FINTECH AS A TOOL TO FINANCE CLIMATE-NEUTRAL CITIES

Index

Introduction

Sustainable finance and more specifically, climate-related finance gained increased importance. Climate change is having the disruptive effects of an economic crisis, just like the "Great Recession" of 2007. The temperature increase caused by CO2 emissions and the subsequent catastrophic changing in the environment represents a major threat to humankind not only from an environmental aspect but also from an economic one. Constant drought and floods cripple the production of the primary sector, weaken agricultural holdings, and cause major damage to infrastructures, creating a waterfall effect that directly strikes a nation's economic resources. The damage caused to the real economy affects the financial system creating defaulting debtors, and damaging banks and insurance companies. In the context of decarbonization policies and implementation of sustainable economies, coordination of Central Banks is a key factor in giving economic and financial stability (for example initiatives like "Network for Greening the Financial System[1]" aims to share experiences and best practices for the management of the climate risk in the financial system). According to the intent behind "green deal[2]" and the implementation of a "just transition mechanism", the first methodology for reaching the objectives of climate neutrality is the rightful implementation of a green economy. "Money moves the world" and for bringing a real change economy needs to be changed accordingly. EU union is moving in that direction in the financial market with responsible investments issuing green bonds[3] and aiming at a smart cities marketplace creating a network between public and private sectors4. The most recent and ambitious plan was announced. On 28 April 2022, when the Commission picked 100 participating cities that will receive the Commission's support in achieving the goal of Climate-Neutral and Smart Cities by 2030[5.] to reach climate neutrality we need to look at implementing new technologies that can speed the decarbonization process, create stable

[1]NGFS Official Site: https://www.ngfs.net/en
[2]European Commission, "A European Green Deal Striving to be the first climate-neutral continen" [Online] https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en
[3]European Commission website (2013). "EIB launches largest EUR Climate Awareness Bond (CAB) ever" [Online] https://ec.europa.eu/commission/presscorner/detail/en/BEI_13_109
[4]European Commission, "Smart cities Cities using technological solutions to improve the management and efficiency of the urban environment" [Online]https://ec.europa.eu/info/eu-regional-and-urban-development/topics/cities-and-urban-development/city-initiatives/smart-cities_en
[5]Ibid.

climate contracts and make the citizens active participants in the process itself. In this context, Fintech Firms can give a major hand in creating a green economy thanks to the massive use of distributer ledge technologies able to connect and protect the city interests creating a stable public-private partnership and drastically improving the financing process. There are of course a lot of concerns on the matter, first of all the massive implementation of an "always connected" city requires the construction and maintenance of massive server's banks that requires the use of a lot of electric energy, and this thing by itself can be very counterproductive. the second point of discussion is from the legal point of view, we need to evaluate how much fintech technologies are in compliance with the GDPR and how much the privacy of the citizens is at risk. Starting from this concerns this elaborate will look at the deep connection between Fintech Firms and the development of Smart cities taking in consideration the sustainability aspect and the actual aid Fintech can give to the public sector, cooperation between Bottom-Up and Top-down initiatives, active citizens participation and actual financial growth of the single city. These points of discussion, in the last chapter, will be discussed by looking at the solutions achieved by three different countries and their smart implementations:

-Switzerland: outside the boundaries of the EU union, has already implemented green-fintech and is reaching significant results on the route for climate neutrality. Will be looking at a couple of examples of Zurich's green FinTech's and their impacts.

-China: increasing focus has been placed on the public engagement of people and social organizations in different areas in order to support their dynamic interactions with different levels of government. Promoting public engagement and the role of social organizations were two important topics highlighted during the 19th National Congress of the CCP in October 2017. The study will focus on the work of Chinese community planners to engage the population and the bottom-up initiatives on the management and expansion of city boundaries. a special part will be dedicated to "Shuangjing International Sustainable Development Community Pilot" in Beijing

-Nigeria: in December 2017 became the first African nation to issue a sovereign green bond

(and the fourth to do so globally) worth $25.69 million[6]. In the 2021 Fintech Times report, Nigeria's fintech landscape consists of 210 to 250 fintech companies, key stakeholders (banks, telecom companies and the government), enablers and funding partners and by being the largest country in the African continent by population, presents a future whereby it can bring financial inclusion to its population[7]. Despite that the Nigerian legal system is far behind the financial progress and is creating a strange impasse between economic growth and policymaking.

[6]"Green Bonds In Nigeria, catalyzing Nigeria's transition to a climate-resilient, inclusive and sustainable economy" [Online] 2021 https://www.fsdafrica.org/wp-content/uploads/2022/04/Green-Bond-Impact-report-2018-2021.pdf
[7]Nigeria's Fintech Landscape in 2022
[Online]https://thefintechtimes.com/nigerias-fintech-landscape-in-2022

Chapter I

Old and new views of sustainable development in Europe

1.1 Abstract

In this chapter, starting from the "Paris Climate Agreement" I will try to comprehend the concept of sustainable development[8], looking at sustainable development goals (SDGs) to understand how can be implemented, the economic impact, and the limits states are facing[9]. I will look at how EU member states started implementation with mixed results and the lack of coordination and clear framework[10]. The clear solution for the implementation of SDGs is in the development of smart cities and the elements that make them "smart"[11] is the key to understand "sustainable development". This part opens an important point of criticism: the development of smart cities requires also the development of smart financial networks able to create clear and convenient partnership between public and private sector[12]. In this context EU union is using old and cumbersome financial tools leading to a considerable number of risks making public-private-partnership not worthwhile[13.] There's the need for implementation of a new system that can coordinate the partnership between public and private sector with the implementation of a "Fintech model" and the use of smart contracts technologies leading to fast, transparent and reliable[14] partnerships. The most obvious benefit that "FinTech" can offer is the possibility of accelerating the "dematerialization" of the economy, which, if successful, would have a good impact not only on the cost but also on

[8]Art. 2, Paris Agreement, United Nations 2015

[9]Ranjula Bali Swain (2015), "A Critical Analysis of the Sustainable Development Goals" Södertörn, Södertörn University.

[10]Kamphof R. (2018), EU and Member State Implementation of the UN Agenda 2030 and Sustainable Development *Goals*, Institute on Comparative Regional Integration Studies, Tokyo, United Nation University.

[11]Yigitcanlar T, Han H, Kamruzzaman M. (2019), "Approaches, Advances, and Applications in the Sustainable Development of Smart Cities: A Commentary from the Guest Editors. *Energies*.
[Online] https://doi.org/10.3390/en12234554

[12]Mohammad M. A., Sardroud M. J. (2022), "Chapter 9 - Public–private-partnerships (PPP) enabled smart city funding and financing", Elsevier.
[Online] https://doi.org/10.1016/B978-0-12-819130-9.00011-5.

[13]Public Private Partnership in the EU: Widespread shortcomings and limited benefits (2018)
[Online] https://www.eca.europa.eu/Lists/ECADocuments/SR18_09/SR_PPP_EN.pdf

[14]Panisi F. (2017), "*Blockchain and 'Smart Contracts': FinTech Innovations to Reduce the Costs of Trust"*, Stafford, Stafford Law School.

accessibility and the environment. Digitalization has the potential to reduce global carbon emissions by 15% if creative solutions are implemented in the energy, agriculture and land use, and transportation sectors[15]. Still, everything needs to be exceptionally organized, as said before, the heavy implementation of digital technology if misdirected can be very counterproductive if not dangerous for the ecosystem. According to the findings of a study that was carried out by the Carbon Trust and the GSMA[16] (the trade group that represents mobile carriers), the reduction in indirect emissions that can be attributed to the utilization of mobile technologies could be as much as ten times greater than the reduction in emissions that can be attributed to the utilization of mobile technologies[17.] However, reducing energy use and the negative effects it has will continue to be a challenging undertaking.

1.2 Understanding sustainable development

Paris Agreement represent a landmark in the multilateral climate change process. For the first time, a binding agreement brings all nations into an economic and social transformation to combat climate change providing mutual financial assistance. Art 9 comm. 1 states "Developed country Parties shall provide financial resources to assist developing country Parties with respect to both mitigation and adaptation in continuation of their existing obligations under the Convention". Industrialized countries will provide financial support to countries under development in adaptation and mitigation projects, while it will be given the possibility for other countries to make a voluntary contribution. It follows that the resource mobilization will be carried out by all countries but with diversity of resources and financial instruments. On Art. 2 we have an underlying of the economic action that signatory countries must follow indicating a direction of "Sustainable development": "This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen

[15]Smith N. (2020), "Beyond Energy: The Main Offenders", Climate Change Energy. London, The Institution of Engineering and Technology.
[Online] https://doi.org/10.1049/et.2020.1003
[16] GSMA
[17]Basole, Rahul C. and Rouse, William B. (2009), "Enterprise Readiness for IT Innovation: A Study of Mobile Computing in Healthcare".
[Online]https://aisel.aisnet.org/icis2009/104

the global response to the threat of climate change, in the context of sustainable development […]"[18].

The concept of "sustainable development" dates to 1987, when the "World Commission on the environment and development" 1983 by the United Nations and chaired by Gro Harlem Brundtland presents the final report referred to as "Our Common Future" (the "Brundtland Report19"), defining sustainable development as "development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs"[20]. All the various international and global conferences have referred to this concept, but on a pure practical sense, how we can implement it and how much does it cost? We can search for an answer looking at the Resolution adopted by the General Assembly on 25 September 2015 (and the successive more complete list adopted by the General Assembly on 6 July 2017), called "2030 Agenda for Sustainable Development" stated 17 Sustainable Development Goals to "stimulate action over the next 15 years in areas of critical importance for humanity and the planet"21. Despite the name and the adoption by the 193 countries of the UN General Assembly, they have been criticized for being inconsistent, difficult to quantify, implement and monitor. Disparaging analysis suggests that there exists a potential inconsistency in the SDGs, particularly between the socio-economic development but also raises questions on the measurability and monitoring of the broadly framed SDGs22. There's also the problem on quantifying and monitoring data in developing countries which can be extremely complex and can lead to inaccurate results. Looking at Goal 13 on "Climate Action" especially on money investment the United Nations Framework Convention on Climate Change stated that the mitigation measures needed to return global greenhouse gas emissions to current levels by 2030 falls between $200-210 billion per annum and in

[18] Art. 1- Art. 2, Paris Agreement, United Nations 2015

[19]Brundtland, G. (2011), "Report of the World Commission on Environment and Development: Our Common Future", United Nations General Assembly, Document A/42/4
[Online] https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf.

[20]Düwell, M., Bos, G., & van Steenbergen, N. (Eds.) (2018), "Towards the Ethics of a Green Future: The Theory and Practice of Human Rights for Future People (1st ed.)", Routledge. [Online]https://doi.org/10.4324/9781315115788

[21]UN General Assembly Resolution Adopted by the General Assembly on 25 September 2015. Transforming Our World: The 2030 Agenda for Sustainable Development

[22]Leal F. W. (2018), "Handbook of Sustainability Science and Research", Springer International Publishing, pp. 341-355 [Online] DOI: 10.1007/978-3-319-63007-6

developing countries mitigation could cost $140 to $175 billion a year over the next 20 years[23]. The challenge is here is to mitigate risk and invest in transparent bankable projects with an uncertain framework and scarce monitoring the risk of wasting resources is very height. Without a formal implementation strategy and action plan, EU Member States began implementation on their own, with uneven outcomes, including forerunners like Sweden, Finland, and Germany that have not even begun implementation. Nonetheless, fourteen EU Member States have presented their action plans to the UN High Level Political Forum on Sustainable Development by July 2017[24]. Some Member States have a 'central' structure comparable to the European Commission, which means coordination occurs at the Prime Minister's office level. Other Member States have coordination inside their Foreign Affairs, Development Cooperation, or Environment Ministries. Adopted 11 December 2019 "Green Deal" communication impose the search of sustainable development as the main political guideline without giving a clear definition or framework[25]. Despite not having an empirical application, we can take into consideration the statement of the High-Level Expert Group which summarize the spectrum of sustainable development in two statements:

- Improving the contribution of finance to inclusive growth capable of guaranteeing well-being in the long run together with the mitigation of climate change

- Strengthen financial stability by incorporating Environmental, Social and Governance factors ("ESG Factors" are real financial indicators useful for evaluating the riskiness of investments), in corporate decision-making

Due to the enormous investments and risks required to achieve the SDGs, one of the major levers for alleviating the impact of climate change is the financial system[26]. banks were the primary players in the financial services landscape, however, as a result of technological and

[23]Lorraine E. (2012), "Climate Change, Migration and Human Security in Southeast Asia", S. Rajaratnam School of International Studies Nanyang Technological University, Singapore, pp. 13-28
[24] Co-VAL [770356] (2017), "Understanding value co-creation in public services for transforming European public administrations"
[Online] DOI: 10.3030/770356
[25]Kamphof, R. (2018), "EU and Member State Implementation of the UN Agenda 2030 and Sustainable Development Goals", UNU Institute on Comparative Regional Integration Studies, Bruges.
[26]Ibid.

entrepreneurial advancements, new business models have emerged, introducing new participants such as start-ups and technology firms. These new disruptive companies, as well as the components that contributed to it, are now commonly referred to as "Fintech", and "between 2010 and now, the amount of investment in this Fintech industry has reached a peak of $215.4 billion USD in 2019. The market is predicted to increase at a steady 20% rate over the next four years, reaching roughly $305 billion by 2025"[27]. Inside this prediction we can also find the emerging presence of a sub-group called "green FinTech" with the purpose to alleviate climate change risks and their relevancy to policymakers, particularly in developing countries. Green FinTech connects all key participants in the value chain including consumers, (central) banks, insurers, non-banks (startups, big tech firms), (technology) providers, regulators, etc.

