models. Since 1900, the world's population has quadrupled. Resource consumption has grown by a factor of 10 and is expected to double by 2030 (source: "Global Material Resources Outlook to 2060 Economic drivers and environmental consequences", OECD Feb 2019).

#### The Sustainable Grid

Environmental	Social	Governance
<ul> <li>Mitigation of and adaptation to climate change.</li> <li>Water and marine resources.</li> <li>Resource use and circular economy.</li> <li>Pollution.</li> <li>Biodiversity and ecosystems.</li> </ul>	<ul> <li>Equal opportunities, access to the labor market, gender equality, and disability.</li> <li>Working conditions, including wages, social dialogue, and work-life balance.</li> <li>Human rights, fundamental freedoms, and democratic principles, with reference to the International Bill of Human Rights.</li> <li>Adequate or equal presence of women in management positions (boards of directors) and during meetings (webinars, Zoominars).</li> </ul>	<ul> <li>The role of administrative, management, and control bodies.</li> <li>Ethics and corporate culture, including the fight against corruption.</li> <li>Political commitments and lobbying activities.</li> <li>Management of relations with business partners.</li> <li>Internal control and risk management.</li> </ul>

Source: A.Lanotte – Tax Notes International (US): "Green Finance: Sustainable Growth And the Circular Economy"

#### 14. Governance and participatory democracy action plans.

They should be revisited with Decentralized Impact Organizations (DIOs) built on Decentralized Cooperation Organizations (DAOs) and Regenerative Finance (ReFi) for impact verification, staked commitments & collective action concerning the climate crisis, and the management of the commons. (A.Lanotte, <u>The DAO: Decentralised Autonomous</u> <u>Organisation</u> Medium, July 2022).

#### 15. <u>Revolutionize humanitarian aid and digital assets.</u>

Humanitarian aid could be more efficient, accountable, and inclusive addressing digital literacy and the ongoing digital technology divide. Blockchain technology can play a key role in creating a more inclusive and accessible education ecosystem by providing decentralized and transparent learning records. This can help bridge the skills gap and improve the employability of individuals, particularly those from underserved communities. Blockchain presents opportunities for new job roles in blockchain development, smart contract auditing, and decentralized application creation. It is essential to consider the social and economic impact of reskilling and upskilling programs to ensure a smooth transition for marginalized individuals.

### 16. Digital Assets for Humanitarian Cash-based Transfers.

Analysis should be made on the potential benefits provided to CBT beneficiaries which could include mitigating challenges of local currency instability, privacy protection, and by-passing expensive international monetary transfers, as well as improving access to financial services to the unbanked or underbanked.

## 17. Dynamic informed digital consent.

This is another critical consideration in the context of blockchain-based solutions. Blockchain technology can provide individuals with greater control over their personal data, enabling them to manage and share their data transparently and ethically. This can be achieved by using smart contracts and other blockchain-based tools to enable individuals to specify the terms and conditions under which their data is shared. A digital ID would give citizens a personal wallet with which they can access public services. The legislation includes zero-knowledge-proof technology, which reveals only the necessary data in a transaction, to protect users' privacy. The electronic identification and trust services 2 (eIDAS 2) regulation needs to be future-proof and able to support the societal and economic developments that have emerged in recent years. Among them is the concept of electronic ledgers that provide an innovative addition to the trust service landscape. See International Association for Trusted Blockchain Applications, "Open Letter for the Preservation of the Electronic Ledger's Provisions in eIDAS 2" (Mar. 13, 2023). (A. Lanotte, MiCA Leads the EU Digital Market's Growing Presence (TNI, June 2023).

A zero-knowledge protocol ("**ZKP**") is a method by which one party (**the prover**) can prove to another party (the verifier) that something is true, without revealing any information apart from the fact that this specific statement is true. In this light Web 3.0 will become a humancentric Trust Machine. An open and decentralized gate to Metaverse, publicly accessible and in some cases privately designed in which tokens will represent the main keys to access it and interact producing a social economic and political impact (see point 21: The Metaverse strategy). Zero Knowledge Proofs have transformative implications for privacy and security in the digital world. They can validate statements without sharing sensitive information, revolutionizing fields like cryptocurrencies, data privacy, and identity management. The core concept here is knowledge without disclosure. Zero-knowledge technology is a subset of cryptography that is helping blockchain projects overcome the scaling and privacy limitations inherent to many layer-1 blockchains. The technology enables blockchain projects to facilitate greater transaction throughput, protect user data while still being able to verify identities, and support complex computation, while also allowing enterprises to adopt blockchain technology while protecting their intellectual property. (A. Lanotte, The Tokenization of Assets for a Decentralized Future in Europe, TNI Feb 2023).