The potentials of such solutions are manifold and range from more transparent, blockchain-based supply chains for consumers to investment solutions that only consider sustainable companies and products, developing a physical application of sustainable development.

1.3 Smart cities and climate contracts the six steps of smartness

In order to understand sustainable development and look at the actual physical application of climate neutrality promises inside European Union landscape, is important to understand the concept behind Smart cities and what make them "smart".

The phrase "smart city" initially originated in the mid-1990s, when cities branded themselves as "smart" when they implemented functional ICT infrastructure, and e-governance, or attracted high-tech firms to encourage economic growth. The Multifunction Polis (MFP)[28], an independent smart city near Adelaide, Australia, was designed in 1994. In 1997, the Malaysian towns of Cyberjaya and Putrajaya were re-planned as intelligent garden cities

[27]Nelaturu, K., Du, H., Le, D.-P. (2022), "A Review of Blockchain in Fintech: Taxonomy, Challenges, and Future Directions", Fintech Research, Bank of Canada
[Online] https://pdfs.semanticscholar.org/ceae/505f565416ac907fb29a108cabb24b874793.pdf
[28]Samih H. (2019), "Smart cities and internet of things, Journal of Information
Technology Case and Application", Taylor&Francis, [Online] https://doi.org/10.1080/15228053.2019.1587572

known as smart cities. What distinguished the Australian and Malaysian cases was their concept of using ICT infrastructure not just to attract industry, but, to the extent practicable at the time, to enable the ICT grid to direct the city's operation in order to automatize and optimize its processes. This remains the outline that manages a Smart City still in this day, urban development model that integrates modern ICT for management of the heritage of a city as well as of all its components[29]. A Smart City's architecture places a primary emphasis on accurately representing the structure of the entire system, elaborating on the intra- and inter-system relationships, and defining the guidelines and principles that will direct the design, development, and evolution of the city over the course of time. In general, the architecture needs to be compliant with certain standards established by reasoning on the integration between technology and systems necessary for the needs identified by the stakeholders. Smartness is measured in the ability to integrate various "aspects of sustainability, of creativity, social inclusion and cultural development to determine the truth notion of smart city "2 seek solutions in technologies, services and applications attributable to various areas, from building construction, energy efficiency and attention to the environment up to health, education, mobility and governance. To more precisely underlain the different contemporary implications behind a smart city we can look at 2014 Commission report "Mapping Smart Cities in the EU"[30] which explains the six mandatory characteristics for a smart city project:

- Smart Governance
- Smart Economy
- Smart Mobility
- Smart Environment
- Smart People

[29]Willis S., Aurigi K. (2020), "The Routledge Companion to Smart Cities", Routledge, UK, pp. 82-90
[30] Co-VAL [770356] "Understanding value co-creation in public services for transforming European public administrations" [Online] 2017, DOI: 10.3030/770356

- Smart Living

The first area concerns the administration, with the goal of connect and possibly integrate public organizations, private, civil and European so that the city can function efficiently and effectively as a single organism. This implies collaboration between parties public, private and civil with various stakeholders in order to reach the goals set by the city. development posed by bureaucratization of ICT could guarantee a more fluid use of the services offered to citizens (eGovernment) and on the other hand would favor the active participation of these in life city administration (e-Democracy).

In regard of smart economy, we have sets of initiatives aimed at encouraging technological entrepreneurial to thrive and stimulating creativity through incubators, research centers or so-called Living Labs, centers that allow citizens to collaborate directly with designers, thus becoming "co-developers" of new products or services intended for themselves. They fall into this area also includes electronic entrepreneurship and electronic commerce projects and in general the goal is to raise the general technological level to create a stimulating environment for high-tech enterprises.

Smart mobility is also one of the most critical aspects specially in regarding sectors emissions of greenhouse gases, the resulting noise pollution and traffic congestion from local public transport. Therefore, one of the strategic tools to achieve the goal of mobility are Intelligent Transport Systems (ITS), systems and devices that allow, through the collection, processing and distribution of information, to improve the transport and mobility of people.

When we talk about smart environment the Commission refers to the use of renewable energy sources, the use of smart grids and lighting intelligent, pollution monitoring, building planning sustainable, the rational use of resources, waste and water management. For the right monitoring of water, waste and pollution, the key tool is the network sensors. This allows you to detect faults in the water pipes and therefore of intervene in a targeted manner, and to monitor the level of the bins, to optimize the route of collection vehicles, as is the case in Santander.

A characteristic of the smart city that acts as a common thread for all the others is the enhancement of human behaviors. There could not be smart initiatives without smart people. The goal is to develop IT skills both to take advantage of ICT-based services, but also for stimulate creativity and encourage innovation. Citizens can become creators of new services or products aimed at meeting their needs, such as in already mentioned Living Labs. An interesting case is one of the urban planning projects in the city of Barcelona: the transformation of 200 hectares of the area industrial district of Poblenou in an industrial district called "22 @ Barcelona"[31], a large core of knowledge and innovation with large sustainable green spaces and structures dedicated to people where economic, cultural and cultural activities take place educational. In the end Smart Living area refers to lifestyle, behavior and consumption of citizens and the sectors in which the main interventions are detected are health, safety, culture and tourism. Despite talking of innovation and modernity, the member state approach on smart cities was far from innovative especially on an economic point of view. Contracts between public Public-Private partnerships are slowed down by a cumbersome procedure making the whole process of sustainable development much more expensive and long.

According to Eric W. Orts "climate contracts"[32] climate contracts comprise not just international treaties, but also national and regional rules, public-private partnerships facilitated by non-governmental organizations, and day-to-day business transactions. A way of collaboration and policymaking that set objectives and obligations between citizens and the city with the final objective of maintaining a "clean" living, will include goals and targets, strategies, and the roadmap for achieving the climate transition while mapping out involved stakeholders and responsibilities[33] and thus should be a legally binding contract that outlines all the mission's components. The lack of coordination between all urban area stakeholders is the most significant climate policy problem but not the only one; city innovation should not

[31]Ecpa Urban Planning (2022), "Case Study: 22@ Barcelona Innovation", SMARTCITIESDIVE. [Online]https://www.smartcitiesdive.com/ex/sustainablecitiescollective/case-study-22-barcelona-innovation-district/27601/

[32]Orts E. W. (2011), "CLIMATE CONTRACTS." Virginia Environmental Law Journal, University of Pennsylvania - Legal Studies Department, Philadelphia. [Online] https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1814504

[33]Ibid.

be seen just from the standpoint of technological advancement, but also from the standpoint of social advancement. Modern urban development is a complex process comprising a diverse group of stakeholders with competing ambitions and interests relying on horizontal collaboration between municipal stakeholders and people who agree on a shared vision, objectives, actions, and synergies to share and mitigate their climate impact. Citizens' participation plays an active part in driving the transition to climate neutrality as co-designers, co-creators, co-implementers, and co-beneficiaries in various capacities, but also requires strict control of privacy and a clear network in which they can participate. In the end, climate city contracts are the groundwork for creating a smart city and require two fundamental elements: Connection and Coordination. These are two simple concepts that Eu cities struggle with, chained by dilapidated infrastructures and ancient financial viewing.

1.4 The need for a new private-public partnership

Financing is a complex method to pay for any kind of investment, particularly for new technology projects, such as the Smart City, which has many variables to take into account, variables as the expected duration of the financing, the number of interested parties on the decision making process of the financing for the project, conflicting interests, like in projects related with city infrastructure or with a Public Private Partnership[34], the risk associated with the investment, for the investors and for the borrowers and incentives related to the project that can lower its risks[35]. Public-Private partnerships can be defined as all those cooperation agreements where two or more agents, that have a public or private background, decide to combine their competencies in order to work on projects that have relevant public interest[36].

[34]Iaione C. (2016), "The CO-city: Sharing, collaborating, cooperating, and commoning in the city", The American Journal of Economics and Sociology, 75(2), pp. 415-455
[Online] https://doi.org/10.1111/ajes.12145
[35]Alberto, R. (Academic Year 2014/2015), "Financing instruments for Smart City projects based on Internet of Things", Master Thesis, Politecnico di Milano Scuola di Ingegneria dei Sistemi Polo territoriale di Como and Campus Bovisa Master of Science in Management Engineering.
[Online] https://www.politesi.polimi.it/bitstream/10589/116101/3/2015_12_ALBOR_DE%20VUONO.pdf
[36]Andersen H., Cao F., Tvarnø C.D., Wang P. (2010), "Public-Private Partnerships: An international analysis - from a legal and economic perspective" EU Asia Inter University Network for Teaching and Research in Public Procurement Regulation

In such cases, the private sector usually provides a high percentage of the capital needed for the project development and the public sector provides permission for the use of public spaces and implements mechanisms to lower the financial risk of the private sector. This type of financing calls for the need for a strong and participative public-sector entity that takes the role of the project manager and the gathering of a series of capabilities that are crucial for the project's success, such as ex-ante efficiency and cost-effectiveness evaluations as well as the capability of negotiating with the other parties involved in the project, being them public or private[37]. Before the stipulation of a contract between the parties is mandatory to compile a preliminary design, with the purpose of translate the idea in an actual investment proposal, analyzing the general context and assessing the economic and financial feasibility of the project. The PPP model has the potential to provide several benefits in a relatively slow risk environment such, however, reality has shown that PPPs do have a high value of risk, with potentially high losses, particularly when considering the negative effects of ex-post renegotiations. Renegotiations occur when their new circumstances arise that affect the economic and financial equilibrium of a project. For example, lower-than-expected demand, a change in the project design by the government, fiscal and legal changes, etc. Therefore, one can define a renegotiation as a remedy for contractual failure, although, in theory, the number of renegotiations should be minimal, and the empirical data suggests that most contracts are renegotiated. [(overview of the renegotiations that occurred in the Portuguese PPP sector, for a wide range of projects (roads, railways, health, security, ports, water, and energy) during the period from 1994 to 2012[38].

PPP projects often combine EU funds with private financing resources resulting in more affordable projects[39]. There has been a tendency towards a more intensive leverage of public funds with private finance through PPPs for instance, the Europe 2020 strategy highlights the importance of PPPs leveraging financial means by combining private and public finance and

[37]Ibid. 34
[38]Public Private Partnership in the EU: Widespread shortcomings and limited benefits (2018), [Online] https://www.eca.europa.eu/Lists/ECADocuments/SR18_09/SR_PPP_EN.pdf
[39]Delmon, J. (2021), Private sector investment in infrastructure: Project finance, PPP projects and PPP frameworks (Fourth ed.). Wolters Kluwer.

creating innovative instruments to finance the needed investments is one of the key aspects Europe must pursue in order to accomplish its objectives[40]. The issue is that the potential benefits of PPPs were frequently not realized due to delays. This is partly due to a lack of sufficient evaluations, strategic approaches to the utilization of public-private partnerships, and institutional and legal frameworks. Spanish highway contracts, for example, were renegotiated shortly after contract signature owing to essential changes in the planned works, resulting in cost hikes of roughly 300 million euros to be paid by the public partner[41]. Another example is the cost for the Pau Pyrénées ICT project in France increased by 73% (from 18 to 31 million euros) in order to comply with regulatory changes or the construction phase of the Metropolitan Area Network (MAN) ICT project in Ireland, so poorly planned that the entire project was subsequently downsized, with the result of realizing fewer MANs (to 66 towns rather than 95) and 4. % (50 953 euro) cost increase per town[42]. Moreover, the principles of accountability and transparency principles could be distorted, and the major risk concerns the fact that if any exclusivity clause agreement are foreseen in PPPs contract, it could lead at the award of monopoly market to the private partner, decreasing the competitiveness, therefore.