## 18. Decarbonize crypto.

The Europeans should join the Crypto Climate Accord, initiated in 2021 by Energy Web, the Rocky Mountain Institute (RMI), and the promoter of fair financial systems Alliance for Innovative Regulation (AIR). The EU Market in Crypto-Assets (MiCA) regulation is a game changer for the EU crypto-assets sector. With the entry into force of MiCA, unregulated offshore companies will no longer be able to target EU consumers. MiCA-regulated crypto

asset firms will gain significant EU market share over their unregulated offshore competitors. Crypto-asset regulatory clarity amid global uncertainty could attract capital, talent, and companies wanting to launch the tokenization process. This emerging industry could become an opportunity for the economic and technological revival of the EU. (A. Lanotte, <u>MiCA Leads the EU Digital Market's Growing Presence</u> (TNI, June 2023).

#### 19. Cybersecurity.

Despite the release of the code as open source understanding the subtleties of sophisticated cryptographic primitives and the complexity of consensus algorithms are far from trivial tasks even for experts. Therefore, developing approaches that allow for the exhaustive auditing of such systems by the involved stakeholders and increase the awareness of the trust assumptions for the largest possible audience of stakeholders, including end users, is crucial to promote acceptance and ripe the benefits of Blockchain solutions.

#### 20. Taxation and the digital economy.

Because of the digitization of the economy, changes to the rules on the distribution of taxing rights must be coordinated globally to harness the benefits of globalization with proper and effective governance and rules. Solutions must result from an international agreement including as many tax authorities as possible. Also, the varying effect of the new rules on smaller and bigger member states should be duly considered. Businesses run on information. The faster it is received and the more accurate it is, the better. Blockchain is an ideal information tool because it provides immediate, shared, and completely transparent information stored on an immutable ledger. There is no going back on the global economy's digital transformation. The digital world is constantly evolving, and it is up to us to evolve with it. To realize this green potential, digital technologies need investment and legislation that encourages them to flourish. Europe, therefore, needs to step up its digitalization efforts - such as boosting connectivity and increasing funding for research and development. For this to happen, Europe must look at digital and climate action together, rather than separate policy areas. The implementation of a "Recovery and Resilience Facility for Energy Transition" will also be crucial to give a big impetus to important investments and reforms. The European Union has, so far, responded forcefully to the economic crisis brought about by the pandemic event and the war in Ukraine. The role of the European Central Bank has been crucial in buying public debt bonds and also exceptional national fiscal stimulus measures have been complemented by unprecedented action at the EU level, to provide important support to the vulnerable member states, opening up a broad space for some incoming fiscal reforms on a more union basis instead of individual measures. For example, "renewable energy communities (RES communities)" are a growing and extraordinarily multifaceted phenomenon that involves a range of activities around renewable energy (notably, production, supply, distribution, sharing, and consumption) collectively conducted by citizens, often in partnership with small and medium enterprises and local public authorities. The Clean Energy Package (CEP) is expected to represent a turning point for the development and diffusion of RES communities in Europe, as for the first time both their very existence and their potential role in the energy transition receive legal recognition at the EU level. In this direction, a renewed fiscal framework would be more effective if complemented with spending reviews and better public investment management systems that also contribute to increasing high-quality public investments. The REPowerEU Plan can respond to this ambition, through energy savings, diversification of energy supplies, and accelerated roll-out of renewable energy to replace fossil fuels in homes, industry, and power generation. The Recovery and Resilience Facility (RRF) is at the heart of the REPowerEU Plan, supporting coordinated planning and financing of cross-border and national infrastructure as well as energy projects and reforms. (A.Lanotte, Toward a Digital Supply Chain and a Digital Taxation (TNI, Jan 2023).

For taxation of the digital economy to work, the introduction of a digital approach to tax is necessary. This calls for more unified actions to address the fragmented, uncoordinated taxation systems in various authorities and respond to the actions that companies may take to reduce their tax base and transfer profits to countries with lower taxation. The creation of a digital single market can empower all relevant parties thanks to the implementation of a large-scale, innovative, and ground-breaking system that offers benefits in the form of fairer taxation, efficient reporting tools, transparent and streamlined information, and the capacity for precise calculation of taxes. The digital single market can be established on a blockchain-based network - specifically, a DLT, in which all the stakeholders, including revenue agencies, customs, peripheral tax offices, and other agencies, will have defined roles. Each entity will function in line with its respective field of responsibilities - for example, by giving consensus (that is, by effectively checking and monitoring the streamlined information in the Digital Value Chain) in matters of indirect and direct taxation. Key issues include the identification and definition of the market, the access and exit points on the value chain, and the target data needed for tax purposes. Tax or other competent authorities thus receive necessary data, which is transmitted by counterparties via the blockchain. AI-run mechanisms can help collect relevant information to issue tax returns or similar acts and can eventually establish a profile of the taxpayers. Because of the resulting decentralization, the digital transformation of the public authorities may alleviate most of the tax and administrative task burdens for external stakeholders, including companies. In addition to being cost-effective and time-saving, the digital chain will bring transparency to the entire tax process while granting its users autonomy and security. For example, the use of blockchain for issuing digital invoices allows value-embedded assets to be sent across multiple network participants, ensuring that all parties receive the same information at the same time. Everything is recorded on the distributed and decentralized ledger, which increases trust and transparency between counterparts. Businesses run on information. The faster it is received and the more accurate it is, the better. Blockchain is an ideal information tool because it provides immediate, shared, and completely transparent