Problems of transparency and mismanagement show us how actual application of PPPs is in stark contrast with the objectives of a smart city, and there's the need for implementation of a new system that can coordinate the partnership between public and private sector. a major driver of FinTech is the availability[43], transparency and reliability of data. If applied correctly, can elaborate more fast and trustworthy risk evaluation data, eliminate the need for project manager, streamline contractual procedure, making a transparent money exchange thanks to the use of blockchain technologies and cryptocurrency payments.

[40]De Pinho Campos K., Cohen, J. E., Gastaldo, D., & Jadad, A. R. (2019), "Public-private partnership (PPP) development: Toward building a PPP framework for healthy eating. The International Journal of Health Planning and Management" [Online]https://doi.org/10.1002/hpm.2714

[41]Baeza, M. de los Ángeles & Vassallo, Jose M (2010), "Private concession contracts for toll roads in Spain: Analysis and recommendations". Public Money & Management, Taylor&Francis, Spain, PP. 299-304.
[Online] https://doi.org/10.1080/09540962.2010.509179

[42]Ibid. 35

[43]Finocchiaro G., Falce V., Bomprezzi, C., Alpa G. (2019), "Fintech: Diritti, concorrenza, regole: Le operazioni di finanziamento tecnologico", Zanichelli.

1.5 Fintech Ecosystem and legal regulation

The fintech ecosystem is composed of a diverse range of players, lee and shin highlighted five distinct components of the fintech ecosystem: fintech startups, technology developers, government, financial stakeholders, and traditional financial institutions. Represents a new way of doing business directly connected to the intensive use of technology and direct collaboration between physical entity (the client) and juridical entity (the company). The extensive use of distributed ledge technology makes this interaction instant and direct and helps the coordination between different stakeholders. Because to improvements in digitization, a wide variety of economic operations may now be carried out entirely online. This includes the provision of services in place of the sale of physical items, the broadening of chances for small and medium-sized firms to enter international markets, and the enhancement of material monitoring that is required for reuse and recycling. There is a possibility that the digitalization of medical and educational services will lead to a reduction in the expenses of such services as well as an increase in their accessibility for those who reside in more rural areas. The intelligent transformation of our built environment will begin with the creation of transportation networks that are adaptable and produce less pollution, as well as buildings that are efficient in their use of energy. The advent of digitization has made it possible to share and make more intensive use of a wide variety of resources, including automobiles, highways, and residences, as well as clothes, equipment, and food.

Fintech is a portmanteau of the terms "finance" and "technology" and incorporates directly two fundamental concepts of contemporary business in one in one specific sector[44]. The term fintech was already used as early as 1972 in a scholarly article detailing models on how he had analyzed and solved daily banking problems encountered at the bank manufacturers Hanover trust. The vice president of the bank, Abraham Leon Bettinger provided the following definition "fintech is an acronym which stands for financial technology, combining

[44]Schueffel P. (2017), "A reality check on FinTech: Disruption, Diversification or Differentiation?", Journal of Innovation Management, Switzerland, pp. 32-54.
[Online] DOI: 10.2139/ssrn.3097312

bank expertise with modern management science techniques and the computer"[45]. In their 2015 research paper on the evolution of fintech earner (2015) state that "the term's origin can be traced to the early 1990s and referred to the 'financial services technology consortium', a project started by Citigroup within the early 1990s. The American financier besides distributed however another article on the term fintech with the title "Friday flashback: did city coin the term 'fintech'?". This article is gone before by an editor's note attesting that "the article underneath showed up in American financier on admirable 13, 1993 and contains the most punctual utilize we may discover of the now-trendy word "fintech"[46].

In present day times the concept behind fintech can designated with companies that practicing money related exercises and administrations with seriously application of advanced advances such as cash exchanges, keeping a check along with your smartphone, bypassing a bank department to apply for credit, raising cash for a commerce startup, or overseeing ventures. When applied to the whole financial sector, the word "Fintech" can also be interpreted as "the use of digital technology as a tool for doing business"[47]. This greater tendency toward digitization in the financial services business is shown by the proliferation of technologies such as internet banking, chip cards, electronic payments, mobile wallets, and payment apps[48]. Ozili defines "digital finance businesses" as organizations that strive toward the development of technology that enable the integration of digital banking, mobile applications and distribution networks, microfinance, payment solutions, peer-to-peer loans, and crowdfunding[49]. It is true that some of the digital systems and services mentioned above have reached their full potential, such as chip cards and online banking; however, there are still

[45]Kohn, B.B. (1981), "Corporate history and the Corporate History Department: Manufacturers Hanover Trust Company," The Public Historian, 3(3), pp. 31–39.
[Online] https://doi.org/10.2307/3377730.
[46]Ibid. 35
[47]Przychodzen W., Gómez-Bezares F., Przychodzen P. (2018), "Green information technologies practices and financial performance – The empirical evidence from German publicly traded companies" Journal of Cleaner Production, Volume 201, pp. 570-579
[Online] https://doi.org/10.1016/j.jclepro.2018.08.081.
[48] Ibid.
[49]Ozili K. (2018), "Impact of digital finance on financial inclusion and stability", Borsa Istanbul Review, Volume 18, Issue 4
[Online] https://doi.org/10.1016/j.bir.2017.12.003.
(https://www.sciencedirect.com/science/article/pii/S2214845017301503)

several cutting-edge technologies and business models that are not being fully utilized, which may have a significant impact on the financial industry.

Revolutionary element brought by 2.0 companies is the shift of customer expectations and behaviors. Smartness conditioned consumers to expect digital services to be timely, customized, reliable, and always ready to use, seeing old financial and banking services as outdated. Research conducted by scratch over 10,000 millennials uncovers that 53% don't think their bank offers anything distinctive from other banks and approximately 1 in 3 are open to exchanging banks within another 90 days[50]. This environment in conjunction with the fall of reliability following the financial crisis in 2009, has driven customers to look for alternatives, with new fintech offerings. This change has caused for example an explosion in the number of investing and savings apps in recent years, fintech companies like "Robinhood", stash and acorns use a combination of savings and automated small-dollar investing methods, such as instant round-up deposits on purchases, to introduce consumers directly to the financial markets with just the use of the phone. Another impact is the growing diffusion of digital payment methods, making the use of cashless and less frequent in both developed and emerging economies. As pointed out in the world installment Report 2019 (carried out by Capgemini[51]), worldwide non-cash exchange volume developed by 12% from 2016-17 to reach 539 billion us dollars (the most elevated sum within the past two decades). In advanced economies, this is often the continuation of a long-standing slant of digitization where tolerating advanced installments has gotten to be both simpler and less costly for vendors expanding the assortment of dealers who acknowledge noncash installments and diminishing the least ticket estimate, they require for clients to utilize these installment strategies.

Is an economic phenomenon where the most innovative financial services, thanks to digital technologies, now find new development opportunities and can evolve to bringing new

[50]Umair S. B. (Academic Year 2020/2021), "FinTech and Blockchain", Master Thesis, Politecnico Di Torino, Department of Engineering and Management & Production.
[Online] https://webthesis.biblio.polito.it/23020/1/tesi.pdf
[51]Mützel, S. (2021), "Unlocking the payment experience: Future imaginaries in the case of digital payments", New Media & Society, Department of Sociology, University of Lucerne, Switzerland.
[Online] https://doi.org/10.1177/1461444820929317

benefits to end users, from individual consumers to large companies and SMEs. These peculiar companies, as well as the components that contributed to them, between 2010 and presently, the sum of speculation in this fintech industry, has expanded significantly, coming to a crest of $215.4 billion USD in 2019. The showcase is anticipated to extend at an unfaltering 20% rate over the following four a long time, coming to generally $305 billion by 2025[52]. Modern advances, like machine learning/artificial insights, prescient behavioral analytics, and data-driven showcasing, will take the mystery and propensity out of budgetary choices. "learning" apps will not as it was learning the propensities of clients but will lock users in learning diversions to form their programmed, oblivious investing and sparing choices superior. The control of this ai-subset lies in its capacity to run enormous sums of information through calculations outlined to spot patterns and dangers, permitting buyers, companies, banks, and extra organizations to have a more informed understanding of speculation, and acquiring dangers prior within the use of chatbots and ai interfaces. Inside this spectrum, financial services companies such as Charles Schwab's Robo-advisor technology thrived managing $40.7 billion in assets for around 360,000 accounts[53]. A key element, like most fintech companies, is accessibility with a user-friendly interface. Charles Schwab onboards its Robo-adviser customers with a short 12-point questionnaire meant to collect data points that feed its algorithm, which includes questions about the user's goals, knowledge of how stocks and other investment alternative's function, and reactions to certain hypothetical scenarios. Using this data, Charles Schwab's algorithm can generate a hypothetical portfolio with allocations to various types of stocks, bonds, and commodities, as well as provide a general projection on returns[54]. Artificial intelligence (AI) and machine learning (ML) are now two of the most popular kinds of FinTech technology, and they have the potential to play an increasingly major role in the financial sector in the future[55]. Some of

[52]Kagan J. (2022), "Financial Technology (Fintech): Its Uses and Impact on Our Lives".
[Online] https://www.investopedia.com/terms/f/fintech.asp
[53]Schwab Intelligent Portfolios [Online] https://intelligent.schwab.com/
[54]Dol Q. (2020), "What Is a Robo-Advisor? How Do They Work?", BiltIn.
[Online] https://builtin.com/fintech/how-robo-advisor-technology-works
[55]Nishant R., Kennedy M., Corbett J, (2020), "Artificial Intelligence for Sustainability: Challenges, Opportunities and a Research Agenda", International Journal of Information Management 53, Ai to Adress Grand Societal Challenges
[Online] 10.1016/j.ijinfomgt.2020.102104

the applications of artificial intelligence and machine learning in the financial technology sector include: automation, higher productivity, lower operational expenditures, enhanced security, increased customer connection, and tailored marketing and sales tactics[56]. When it comes to automation first, AI-based working methods may replace inefficient paperwork procedures. The goal is to offer more effective ways to organize, distribute, store, and utilize the information, which will lead to a reduction in expenses and the amount of time spent on document processing. In addition, MLAI may be used to take over the daily repetitive duties performed by people, which can lead to a decrease in the costs associated with human resource-intensive activities as well as an improvement in overall productivity. Employees and supervisors are given more time to concentrate on tasks with a greater potential return, such as decision-making, which is to the overall advantage of the organization (Khakurel et al., 2018). In addition, MLAI makes it possible to conduct efficient work monitoring by ensuring that the proper Key Performance Indicators (KPIs) are collected, which improves both compliance and security. In addition, the capability of MLAI to automate processes may be of assistance in maintaining continual communication with consumers and other parties that have an interest in the matter. By using MLAI, it is possible to cut down on the amount of time spent on administrative chores such as the correction of errors, the resolution of customer service issues, the search for data and information, and other similar activities, from days to minutes (Nilashi et al., 2019). Additionally, other applications, such as automated chatbots or MLAI-based virtual assistants, are able to filter and classify customer complaints, which helps to avoid long wait times and inefficient problem answers, which eventually leads to an improvement in customer satisfaction (Nishant et al., 2020). Profiling represents one of the main cornerstones on which the digital economy revolves and naturally constitutes an essential strategic resource for carrying out the activities of the Fintech sector. On one hand, Big Data Analytics techniques can facilitate greater personalization of products and services, favoring a more accurate estimate of risk profiles and consumer needs. On the other hand, however, the same techniques can have negative effects on the availability and affordability of the same products and services for some consumers with higher risk profiles or for whom only a little information is available due to their limited online activity.

[56]Ibid.