information stored on an immutable ledger. One of the most relevant aspects of this "extraordinary" emergency period is the importance of digital transformation. There is no going back. The digital world is constantly evolving, and it is up to us to change with it. We need to get used to physical distancing without losing social connection. It is time to facilitate the so-called "**digital transformation**." The opportunity is there to make leaner, faster, more effective, and more efficient physical infrastructures not only through digital ones but also through new communication paths that can make the administrative machine less physical but more present for the citizen. The future implementation of modern technologies will lead us towards a simpler, more linear, and sustainable world, enabling people to live their lives in a different, paradoxically more inclusive way, and minimize the anguish of bureaucratic and regulatory practices, in a revolutionary way. Some examples of the use of the digital platform are listed as follows:

- Certification and notarization of administrative processes and document management processes to ensure transparency and traceability toward citizens and the main stakeholders.
- Creation of NFTs to ensure the uniqueness of documents, physical and digital assets; for example, it could be used to manage the uniqueness of a patent or to protect any type of digital content with benefits for both the PA and citizens.
- Creation of a digital ecosystem via eIDAS. "eIDAS" stands for "electronic identification and trust services." It refers to a range of services that include verifying the identity of individuals and businesses online and verifying the authenticity of electronic documents. The eIDAS Regulation is Regulation (EU) 910/2014 on electronic identification and trust services for electronic transactions in the internal market - The Eu Digital Single Market. Under eIDAS, the legislation includes zeroknowledge-proof technology, which reveals only the necessary data in a transaction, to protect users' privacy. The electronic identification and trust services 2 (eIDAS 2) regulation needs to be future-proof and able to support the societal and economic developments that have emerged in recent years. Among them is the concept of electronic ledgers that provide an innovative addition to the trust service landscape. See International Association for Trusted Blockchain Applications, "Open Letter for the Preservation of the Electronic Ledger's Provisions in eIDAS 2" (Mar. 13, 2023). Citizens and businesses can use their native eIDs when accessing public services within other EU Member States that use eIDs. This regulation defines the conditions under which the Member States will recognize electronic identification from users. Additionally, this regulation implements standards for electronic signatures, time stamps, electronic seals, and other proof of authentication, including electronic certification and registered delivery services that give those electronic transactions the same legal status as if they were conducted on paper.

(A. Lanotte, "Impact Finance: The Twin Green Transition and Digital Transformation will be driven by the new Stability and Growth Pact in Europe and trigger the future European Fiscal Union." Medium, Jan 2023).

## 21. The Metaverse strategy.

It holds the promise of substantial reductions in carbon emissions, whether through the substitution of physical goods with digital ones, replacing real-world presence with virtual interactions, or digital twins that will help us optimize the physical world — from the planet to individual humans. The immersive nature of metaverse experiences could also help overcome our behavioral barriers to climate action.

The term "**Metaverse**" is a combination of "**meta**" meaning "**virtual**, **transcendence**" and "**verse**" a back-formation from the "**universe**." The Acceleration Studies Foundation (ASF), a non-profit technology research organization, classified the Metaverse into the following four categories: a virtual world that experiences a flawless virtual story, a mirror world that reflects the current real world, an augmented reality that shows a mixture of augmented information in the real world and life logging, which captures and stores everyday information about people and things.



Figure 1. Relationship between the real world and the Metaverse.