The fortune and smartness of fintech companies lay also in the application of the "disintermediation" theory. Maciag (1996)[57] describes the word disintermediation as an economic term dumping the middleman, in a disintermediated system, the consumer directly deals with the producer, thus removing the intermediaries or middlemen from the supply chain. Conventional banking methods involve dependency on intermediaries at all levels and every transaction requires a counterparty to process, this causes bottlenecks and systems prone to single points of failure. Disintermediation refers to the reduction of the use of intermediaries between producers and consumers inducing decentralization abandoning physical structures and implementing technologies like ai, blockchain and data science into traditional financial sectors, Neobanks are a recent creation of this financial system

Neobanks are essentially banks without any physical branch locations, serving customers with checking, savings, payment services, and loans on completely mobile and digital infrastructure[58], there are two types of digital banks a full-stack neobank or a front-end focused neobank: a full-stack neobank is a standalone bank with its own banking license and can function completely independently, comparatively, a front-give up targeted neobank does now not have its own banking license and must function in partnership with both a traditional or legacy bank to provide its services to customers. An example of front-end is chime, with more than 12 million[59] users in the us Despite providing bank related services (credit-building opportunities, early access to direct deposit payments and automatic savings etc.), is a financial technology company, not a banking services and debit cards are issued by the bancorp bank or stride bank.

In Italy, according to a study carried out by money.it in 2017, there were about 8900 start-ups, 235 of which can be classified as fintech companies. The following year, according to

[57]Kaili E., Psarrakis D. (2021), "Disintermediation Economics. The Impact of Blockchain on Markets and Policies", Palgrave Macmillan Cham pp. 1-13
[Online] https://doi.org/10.1007/978-3-030-65781-9
[58]Guarda D. (2020), "Fintech Now, How Big is the Fintech Industry", IntelligentHQ.
[Online] https://www.intelligenthq.com/fintech-now/
[59]Rao R. (2022), "Digital Banks - Reimagining Trust", LinkedIn.
[Online] https://www.linkedin.com/pulse/digital-banks-reimagining-trust-rajashree-rao

the data reported by Italiafintech (2018), Italian fintech raised about 200 million euros in loans, almost quadrupling the numbers for the year. In the same year, moreover, there were 11 million of italian users most inside the area of mobile payment services, family budget management, p2p transfers and chatbots (italiafintech, 2018; adonopoulos, 2019). The success launched in milan an initiative called "fintech district"[60] an open ecosystem of companies that collaborate with each other for facilitate the adoption and development of fintech at national and international level boasting more than 100 players in the fintech market and around 30 partners.

The disruptive transformation, originated by Fintech, can bring with it, not only new opportunities for businesses and possible benefits for customers but also new and worrying unknowns also in terms of the protection of the personal data of consumers and savers. Particularly significant, in this sense, are the operating mechanisms of the telematic service platforms, the so-called marketplaces: direct intermediation channels between savers and companies, debtors and creditors, insurers and policyholders, in which Fintech operators perform ranking activities/scoring of the risk profile, the degree of solvency, or the adequacy of the contractual counterparties, guiding the investment or insurance choices of the customers, without however assuming any risk on one's own, raising legitimate questions related to the completeness and reliability of the data and sources used, the correctness of their processing, the degree of transparency towards consumers[61]. Moreover, the risks of unfair or fraudulent behavior towards customers increase with the increased use of algorithms and the further development of artificial intelligence techniques, since they make the decision-making process more opaque and increasingly difficult for consumers and savers to understand the underlying logic. to the offer of services or products dedicated to them[62].

As far as legal regulation financial services are among the most heavily regulated sectors. As

[60]"The Gateway to the Italian Fintech Ecosystem" (2022),
[Online]https://www.fintechdistrict.com/
[61]Ibid.27
[62]"Fintech e Diritto – Intervento di Antonello Soro" (2018),
[Online] https://www.garanteprivacy.it/web/guest/home/docweb/-/docweb-display/docweb/8818313

technology is integrated into financial services processes, regulatory problems for such companies have multiplied. International regulatory bodies are trying to understand how to calibrate the interventions of a regulatory nature to push on the one hand, towards one progressive and necessary financial innovation but, on the other hand, do it with the necessary caution to reduce the risks of entering the financial market of non-fintech companies are subject to the regulatory perimeter. The financial stability board, born as a board international study of the fintech market, in June 2017 published a study from the title financial stability implication from fintech where it reports the main areas of attention on which the regulatory authorities will have to focus attention. In some times, the problems are a feature of era, in others, they replicate the tech enterprise's impatience to disrupt finance. for example, automation of approaches and digitization of facts makes fintech structures vulnerable to assaults from hackers. current times of hacks at credit score card groups and banks are illustrations of the ease with which terrible actors can benefit get entry into systems and purpose irreparable harm. There have additionally been times wherein the collision of a generation culture that believes in a "flow rapid and spoil things" philosophy with the conservative and threat-averse world of finance has produced unwanted effects. San Francisco primarily based insur-tech startup Zenefits, which become valued at over one billion greenbacks in personal markets, broke California's insurance legal guidelines by means of allowing unlicensed agents to sell its merchandise and underwrite insurance policies. The sec fined the company $980,000 and that they had to pay $7 million to California's department of insurance[63]. The European union, on the other hand, is strongly interested in the fintech phenomenon, published, in January 2017, the fintech resolution: the impact of technology on the future of the sector financial in which it invited the European commission to outline an action plan for push for a healthy integration of technology into the financial system with a perspective integrated involving bank, insurance and the market. Furthermore, again the European union, as part of the Horizon 2020 program, aimed at financing innovative start-ups, has allocated almost 6 million euros for the adoption of peer-to-peer transfer mechanisms of money (using blockchain technology). In Italy, the fintech &

[63]"What Is Financial Technology – Fintech?" (2022), Emerging Industry Professionals. [Online] https://emergingindustryprofessionals.com/news/what-is-financial-technology-fintech

digital finance 2017 observatory of the Politecnico di Milano, found that 16% of Italians have used at least once innovative financial services, the share doubles (32%) if they only consider millennials[64]. About 2 out of 10 people have already tried a new way of offering traditional services and the percentage will certainly tend to rise and not just a little. law is likewise a hassle in the rising world of cryptocurrencies. initial coin services (icos) are a new shape of fundraising that lets startups to raise capital immediately from lay investors. In most nations, they're unregulated, and feature come to be fertile ground for scams and frauds. Regulatory uncertainty for icos has additionally allowed marketers to slip safety tokens disguised as software tokens past the sec to avoid expenses and compliance costs. because of the diversity of offerings in fintech and the disparate industries it touches, it is hard to formulate an unmarried and complete approach to these problems. For the maximum element, governments have used present regulations and, in some cases, customized them to modify fintech. they've hooked up fintech sandboxes to assess the implications of era within the zone. The passing of well-known information protection law, a framework for collecting and the use of private information, in the EU is some other try to limit the number of private records available to banks. numerous international locations wherein icos are famous, along with Japan and South Korea, have also taken the lead in growing regulations for such offerings to defend investors[65].

1.6 Distributed ledger security and transparency

Cryptocurrencies are legally defined, by means of America financial Crimes Enforcement network directive issued early in 2013, as "convertible virtual currencies[66]" or instead as a "digital equal of cash" (consistent with the EU rules EC/2009/one hundred ten on electronic cash). In 2008, the pseudonym Satoshi Nakamoto, who is the inventor of the crypto foreign

[64]Di Perna G. (Academic Year 2017/2018), "Insurtech in the Italian insurance market: an insightful view from incumbents", Master Thesis, Scuola di Ingegneria Industriale e dell'Informazione, Istituto Politecnico di Milano.
[65]Ibid. 52
[66]Application of FinCEN's Regulations to Persons Administering, Exchanging, or Using Virtual Currencies" (2018), Financial Crimes Enforcement Network, U.S. Department of the Treasury
[Online]https://www.fincen.gov/resources/statutes-regulations/guidance/application-fincens-regulations-persons-administering

money Bitcoin, posted a white paper titled “Bitcoin: A Peer-to see electronic cash system”. The paper described in element a fee gadget in which people would immediately send/get hold of payments to/from every other. The generation illustrated a mechanism by which payments might be accomplished securely with a non-intermediary financial organization.

Among the number of different technologies that are reshaping the financial services, blockchain is by far the most important, it has received a significant amount of analyst and press attention over the last few years as holds significant monetary potential. Blockchain can be compared to a database, or a collection of information stored electronically on a computer system. The information, or data (which are in huge quantities) in these databases are generally organized in a tabular fashion to allow a more logical and simpler search of the necessary information. The data they are stored on servers. The difference between a database and the blockchain is how they come structured the data[67]. The blockchain data is collected in groups (blocks), these blocks form of the data chains from which the blockchain is created. Whenever there are updates, new data, are inserted in a new block that will be attached to the chain of the others, every block is validated and archived by a “timestamp” which guarantees security to the model, as it prevents operations, once performed, to be canceled or modified.

Blockchain database is a distributed ledger that can store transactions between parties in a secure, verifiable and permanent way, a database that is consensually shared and synchronized across multiple sites, institutions or geographies. The participants in the system are defined as 'nodes' and are connected to each other in a distributed manner. The distributed nature and the cooperative model make the validation process particularly safe and stable, even though it must resort to non-negligible times and costs, largely referable to the price of the electricity necessary to validate the blocks (this in the case of the Blockchain of bitcoin) and the computational capacity necessary to solve complex algorithmic calculations (an activity commonly referred to as 'mining'). Authentication occurs through mass collaboration and is fueled by community interests, the Blockchain is a public ledger of Bitcoin transactions in chronological order. It is used to permanently store Bitcoin transactions and to prevent the

[67]Damico F. (Accademic Year 2020/2021), “*How technology is reshaping financial services: Blockchain use cases in the banking industry*”, Master Thesis, Istituto Politecnico Di Torino

phenomenon of so-called "double spending" (to prevent it from spending bitcoins more than once at the same time). As already observed, the Blockchain is a set of blocks linked together: each block is identified by a code, contains the information of a series of transactions, and contains the code of the previous block, so that it is possible to retrace the chain backwards, up to the original block[68]. All the nodes of the network store all the blocks and therefore the whole Blockchain

The cryptocurrency of Bitcoin was the first application of blockchain technologies and the still represent a state of the art copied by other cryptocurrencies and in doing so introduced an entirely new set of businesses, jobs, and vocabulary to the world of digital payments, becoming the digital declination of a new concept trust. For these reasons, some believe that the blockchain can also take on a value in certain aspects of a "political" type, as a platform that allows the development and realization of a new one form of economic freedom, able to guarantee everyone the possibility of verifying, of "control", have total transparency on the acts and decisions, which are recorded in unchangeable and shared archives that have the characteristic of being unalterable, unchangeable, and therefore, immune from corruption permitting transactions to have public "witnesses," thereby making a cyberattack extra tough. The participant at each node of the community can get entry to the recordings shared across that network and might personal the same copy of it.

It's important to understand that despite its undoubtful economic value, Bitcoin is not a currency by legal definition, for an asset or a payment vehicle to be named as money, it must be the universal means of exchange and standard of value at least in the geographic area of a state or the economic area of a market.

Blockchains can be public (or permissionless), private or consortium (or permissioned), cryptocurrencies are typically open to anyone to join the network and contribute to maintaining the integrity of transactions. However, in many other blockchain-based applications (e.g., related to company's private database), service providers may want to limit

[68]Cian M., Sandei C. (2020), "*Diritto del Fintech*", Wolters Kluwer-CEDAM, Milan.

access rights, in a consortium blockchain platform, as opposed to a public platform, will allow organizations to retain control and privacy while still cutting down their costs and transaction speeds. Typical examples include Hyperledger Fabric and Multichain[69.] While clients are allowed to submit transactions, only pre-determined participants have permission to execute the consensus protocol and update the distributed ledger as well. These participants must be governed by informal arrangements, formal contracts or confidentiality agreements. permissioned blockchain, unlike the private one, have a consensus mechanism controlled by a set of preselected nodes, a "consortium" of 10 or more financial institutions, each of which manages a node. In this case it is enough for 8 of them to sign a block for the block to be valid. In this regard, the right to read the blockchain can be both public and limited to some participants, having a type of blockchain is defined as "partially decentralized". Numerous banks and insurance agencies, together with JP Morgan and MetLife, are using their very own private blockchains to simplify, streamline and confirm transactions and contracts that might previously have taken far longer and probably been much less at ease[70.]

In the aftermath of the financial crisis, onerous reporting requirements compelled the regional digitization of Europe, which in turn prompted intermediaries and regulators to become digital. Consequently, Europe went through a period of rapid digitalization. Beginning with the adoption of comprehensive digital reporting to regulators and ending with the implementation of 'open banking,' in which incumbent intermediaries are required to share customer data with rivals, Europe's approach to digitalization is multifaceted. It begins with the adoption of comprehensive digital reporting to regulators and ends with the implementation of open banking.