Political, economic, social, and cultural interactions appear in the Metaverse, which mimics the real world. Figure 1 shows the process of interworking and convergence between the real world and the Metaverse. The Metaverse expresses an alternative world that cannot be achieved well in the real world. The Metaverse is a powerful mix of blockchain-based and other innovative technologies that are converging to give birth to a new iteration of the internet, known as Web3, which promises to decentralize and disintermediate the current Web2 internet, making it easier to create a shared, persistent, three-dimensional virtual world. An open Metaverse is decentralized, allows users to control identity, enforces property rights, aligns incentives, and ensures value accrues to users (not platforms). An open Metaverse is also transparent, permissionless, interoperable, and composable (others can freely build within and across Metaverses), among other criteria. After the fourth industrial revolution, the virtual world has grown rapidly. The real thing has been converted into data from the virtual world, and the virtual world has even played a role in leading the real world. Here, we have a question about the reliability of data about whether the real thing is becoming data accurately in the virtual world. In the virtual world, trust technology is emerging as a critical issue. We can think of blockchain as one of these trust technologies.

Blockchain Potential in AI

Blockchain 1.0	Blockchain 2.0	Blockchain 3.0
Crypto currency, Currency transfer, Remittance. Digital payment system	Smart contract, Decentralized autonomous organization(DAO), Stock, Bonds, Loans, Mortgages, Smart property	Government, Public, Science Health, Culture, Art, IoT, Big Data, AI

Table 1.

Blockchain paradigm evolution direction.

- Blockchain is developing and evolving as shown in Table 1. Blockchain 1.0 was a period of innovation in the financial system with the advent of Bitcoin. Bitcoin is meaningful in that it attempts a single global financial system based on decentralization and decentralization, which are the core values of blockchain.
- Blockchain 2.0 is a period of contract automation centered on Ethereum smart contracts. It made it possible to execute contracts with legal effect online only with computer code without a transaction intermediary. It is a period that showed the potential for development as an online trading platform.
- Blockchain 3.0 is the stage in which blockchain technology is spread and applied to various industries. To solve the problems of the previous blockchain, technological improvements such as changes in consensus algorithms, improvement of transaction processing speed, and in-house decision-making functions are being made [10]. While it is expected that artificial intelligence will be applied to more expanded fields in Blockchain 3.0, more various applications of blockchain and artificial intelligence are expected to appear in the Metaverse environment. (A. Lanotte, "A DECENTRALIZED EDUCATION IS THE KEY FOR THE FUTURE SUCCESS" Medium, Aug. 22).

### 22. The impact of AI.

**Opportunities and Risks of Artificial Intelligence**. Artificial intelligence is radically changing the way people interact with money. Everyone can benefit from the application of

this technology. Not only financial institutions, but also bank clients and investors. Artificial Intelligence is about to have a strong impact on the financial sector and especially on the Fintech sector, greatly increasing the benefits of the use of technology and consequently the number of users, for example the so called "unbanked people". Fintech, in fact, is about to have a significant impact on society, both in terms of the way financial services are provided and in terms of the economy at large. To this must be added the activity of digital payments and money transfers. Fintech has already had a big impact on the way people make payments and money transfers and this trend is set to continue (e.g., mobile banking and peer-to-peer payment platforms).



source: "Characteristics of a digital ecosystem".

And finally, **Blockchain and cryptocurrencies**. Blockchain technology and cryptocurrencies have the potential to revolutionise the financial sector and we can expect to see further innovations in this area in the coming years. Indeed, blockchain technology is set to impact the financial sector globally. It, in its architecture, is poised to enable faster and more convenient processing of financial transactions. Supply chain finance, for example, is one of the most revolutionary tools available to the financial industry, especially the fintech industry. Its main contribution is to simplify the integration of physical and financial flows. This is due to Blockchain technology and IoT. So is the automation of the process, leveraging artificial intelligence (AI) and Big Data Analytics. In addition, these technologies can help

reduce many financial risks in the better-known supply chain. Among these, we can find operational risks. For example, the risk of double financing or the risk of not getting the desired output. Governments (regulators), companies (MNEs and SMEs), especially those that are highly automated, and fintech start-ups form an ecosystem. All participants in this ecosystem face different challenges and opportunities. This makes the landscape more dynamic and complex, as well as constantly evolving. Businesses can facilitate the exchange of non-sensitive data to create algorithms "digital twins" capable, through the use of AI, typically machine learnings, of profiling not only users, but so-called "best practices" that can develop and grow the "digital" ecosystem (regulatory sandbox) in which regulators, fintech companies and SMEs operate to reduce capital procurement costs, reduce legal uncertainty, via smart contracts, and support faster and more immediate "flow" of financial funding, the "working capital" to businesses.

It is, therefore, very important for financial institutions and experts to understand the role of disruptive technologies to benefit from this financial revolution. The creation of a digital ecosystem through a **ZKP system** (see point 17) refers to a range of services that include verifying the identity of individuals, through AI tools, and online businesses and verifying the authenticity of electronic documents. (A. Lanotte, "<u>The impact of AI : Opportunities</u> and Risks of Artificial Intelligence in Finance." Medium, Apr. 2023).