In contrast to the approach used in India, the European plan does not have a single, overarching objective in mind. Instead, the course was set by the demands of certain industries, such as the efforts of financial authorities to tighten their grip on systemic risks and the privacy concerns raised by the rise of data-driven companies like BigTech. Both of these examples are examples of how the demands of certain industries have set the course.

[69]Ibid. 27
[70]Ibid. 62

The stricter limits placed by EU law on how data may be used are one of the most significant differences between EU law and American law. The results of enforcing data protection standards and safeguarding protected factors are same. Both need a little amount of confidential data in order for the analytical algorithms to function properly. However, data and factor protection regulations may be quite variable depending on whose authority is responsible for making the decision to delete a data set or a factor. In contrast to protected factors, which are not open to the possibility of private transactions, data privacy "privatizes" the data. This means that in order to make use of the data, data users need to get qualified authorization from the data owners. European cryptocurrency market is constantly increasing, and the European Union followed the trend on 10th of April 2018 creating the European Blockchain Partnership (EBP) with cooperation of 21 member states and the establishment of European Blockchain Services Infrastructure (EBSI). With four million euros invested, with a total of 36 nodes, EBSI is having a slow development principally for lack of rule in compliance with GDPR regulation and physical infrastructures for servers. EBSI acts in the context of the permissioned blockchain in which the validators of the transactions are limited to a predetermined and identified set of actors, and the privacy of them is one of the main issues that slows down the project. The European Blockchain Partnership (EBP) represent an important step forward, firmly promoting interoperability and broader deployment of blockchain-based techs, contributing to more efficient and more accessible cross-border government services across Europe. It additionally offers regulatory surroundings in full compliance with ECU laws, and its miles planning the abovementioned pan-EU regulatory sandbox in cooperation with the EU fee to be used instances inside and outside the EBSI[71.] To EU Commission is clear that blockchain can radically change public administration, the demand for a platform guaranteed in terms of transparency and compliance is very high, especially with the following implementation of a full EU cryptocurrency[72.]

[71]Agostini L. (Academic Year 2020/2021), "Blockchain and Smart Contracts: the EU's (lacking) view", Bachelor Thesis, Luiss Department of Business and Management Bachelor's Degree in Management and Computer Science Course of Business Law and ICT, Italy
[Online] 238401_AGOSTINI_LUCA.pdf
[72]"Governance for a DLT / Blockchain enabled European Electronic Access Point (EEAP)" – European Commission (Final Report, October 2019)

On September 24, 2020, the European Commission adopted a new and comprehensive digital finance package aimed at improving the competitiveness of the continent's Fintech sector and technologies, mitigating risk, and ensuring the European economy's financial stability, including a comprehensive new legislative proposal on cryptocurrencies. Markets in Crypto assets (MiCA)[73] is a concept designed to simplify Distributed Ledger Technology and the regulation of virtual resources in the European Union while safeguarding users and investors. The 168-page MiCA paper focuses mainly on the regulations for regulating cryptocurrencies that are currently out of scope, such as "Stablecoins[74]" and cryptocurrency service providers, referred to as Crypto Asset Service Providers frameworks in other countries, such as Japan. MiCA will introduce standardized definitions for a few precise virtual property market elements formerly missing replacing countrywide policies and providing extra certainty for the digital asset space inside the gift marketplace, but, until then, regulations (and issues) around cryptocurrencies will remain on a nation-by-kingdom case. Numerous open questions are under discussion, for example, the ethical problem relating to the expenditure of electricity, caused by the mining process, the problem related to the scalability of this technology, or the topic concerning privacy.

The General Data Protection Regulation (GDPR) don't take in consideration neither the technology behind blockchain nor its distributed ledger, bringing up legislative issues. The GDPR could conflict with the very characteristics of the technology when we ask ourselves who is having the role of data controller and data processor.

Bitcoin was initially designed for peer-to-peer (P2P)[75] money transfer only. However, it soon showed the potential to be used for any kind of P2P value transaction on top of the Internet. The concept of smart contracts was later introduced but ignited significant interest and

[73]Hallak I. (2022), "Markets in crypto-assets (MiCA)" European parliament Research Service

[74]Ossinger J. (2021), "Rise of crypto market's Quiet Giants has big market implications", Bloomberg.com.
[Online] https://www.bloomberg.com/news/articles/2021-03-19/rise-of-crypto-market-s-quiet-giants-has-big-market-implications

[75]Fenwick, M. and Vermeulen, E.P.M. (2021), "The historical significance of blockchain and smart contracts," Smart Contracts.
[Online] https://doi.org/10.5040/9781509937059.ch-008.

popularity. Typically, the contract layer is decoupled from the blockchain layer, where the ledger itself is used by smart contracts that trigger transactions automatically when certain pre-defined conditions are met an auto-execute actions automatically (or give instructions so that certain ones can be carried out actions) when the conditions determined between the parties are met and verified. In other words, the Smart Contract is based on a code that "reads" both the clauses that have been agreed, both the operating conditions in which the agreed conditions must occur and auto-executes automatically when the data referring to real situations correspond to data referring to the agreed conditions and clauses. On blockchain, smart contracts can streamline complex processes that involve several intermediaries, reducing costs, creating the opportunity to code transactions management directions into self-enforcing software running on blockchain platforms[76]. Therefore, thanks to "smart contracts", transactions management is radically simplified because any variation of the initial contractual details is constantly updated and immediately executed by the code into which the contractual clauses have been "translated" and this has led to them becoming one of the most popular and talked about subjects in the blockchain industry. They allow the performance of dependable transactions without the engagement of third parties.

There are risks on the massive implementation of this technology especially taking in consideration how an imperceptible software bug can lead to a catastrophic outcome toward investors. An example is the glitch experienced by the American global financial services firm Knight Capital Group in 2012 with 460 million dollars of damage. Similarly, a bug affecting the code The DAO (a distributed autonomous organization) relied on for its investment vehicle running on Ethereum blockchain was essential to allow, in summer 2016, leading the DAO[77] token holders to exploit a bug in the code, to siphon off one-third of the value held in the application (roughly $50 million) and to move it to their own accounts.

HFT is another, more dangerous form of algorithmic trading in which, an AI replicate human decision, automatically determining individual parameters of orders such as whether to

[76]Ibid. 27
[77]Murck P. (2021), "Who controls the blockchain?", Harvard Business Review. [Online] https://hbr.org/2017/04/who-controls-the-blockchain

initiate the order, the timing, price or quantity of the order or how to manage the order after its submission. Due to the risks related to this automation process, HFT has been punctually regulated to underline and protect market stability. In the European Union, its discipline is in the Directive 2014/65 EU (MiFID II)[78]. More specifically, article 17 paragraph (1) Directive 2014/65 EU states that "an investment firm that engages in algorithmic trading shall have in place effective systems and risk controls suitable to the business it operates to ensure that its trading systems are resilient and have sufficient capacity, are subject to appropriate trading thresholds and limits and prevent the sending of erroneous orders or the systems otherwise functioning in a way that may create or contribute to a disorderly market[79]".

FinTech applied with blockchain, and "smart contracts" aim at decreasing monitoring and enforcement costs freeing financial institutions from relying on financial market infrastructures and improve market efficiency in clearing, settlement and transaction management. Under these types of "smart contracts," there is no need for the involvement of a third party in the process of regulating the flow of assets (for instance, the sale of assets at a given price). The blockchain is a decentralized database that may be used to store a variety of data, including monetary transactions and legal agreements, among other types of information. You are free to put it to use for anything that calls for an unchangeable record of events that can be checked by several parties independently. Many individuals are able to read it, examine it, and even add information; nevertheless, they are unable to change or delete anything. With each purchase, the history of a product might be documented and archived for future reference. In order for a new transaction to be approved and for the block of data that is associated to the transaction to be added to the ledger, the entities that are engaged in the transaction and that have copies of the blockchain need to reach a consensus that the transaction is lawful.

Blockchain technology has the potential to both produce and confirm provenance thanks to its ability to preserve an immutable digital record of an object's life cycle and to trace this

[78]DIRECTIVE 2014/65/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 15 May 2014 "On markets in financial instruments and amending" Directive 2002/92/EC and Directive 2011/61/EU (Text with EEA relevance)
[79]Ibid.

item through a chain of custody. The existence of an immutable record of registered things enables various parties located at various points along the supply chain to verify the legitimacy of those registered objects. The technology behind blockchain has the potential to replace industry-wide paper-based systems, which are notorious for their inefficiency, susceptibility to manipulation, and frequent unavailability in the event that an item changes hands or location. The use of blockchain technology might make it easier to register and verify ownership of assets among parties that may not be able to be trusted but who have similar interests. This could be particularly useful in situations in which parties may not be able to trust one another. The growing use of blockchain technology in the financial industry may be ascribed to the fact that it offers a higher level of security for both financial transactions and other types of private data. When employing the technology known as block chain, each transaction is encrypted, making it very unlikely that large hacks would occur[80]. At the moment, a number of different digital currencies are dependent on the blockchain technology that underpins them. The initial iteration of the blockchain technology was conceived concurrently with the launch of the online currency Bitcoin[81]. This "chain" contains a record of every legitimate and authentic transaction that has ever taken place on the network up to this point in time. The original concept of the blockchain, known as "BlockChain 1.0," envisioned it largely as a way to transfer digital currency. However, the usefulness of the platform goes well beyond the confines of the framework, and it demonstrates aspects that are equally important in other domains. When it is used for monetary transactions, contractual agreements, and crowdsourcing, the blockchain network will develop into "BlockChain 2.0." The third version of the protocol is referred to as "BlockChain 3.0," and it places an emphasis on the technology's use in areas other than the commercial and financial sectors, such as "governance, health, literacy, culture, and art"[82].

[80]Giungato P., Rana R.L., Tarabella A., Tricase C. (2017), “Current trends in sustainability of bitcoins and related blockchain technology”. SUSTAINABILITY, vol. 9
[Online] doi: 10.3390/su9122214.
[81] Ibid.
[82]Furfaro A., Argento L., Saccà D., Angiulli F., Fassetti F. (2019), "An Infrastructure for Service Accountability based on Digital Identity and Blockchain 3.0", IEEE Conference on Computer Communications Workshops (INFOCOM WKSHPS), pp. 632-637
[Online] 10.1109/INFCOMW.2019.8845092.

Streamlining occurs in the following areas: accountability of financial transfers, guarantees of purposeful utilization, secure and efficient administration and services, free and open transfer between funds, coordination of client and fund records, and privacy of the data. This is true for both publicly owned and privately-operated pension plans[83].

Smart City includes the principles of the Digital City and that is to offer innovative services thanks to the use of digital technologies, but it also includes those that are the main aspects of the Intelligent City, namely the promotion of innovation as an engine for growth and development. Mitchell W.J. in his 1995 research "City of bits: space, place and the infobahn[84]" talks about the city, as a place made up of two dimensions, a physical and a digital part, invisible made of bits that run through a physical infrastructure made up of optical fiber networks, connected to computers around the world. He claims that thanks to technologies, you will be able to reap enormous benefits on urban management and how these opportunities are reflected in the social, economic and cultural sphere. According to his later 2007 research "Intelligent City" Mitchell states: "We arrive in the twenty first century, where cities have all the sub-systems that are needed by living organisms: structural skeletons, various layers of protective skins and artificial nervous systems. In this context, to create new intelligence in the cities, we need to combine software and digital telecommunications networks, ubiquitously embedded intelligence, and sensors and identifiers[85]". On the same note, In the 2000 publication "Digital City or Urban Simulator[86]" Luigi Aurigi gives us an interesting interpretation of the connection between technologies and city stating that digital cities were born to stimulate the local economy and develop it, through encouraging the use of digital technologies by creating virtual spaces for the purpose to connect the consumer and service providers. The use of technologies like the internet has as the main objective to promote electronic democracy through access to the internet and the services offered by its part of all

[83]Ibid. 80
[84] Mitchell W.J., (1995), "City of bits: space, place and the infobahn", Massachusetts Institute of Technology, USA
[Online] https://doi.org/10.7551/mitpress/1847.001.0001.
[85] Mitchell W.J., (2007), Intelligent cities. UOC Papers. Iss. 5. UOC,
[Online] https://doi.org/10.7238/issn.2462-7461.
[86]Aurigi A. (2000), Digital City or Urban Simulator? Digital Cities, Springer

citizens without distinction of any kind. One of the main objectives of Smart Cities is in fact connectivity, the realization of the studies of twenty years ago, and I objective is partially realizable thanks to the implementation of IoT technology.

The term Internet of Things (IoT) was coined in the 1990s by American researcher Kevin Ashton of the Massachusetts Institute of Technology, in an interview with the RFID Journal in 2009 arguing on the importance of human presence in data gathering looking at them as an unreliable source because it is not as precise and selective as a computer[87]. Internet of Things represents the evolution of the internet, smart devices able to autonomously connect to the network transfer data and information in real time, also being able to access a database. Smart objects are defined as such because characterized by having one or more of the following features: identification, location, status diagnosis, interaction with the environment surrounding, data processing and obviously connection. IoTs can be used for sustainable urban management because they are capable to create data, transmit and process them, giving the possibility to predict phenomena and critical issues. IoTs will soon be mandatory for the creation of a stable climate neutral city improving the quality of life of citizens through continuous and real-time monitoring of parameters such as the quality of air, water, quantity of waste and Co2 emissions. An example on the importance of IoT's application is the city of Turin who won the Award Ecohitech 2019 for the sector of energy efficiency thanks to the use of IoT technology in management urban energy. The system, composed in 88 between sensors, thanks to intelligent algorithms it allowed monitoring and energy retrofit of large buildings (schools, museum offices), detecting and calculating parameters such as humidity, temperature, and Co2, allowing a significant reduction in energy consumption (-20%), reduction[88.]

Starting from this point of view is easy to track parallelism between Digital/Smart city and Fintech. Both the system bases their strength not only on the intensive implementation of technology but also on the creation of a "net", an automatized connective tissue where the

[87]Albrecht, K., & Michael, K. (2013), Connected: to everyone and everything [guest editorial: special section on sensors]. IEEE Technology and Society Magazine

[88]Torino City Lab Official Site: https://www.torinocitylab.it/index.php/en/component/tags/tag/smart-city

IoT sensors work in a similar way that a single block inside a blockchain.

1.7 The cost of internet: digital sobriety and digital carbon footprint

This intensive implementation of blockchain technologies inside the urban structure of a city is not without repercussions and can even be counterproductive if not managed properly. he Shift Project published in March 2019 the rapport "Lean ICT – Towards Digital Sobriety" (2019)[89]in which states that "The energy consumption of Information and Communication Technologies (ICT) is increasing by 9% every year. It is possible to limit this growth to 1.5% per year by moving to sober digital practices. The digital transition as it is currently implemented participates to global warming more than it helps preventing it. The need for action is therefore urgent". Most of the energy that powers the internet comes from sources that use fossil fuels such as coal, natural gas, and oil. Digital professionals, such as designers and developers, are partly responsible for associated emissions to the web. Much of the internet traffic goes through data center, i.e., physical places which host IT services and infrastructures, operating 24 every day, every year of the year. According to the International Energy Agency[90,] data centers consume about 200 terawatt hours (TWh) of electricity, or nearly 1% of global demand, constituting 0.3% of total emissions of greenhouse gases. With the explosion in data traffic and rapidly growing processing needs, these figures are expected to increase, always if no targeted measures are implemented to reduce energy consumption. The implementation of new one's laws and guidelines on energy efficiency, together with the purchase of renewable energy and research and development will in fact be essential to curbing growth in emissions over the next decade.

60% of all data and cloud services are provided by only three companies Amazon, Microsoft, and Google. Google claims to be Carbon Neutral since 2007 and aiming for zero emissions by 2030; In 2019, Amazon CEO Jeff Bezos has promised to reach zero emissions by 2040

[89] The Shift Project (2019), "LEAN ICT: TOWARDS DIGITAL SOBRIETY": OUR NEW REPORT ON THE ENVIRONMENTAL IMPACT OF ICT
[90] IEA (2021), Data Centers and Data Transmission Networks, IEA, Paris

and increase the use of renewable energies to power your cloud[91]; Microsoft has also repeatedly expressed its goal of becoming "carbon negative" and "water positive" by 2030[92]. Furthermore, all three companies have put into practice concrete projects focused on sustainability. Google recently developed a new metric that provides an indication of how green they are its data centers: the CFE%. The CFE%, or percentage of energy carbon-free, indicates which type of energy is used to power the facilities on an hourly basis in one certain geographic region. The higher the value, the greater it is clean energy that powers them. As Google itself explains: "To characterize each region we use a metric: CFE%. This metric is calculated for every hour and tells us what percentage of the energy we consumed during an hour that is carbon-free.[93]"

Despite the intervention of the big tech companies, the issue remains and the sum of information circulating on the network year after year continues to expand the amount of energy required. There's a part of the conversation that speaks against the huge consumption caused by blockchain technologies, but much less consideration is paid to the risks that come with implementing IoT technologies on a larger scale. We are already leaving in a situation in which the internet is not ecologically sustainable: 5G will allow us to send a monstrous sum of information which our photographs, YouTube recordings, and music on Spotify, increasing the traffic on the network and therefore the energy consumed by the internet. "To save the internet and ourselves, we'll need to harden and relocate the infrastructure we've built, find cleaner ways to power the web, and reimagine how we interact with the digital world"[94] servers need electricity, and that electricity comes from fossil fuels and behind the internet, there is a physical infrastructure that was not designed with the climate crisis in mind. The implementation of green energy allocated only for the internet is mandatory, but also a new approach to the usage of the web is needed not only from Fintech firms and stakeholders

[91]Palmer A. (2019), "Jeff Bezos unveils sweeping plan to tackle climate change", CNBC News [Online] https://www.cnbc.com/2019/09/19/jeff-bezos-speaks-about-amazon-sustainability-in-washington-dc.html
[92]Create a Sustainable Future, Microsoft Official Website: https://www.microsoft.com/en-us/corporate-responsibility/sustainability.
[93] "Sustainability", Google guidelines against carbon footprint: https://cloud.google.com/sustainability/region-carbon
[94]Stone M. (2019), "The Planet Needs a New Internet" [Online]https://gizmodo.com/the-planet-needs-a-new-internet-1837101745?mc_cid=489e8fffbe&mc_eid=b20ff00d6b

but also by the population itself, by the clientele. Global restrictions due to COVID-19 have led millions of people to increase their presence on the web: Video calling, email, instant messaging, and virtual entertainment have replaced face-to-face interactions in and out of the workplace, and this new global approach to the internet made a huge impact on data traffic. Between February and April 2020, data traffic increased by almost 40% due to the increasing number of online users[95]. According to current estimates, the web will be three times more in 2025 extended compared to 2010. This expansion will result in an increase in the carbon footprint which, from the current 3%, will increase to 6%[96]. The Covid experience presents a huge point of concern especially if we look at how much Co2 a single personal device can produce: In Europe, a smartphone produces 0.54 Kg of CO2 and consumes 1.825 kWh per year, or approximately 0.05% of the total electricity consumed in a home with four people[97]. At first glance, the impact may seem minimum, but you must also consider all users around the world who use it every day of the year and recharge their mobile phones. The situation is even worse if we take the personal computer into consideration: a computer running for eight hours a day consumes almost 600 kWh and emits 175 kg of CO2 per year, and a laptop turned on for eight hours a day consumes between 150 and 300 kWh and emits between 44 and 88 kg of CO2 per year[98]. Blackstad & Allen research[99] indicates that the integration of blockchain technology and artificial intelligence will make it possible to convert data on monetary transactions into carbon footprints. This would, for the first time, bring attention to the real-time environmental consequences of monetary transactions. In conjunction with the proliferation of use of blockchain technology and other forms of financial technology, there has been a rise in the level of worry around the vast amounts of electricity, heat, and money that are required for its functioning[100]. The information that is made available by social

[95]IEA (2021), "Global Energy Review: CO2 Emissions in 2020"
[Online] https://www.iea.org/articles/global-energy-review-co2-emissions-in-2020
[96] Ibid.
[97]Buglar E. (2021), "*Carbon Footprint of phone Charging"*, The Burrow
[Online] https://www.comparethemarket.com.au/energy/features/carbon-footprint-of-phone-charging/
[98]Ricaldone D. (Academic Year 2021/2022), "*REFRESH: progettazione di una piattaforma digitale per la realizzazione di siti web ecosostenibili*", Bachelor Thesis, Istituto Politecnico di Torino
[99]Blakstad S, Allen R (2018), "FinTech Revolution: Universal Inclusion in the New Financial Ecosystem", Basingstoke: Palgrave Macmillan.
[100]Sedlmeir, J., Buhl, H.U., Fridgen, G. et al. (2020), "The Energy Consumption of Blockchain Technology: Beyond Myth". Bus Inf Syst Eng 62, pp. 599–608.

networking sites may help customers have a better understanding of how the environmental effect of their purchases affects the world[101]. If customers had access to more environmentally friendly products and services, there would be an increase in sales. Institutional investors and public pension policyholders are motivated to achieve a better ecological-economic balance in their company operations when they invest in the digital economy[102]. There is a substantial group living inside the European Union that places values other than monetary gain higher on their list of priorities. The main future trends addressed below will be more responsible for the increase in emissions associated with our online presence. There's a need to educate the user on "Digital sobriety"[103] executing restraint in online video employment implies diminishing the utilization and estimate of video records. This requires a direction of the employments with exact methods, and in this way a societal talk about. The employments of computerized innovations are to an awesome degree the item of a framework and not the sole result of personal buyer behavior. Whereas direction can be grounded in existing instruments and organizations, it moreover requires societal talk. Without a doubt, in a world stood up to such restrictions as those forced by climate alter and the exhaustion of normal assets, not choosing between employments will lead to the arbitrary burden of limitations instead of discretion between alternatives, with governments imposing emission limits on data centers and the citizen resorting to technological solutions, hardware, and software, in proportion to the real needs, avoiding exploiting functionality and methods of use that, although present in these solutions, would increase energy consumption. Respecting commitments such as the Paris Agreement[104,] which aim to ensure the survival of our systems, means drastically reducing our energy consumption and the associated greenhouse gas emissions, it is therefore important to remember that each physical transformation and therefore each of our activities, including that of sending, processing, or storing information, requires energy. Digital technology is therefore both a tool and a challenge for the carbon transition: the opportunities

[Online] https://doi.org/10.1007/s12599-020-00656-x

[101]Ibid. 48

[102]Nguyen T., Novak R., Xiao L., Lee J. (2021), "Dataset Distillation With Infinitely Wide Convolutional Networks" [Online] https://openreview.net/forum?id=dBE8OI8_ZOa

[103]Efoui Hess M., Geist J.N. (2020), "Did The Shift Project really overestimate the carbon footprint of online video? Our analysis of the IEA and Carbon Brief articles"

[104] Paris Agreement, United Nations (2015)

it offers are real, but subject to the same constraints as the rest of our systems[105], and the innovation challenge is to learn to characterize, by quantifying energy and environmental costs, the conditions for deploying our digital technologies that make them relevant from an environmental point of view.

The environmental impacts connected to the digital carbon footprint are not restricted to online use only: the upkeep of our digital economy requires large-scale extraction of resources natural, the utilization of noteworthy amounts of vitality, and the generation of a critical sum of waste progressively troublesome to recycle[106.] The most contentious issue from an environmental standpoint is the extraction of precious metals (Rare Earth Metals), a group of 17 elements used in circuits and batteries, materials taken from the earth's surface, requiring large-scale mining operations, which are frequently carried out in underdeveloped nations, with the implication of Indeed enormously wasteful procedures. Around 60% of global REM production is controlled by China[107], which benefits from lower labor costs and less stringent environmental regulations. in comparison to Western countries most mines Indeed, it is seen in politically vulnerable countries, when the absence of Regulation emphasizes the importance of respecting one's rights and workers' safety. Moreover, between 20 and 50 million tons of electronic garbage (e-waste[108]), are discarded throughout the world, with substances harmful to the environment and non-biodegradable. Digital sobriety means moving from instinctive or even compulsive digital to controlled digital, which knows how to choose its directions: in view of the opportunities, but also in view of the risks. Deploying digital sobriety means managing our technological choices, the deployment of infrastructures, and associated uses in order to preserve the essential contributions of digital technology and without accurate control, policies and strategies for deploying digital tools will remain the

[105]The Shift Project (2020), PUBLICATION DU RAPPORT «DÉPLOYER LA SOBRIÉTÉ NUMÉRIQUE»
[Online] https://theshiftproject.org/article/deployer-la-sobriete-numerique-rapport-shift/
[106]Barnes, O.B.P.L. (2020), "Shrinking our carbon footprint: Update one."
[Online] https://doi.org/10.11647/obp.0173.0108.
[107]Nogrady B. (2016), "Your old phone is full of untapped precious metals" BBC.
[Online] https://www.bbc.com/future/article/20161017-your-old-phone-is-full-of-precious-metals
[108]UN Enviornmental Programme (2022), "BRS COPs conclude with major decisions on e-waste movement and ban of harmful chemicals affecting firefighters"
[Online]https://www.unep.org/news-and-stories/press-release/brs-cops-conclude-major-decisions-e-waste-movement-and-ban-harmful

wasted opportunities of a digital transition which, although ubiquitous, will fail to contribute to meeting the physical and societal challenges of this century.

Chapter II

How fintechs are shaping the world: from urban sustainability to crowdfunding

2.1 Abstract

Changes to the environment, such as deforestation and slope instability, which lead to landslides and flash floods, are a direct outcome of urbanization. Shifts in the Economy Both developed and developing country urban areas have seen the effects of globalization and economic reorganization in the last several decades, the effects on urban labor markets have been especially profound, with increasing occupational and economic stratification. Cities house most of the world's population and are responsible for the bulk of the world's CO2 emissions and other environmental pollutants, therefore, the way cities manage their resource needs and flows are critical to determining the viability of metropolitan areas, including the global ecosystems on which they are dependent for the provision of the commodities and services they require[109]. According to the World Health Organization (WHO), the urban population in 2014 comprised 54% of the overall population and it is anticipated that by the year 2050, more than 6 billion people would call cities their permanent home[110.] A change that brings about a significant shift in the role that cities and local governments play: in point of fact, cities need to get ready to host large communities with dwindling amounts of resources and the requirement to deal with significant challenges (such as poverty, climate change, urban competition, etc.), because smart cities are the dominant paradigm of urban development today and have become a key branding tool for cities, these difficulties demand

[109]Krueger, E.H. et al. (2022), "Governing sustainable transformations of urban social-ecological-technological systems," npj Urban Sustainability,
[Online] https://doi.org/10.1038/s42949-022-00053-1

[110]Moreno-Monroy A.I., Schiavina M., Veneri, P. (2021), "Metropolitan areas in the world. delineation and population trends," Journal of Urban Economics, 125
[Online] https://doi.org/10.1016/j.jue.2020.103242.

tight coordination between local governments, industry, and research institutes. To counter these issues and achieve the intents of green transition we need to identify a wide range of integrated, urban, and ecological acts that contribute to achieving urban sustainability, protecting and conservating the quality of environmental resources, and ensuring the quality of air, water, and soil at levels sufficient to support animal and plant life, and to limit the amount of pollution that is released into the environment[111]. Two repeating features are present in the new sustainable urban designs that adapt the old environmental model and make it possible to fulfill these goals: the elimination of the protection and conservation approach and the introduction of the concept of "environmental balance[112]" in urban transformations. The Smart City application industry is worth just around 8%, or 230 million euros, of the whole IoT market. According to the data, while 51% of medium-large towns have begun a Smart City initiative in the last three years, 56% are still in the testing phase. Furthermore, 74% of the adoption driver was an enhancement of the services provided, and the projects largely dealt with intelligent lighting, tourism services, and garbage collection., which can guarantee the improvement of the ecological conditions of the city, and which can be evaluated in objective terms, through a qualitative balance of environmental resources[113]. Smart cities can impose new urban-ecological standards focusing on issues like enhancing air quality, restoring water balance, cleaning up polluted soil, and bolstering biodiversity using IoT, fintech, and distributed ledger technologies as a "network" with a methodical approach to optimizing the system's impact on the city by interpreting its component parts in a hierarchical fashion based on their relative importance with integrated urban-ecological actions incorporated into the plan contribute to the general process of ecological regeneration of the city, protecting non-reproducible environmental resources and favoring the regeneration of reproducible ones. In this chapter, I will look at the socio-economic impact these technologies are having not only from a “green urban planning” point of view, but also

[111]Silvestrini, G. et al. (2015), Atlante delle Smart City: Comunità Intelligenti Europee Ed Asiatiche. Milano.: Franco Angeli
[112]Oliva F. (1998) “Integrare urbanistica ed ecologia”
[113]Global IoT in smart cities market size, share & industry trends analysis report by component, by solution type, by services type, by application, by regional outlook and forecast, 2021 - 2027 (2022), Giving Intelligence Teams an AI-powered advantage.
[Online]https://www.reportlinker.com/p06249506/Global-IoT-in-Smart-Cities-Market-Size-Share-Industry-Trends-Analysis-Report-By-Component-By-Solution-Type-By-Services-type-By-Application-By-Regional-Outlook-and-Forecast.html?utm_source=GNW

from a financial and legal one taking into consideration three major factors in consideration: Urban sustainability, cooperation between public-private people, and compatibility with European privacy/data protection rules.

2.2 New urban sustainability and cross-sectoral economy

The conditions for sustainability can be met if the good practices enabled by the urban plan, inherent to the management methods of existing urban fabrics and those for the construction of new settlements, are coupled with the completion and construction of the ecological network, and thus the protection and strengthening of the areas of biodiversity, and interventions to guarantee new modes of mobility and a system of technological infrastructures[114]. Many urban sustainability efforts focus on local improvements in ecosystem protection, which are frequently accomplished through the outsourcing of production and polluting industrial processes to other regions or countries, as is the case for feed crop production and heavy industry. Other urban sustainability efforts focus on only one aspect of sustainability (such as GHG emissions) at the expense of others[115.] To begin addressing the issue of sustainability, one of the first steps that must be taken is to improve resource efficiency across the board, this includes increasing energy efficiency in buildings and networks, fuel efficiency in transportation, water efficiency, and the development of new methods to convert waste into energy.

Conventional urban systems operate in a linear manner: resources are collected, used, and then disposed of into the surrounding environment discharging pollution like domestic and industrial wastewater (with limited treatment) back into the environment[116.] Lacking the necessary feedback between ecosystems and consumers, these linear urban supply networks fail to flag degradation or overexploitation of ecosystems. Cross-sectoral techniques, for

[114]Ibid. 106
[115]Ibid. 109
[116]Vătămănescu E., Pînzaru F. M (2018), „Knowledge management in the sharing economy: Cross-sectoral insights into the future of competitive advantage", Springer International Publishing.

example, can be implemented, focusing on the possible synergies between the inputs and outputs of the different sectors. Reuse and recycling systems have been established to combat the issue of shortage. This is shown by the deployment of systems for Windhoek's (Namibia)[117] water delivery system and Singapore's NEWater[118] recycling system, both of which redistribute cleaned wastewater to consumers. Another example is WEF (also known as the coordinated management of networked water, energy, and food systems), which links the wastewater sector with agriculture via the treatment of wastewater for irrigation and the recovery of nutrients for agricultural fertilization[119]. There must be a high degree of coordination between the many social actors, ecosystems, and technologies for cross-sectoral systems to compete to fruition. For example, water suppliers and wastewater managers must collaborate to ensure that water brought into the city and converted to wastewater can be adequately treated and discharged and that nutrients and biosolids extracted from sewage sludge adhere to quality standards to prevent soil and crop contamination. This is necessary to guarantee that the water transported into the city and converted to wastewater can be treated and released effectively (e.g., heavy metals contained in wastewater can contaminate agricultural soils, rivers, and groundwater).

Cross-sectoral systems derive their fundamental notion from the wider concept of Circular economy. In its most limited definition, circular economy (CE) refers to systems that minimize, recover, reuse and recycle resources and materials across several industries. Other interpretations of the CE include the goals of well-being and inclusivity, as well as the necessity for a radical societal transformation, including changes in attitudes and traditions, policymaking, and business models, in order to decouple economic growth from resource consumption. The ability of the CE to achieve sustainability goals is hindered by several fundamental challenges, such as the decoupling of economic development and consumption;

[117]Lahnsteiner, J. and Lempert, G. (2007), "Water management in Windhoek, Namibia," Water Science and Technology, 55(1-2), pp. 441–448.
[Online] https://doi.org/10.2166/wst.2007.022.
[118]Vincent, L. et al. (2014), "The energy cost of water independence: The case of singapore," Water Science and Technology, 70(5), pp. 787–794.
[Online] https://doi.org/10.2166/wst.2014.290.
[119]Chang, Y. et al. (2016), "Quantifying the water-energy-food nexus: Current status and trends," Energies.
[Online] https://doi.org/10.3390/en9020065.

rebound effects resulting from increased resource efficiency, and resource tradeoffs in the bioeconomy, such as the use of biofuels, which in some cases can be more environmentally damaging than fossil fuels. Although technology is not the only factor necessary for sustainability, a significant portion of the most recent academic literature describes CE via the lens of technocracy, forgetting the more holistic and transformative ideas of circularity. In the same context, diverse social and political contexts bring different approaches and ideas on challenges associated with CE. China and Europe, although having distinct motivations (i.e., governmental or 'top-down' in China vs. societal or 'bottom-up' in Europe)[120], and implementation tactics, has two different principles in the implementation of a circular city (technological innovation vs. socio-technological and socio-ecological approaches)[121]. China and Europe are also ahead of the pack in terms of smart city idea adoption. China's resource efficiency grew by 35% between 2005 and 2013, while the country's waste intensity reduced by 47%, due to the deployment of simplified technical processes made feasible by the introduction of CE-related regulations and financial incentives[122]. In Europe, the emphasis has shifted from boosting material efficiency, as in China and other nations, to broader and more diverse initiatives that have been initiated at the sub-city and other levels of government. Among them are urban living lab projects, social and industrial start-ups, and start-ups pushing and applying CE ideas in a variety of fields. Among them are urban agri-food, textiles, plastics, the recycling of construction materials, water, and transportation. These start-ups are backed by civil society groups that provide CE-related assistance.· Consequently, the efforts of European CE and the associated language extend beyond material flows to include the cultivation of social, inclusive, and collaborative ideals; green identities; sharing economies; community gardens and spaces of creative interchange, etc. These sorts of projects engage several layers of actors, including companies, non-governmental

[120]Chen, C., Wang, Z. and Guo, B. (2016), "The road to the Chinese smart city: Progress, challenges, and Future Directions," IT Professional, 18(1), pp. 14–17.
[Online] https://doi.org/10.1109/mitp.2016.2.
[121]Ghisellini, P., Cialani, C., Ulgiati, S. (2016), "A review on circular economy : the expected transition to a balanced interplay of environmental and economic systems. Journal of Cleaner Production"
[122]Ibid. 120

organizations (NGOs), state-level actors, and members of civil society[123].

Both the CE and the WEF nexus approaches have the potential to result in certain increases in efficiency, and recent high-level policy projects, such as the European Green Deal and the US Green New Deal, incorporate components of the CE, which have implications for the management of urban resources, despite this, there are still a great number of practical obstacles to overcome, such as social and technical roadblocks, as well as a scarcity of legal and political frameworks. This will call the need for governance interventions that are thoughtfully and comprehensively designed, some examples of these would be the realignment of subsidies, price floors, trade regulations, and pricing of externalities to favor plant-based diets, as well as efforts to emphasize the link between food production and consumption. Governance mechanisms that promote inclusive policy and decision-making arrangements can bridge the gap between bottom-up behavioral changes and top-down incentive structures and laws because they place an emphasis on inclusivity[124]. In order to prevent the externalities that are the consequence of outsourcing and problem-shifting, more inclusive definitions of sustainability objectives that take into consideration interactions on several scales and in multiple sectors are required. In various contexts of governance, technocratic or social innovations will be preferred, and it will be able to determine whether these innovations are implemented via top-down control, bottom-up efforts, or a mix of both. Urban planning influences the efficiency of land and resource use, CO2 emissions, public health outcomes, and the resilience of cities to climatic effects.

2.3 Different visions of urban sustainability: top and bottom

The relationship between urban planning and the creation of smart cities is intricate. On one hand, top-down planning is slowly imposing the dominance of IT firms in urban development but on the other, innovative bottom-up efforts are beginning to emerge at the neighborhood

[123]Fratini C.F., Georg, S., Jørgensen M.S. (2019), "Exploring circular economy imaginaries in European cities: A research agenda for the governance of Urban Sustainability Transitions," Journal of Cleaner Production, 228, pp. 974–989. [Online] https://doi.org/10.1016/j.jclepro.2019.04.193.
[124]Ibid. 109

level to challenge top-down control. social learning and reflexive action on the part of stakeholders are essential in order to guarantee that transformational processes continue to be adaptable and in line with the ever-evolving sustainability goals. When it comes to handling multidimensional uncertainties, social or collective learning is of utmost importance. These uncertainties call for the integration of information across scales and sectors, and they are impossible for a single actor or institution to fully comprehend[126]. The interpretation of the two models makes it very evident that the role of public actors should be placed front and center. Bottom-up is the name given to the first strategy, which has been used mostly in the United States to establish itself with the function of public authorities reduced to the promotion of a regulatory framework that is conducive to the integration of technology and, more generally, intelligent components into the economic system. and permitted. The tendency toward constructing models within which to offer areas of freedom for the growth of activities is represented in the study of the different sectors of the smart city. The second strategy, which is more common in Europe and is known as a top-down approach, assumes a commitment on the part of public bodies on several different fronts. In the first place, with respect to investments and funding, the European calls for smart cities represent a tangible example, and to this day, they have garnered the most support. These cities have been deemed the most promising. In different settings of governance, technocratic or social innovations will be favored, and it will be possible to tell whether these innovations are implemented via top-down control, come from bottom-up initiatives, or result from a combination of the two. The bottom-up initiative's main characteristic is building on the creativity and diverse knowledge of local actors who work together to develop context-specific approaches and solutions. These local initiatives and institutions create modular structures, which can operate independently but work best when they are interlinked to a moderate degree to facilitate coordination and exchange[127]. Inside this context, smart city development was always imposed as top-down development linked to the global trend of corporatizing urban areas,

[126]Kassam A. (2018), "Top-down and bottom-up approaches in development," The International Encyclopedia of Anthropology
[Online] https://doi.org/10.1002/9781118924396.wbiea1753.
[127]Rice J. L., Cohen D. A., Long, J., Jurjevich, J. R. (2020), "Contradictions of the climate-friendly city: new perspectives on eco-gentrification and housing justice", Int. J. Urban Reg. Res. 44, pp. 145–165

which leaves little space for citizen input, places such as Songdo, Republic of Korea, Masdar, United Arab Emirates, and PlanIT Valley, Portugal, IT businesses dominated planning and building design[128]. In Toronto, public authorities were seen as more susceptible to companies[129], while in China, mega-corporations such as Alibaba and Tencent looked to be at the forefront of a similar trend. In recent years, the major Chinese IT corporations BAT (Baidu, Alibaba, and Tencent), who own vast volumes of data, have entered the urban planning arena. Together with the United Nations Development Program (UNDP), Baidu created its Big Data Lab[130], which is devoted to investigating Spatio-temporal big data. At the 2016 Apsara Conference, the Alibaba Group established a 'City Brain' team and announced its first partnership with the Hangzhou Municipal Government. In 2018, Alibaba also cooperated with the China Academy for Urban Planning and Design (CAUPD) to create 'Future City Lab'[131,] which is devoted to the development of a smart city in Xiong'an[132]. Soft law is one of the probable methods for its translation into the level of sources, which is based on these interactions. As indicated before, Italy's chosen model for the development of smart cities, or more precisely, smart communities, seems to be based on the second model. This might be because both the Ministry of Education and the AgID have oversight power over such programs. On closer inspection, however, this distinction, while descriptively useful, is unsatisfactory if one claims to adopt one paradigm exclusively over the other. This dichotomy is descriptively valuable, but its limits become evident when this assertion is made. At the very least from an eminently legal standpoint, they conflict with an institutional reality in which, depending on the activity evaluated from time to time, the driving force might now be a public body, now a community that is organized. This reality is a direct outcome of the fact that they conflict with an institutional reality in which, dependent on the activity, they are

[128]B. Rozalowska (2020), "The Functioning of Smart City In The Context Of Global City Rankings", Silesian University publishing house, Silesian University of Technology, Gliwice

[129]Carr C., Hesse M. (2020), "When Alphabet Inc. Plans Toronto's Waterfront: New Post-Political Modes of Urban Governance", Urban Planning and the Smart City: Projects, Practices and Politics, vol. 5, No. 1 [Online] https://doi.org/10.17645/up.v5i1.2519

[130] Baidu Big Data and its Applications in Official Statistics: https://unstats.un.org/unsd/trade/events/2014/beijing/presentations/day2/afternoon/7.%20Baidu%20Big%20Data%20and%20its%20Applications%20in%20Official%20Statistics--L%20-1.pdf

[131] China Academy of Urban Planning and Design (CAUPD): https://www.urbaneuchina.eu/en/partners/china-academy-of-urban-planning-and-design/

[132]Wei H. (2017), "Alibaba pledges to turn Xiongan into 'prototyped smart city'", ChinaDaily [Online] https://www.chinadaily.com.cn/business/2017-11/08/content_34286206.htm

sometimes regarded. Certain duties, including infrastructure, IT coordination, data administration, etc., must be inevitably transferred to centralized management and a subject whose activity is functionalized to pursue a non-exclusive interest. In actuality, the need for this duty delegation is self-evident. Even though some practice experiences demonstrate the existence of concrete examples that can be attributed to the bottom-up model, these should not lead to the easy automation of the smart city/bottom-up model, which would result in a myopic and naive perspective, especially considering the critical discoveries that will be made in the following paragraph. However, it is hard to ignore the significance of this strategy, which complements the top-down paradigm well. It aligns with the practical and legal capacity of local communities to govern urban "micro-interventions"[133]. "This capability to handle "micro-interventions" is essential for the creation of a smart environment in which the many instances may find a point of effective synthesis on the landscape. Local sustainability initiatives (bottom-up) are often fragmented, lack funding, and rely on engaged individuals, which creates obstacles to lasting impacts and system-wide transformations, government initiatives (top-down) are typically short-term and responsive rather than long-term and mitigating, anticipatory, or preparatory, sectors are often managed by siloed entities, which are disconnected across sectors and spatial scales[134.] The integration of various technologies in the fields of information and communication technology (ICT), transportation, electricity, water, etc., which together comprise the infrastructural backbone of cities, gives the greatest chance for sustainability and connection between top and bottom-down initiatives, especially FinTech has the potential to expedite the distribution of funding for energy and environmental projects, encourage the building of renewable energy and environmental infrastructure, and pave the way for environmental and ecological growth by providing affordable and sufficient finance[135].

2.4 Fintech in sustainable development goals

[133]Ibid. 127
[134]Ibid. 109
[135]Hoang T.G., Nguyen, G.N., Le D.A. (2022), "Developments in financial technologies for achieving the Sustainable Development Goals (sdgs)," Advances in Environmental Engineering and Green Technologies, pp. 1–19 [Online] https://doi.org/10.4018/978-1-7998-8900-7.ch001.

Earlier, we determined that the term "FinTech" refers to a collection of relatively new technologies that have the potential to bring about major changes to the existing international monetary system such as bringing significant changes in the traditional banking sector's business practices via a process known as “disintermediation”. Financial intermediaries like commercial banks, investment banks, and mutual funds are all examples of entities that continue to play key roles in the monetary system; nevertheless, fintech businesses are gradually gaining market share away from them all over the globe. For example, the peer-to-peer lending platform makes it possible for borrowers and lenders to conduct financial transactions directly with one another, so eliminating the need for an intermediary and allowing for more advantageous conditions to be negotiated[136]. The elimination of financial intermediaries is at the heart of both peer-to-peer lending and social lending, two terms that relate to the same underlying principle[137]. The disintermediating financial service model offers a number of benefits over the traditional banking system in contrast to these benefits. These include a lower need for operating capital, more attractive lending terms, and decreased outlays for operational costs[138]. As stated before, another evidence of this is the dramatic growth in the value of digital currencies such as Bitcoin and Ethereum, with them is possible to transmit money via the internet, eliminating the need for any form of financial intermediary. Academics have established a variety of applications and advantages of cryptocurrencies, including finance for businesses in their early stages, safe and private transactions, and a decentralized, censorship-resistant way of keeping wealth. As a direct result of these transformations, the established order of banking and other types of financial institutions is being put to the test in a significant way. In the present international financial environment, one of the most critical issues is how to attract private capital in order to stimulate economic growth and maintain the stability of the banking system[139]. It is becoming

[136]Ibid. 27
[137]Ibid. 136
[138]Boratyńska K. (2019), “Impact of digital transformation on value creation in fintech services: An innovative approach,” Journal of Promotion Management 25
[Online] https://doi.org/10.1080/10496491.2019.1585543.
[139]Vincent O., Evans O. (2019), “Can cryptocurrency, mobile phones, and Internet Herald Sustainable Financial Sector Development in emerging markets?,” Journal of Transnational Management
[Online] https://doi.org/10.1080/15475778.2019.1633170.

clearer that digital finance has the ability to eliminate impediments to the extension of funding for sustainable development, FinTech can promote ecological sustainability with its capacity to facilitate the deployment of investments in energy security and environmental initiatives, to promote the construction of renewable energy and environmental facilities, and to contribute to environmental development through[140] the provision of low-cost, adequate financing[141].

First of all, the increased availability, quality, and affordability of data paves the way for valuing the effects of policy interventions, risk pricing, and the preferences of capital owners by revealing the nature of the implications of financing choices that are now considered to be externalities. New types of businesses, products, and services, in addition to the establishment of new markets in developing country like "M-AKIBA[142]" the world's first government bond to be subscribed to exclusively by citizens through mobile payments platforms. It was sparked by Kenya's iconic M-PESA[143], which has delivered a quantum increase in financial inclusion and spawned M-KOPA, a business that delivers distributed solar energy to poorer house-holds without a credit record. M-PESA was sparked by Kenya's iconic M-PESA. Another example is "Kickante[144]" the online platform for crowdsourcing initiatives that staged over 8,000 campaigns in which artists, nonprofit organizations, and corporations have participated. These campaigns include an organization in Sao Paulo that is an ecological refuge, placing an emphasis on the collection of money for initiatives that will have a good impact on society and the environment. These projects include low-carbon development, the management of solid waste, and the construction of infrastructure. FinTech's also has the ability to change values, incentives, and behavioral results in a way that is more aligned with the Sustainable Development Goals (SDGs). The provision of personalized, real-time carbon-use statistics based on algorithms of financial transaction data by Ant Financial Services and its partners at UNEP and the Sustainable Digital Finance Alliance has enabled more than 300 million

[140]Ibid. 136
[141]Walker, J.I., Pekmezovic, A. and Walker, G.R. (2019), Sustainable development goals: Harnessing business to achieve the sdgs through finance, Technology and law reform. Chichester: John Wiley & Sons Ltd.
[142]M-AKIBA Official Site: http://www.m-akiba.go.ke/
[143]M-PESA plan: https://www.vodafone.com/about-vodafone/what-we-do/consumer-products-and-services/m-pesa
[144]Kickante Official Site: https://www.kickante.com.br/

Chinese users of Alipay to participate in efforts to reduce carbon emissions. These efforts are made possible thanks to Ant Financial Services[145]. As a result of digitalization, citizens, particularly those who have historically been excluded from economic and financial opportunities, may discover that they have more influence in the value chain of financing, boosting collaboration between Top and bottom-down participation. For individuals who own pension policies, for example, increasing their dependence on robo-investors could make it feasible for them to make judgments on value-based investments. Advances in governance, which, in turn, better align finance with the SDGs, new mandates, regulations, laws, standards, and norms may be established. For instance, at a time when Positive Money[146] and others argue for a decreasing role for commercial organizations in this public-goods crucial job, FinTech offers the possibility for more sophisticated governmental involvement in the establishment of credit, increasing transparency while simultaneously strengthening accountability.

The digitalization of financial flows enables better monitoring, reporting (and consequently, accountability), and, in theory, increased collaboration between state authorities. This is made possible by initiatives such as the Global Forum on Transparency and Exchange of Information for Tax Purposes, which is sponsored by the OECD[147]. In spite of this, the OECD places considerable emphasis, for instance, on the tax concerns related with digitization in its analysis. The OECD believes that these issues might make it easier to evade taxes and, more broadly, to engage in profitable illicit activities[148]. Ant Financial Services is now one of the largest small and medium-sized enterprise (SME) lenders in the world, and it all started in China. It has adopted its so-called "3-2-1 approach,"[149] which stipulates that the application procedure takes three minutes, the decision takes one minute, and no collateral is needed for any loan whatsoever. This is made feasible by the fact that Ant has access to a trove of

[145]Aljohani A., Al-Begain K. (2013), "Transaction-centric mobile-payment classification model," 2013 Seventh International Conference on Next Generation Mobile Apps, Services and Technologies.
[Online] https://doi.org/10.1109/ngmast.2013.21
[146]Positive Money Official Site: https://positivemoney.org/
[147]Tax: G20 countries strengthen international tax co-operation:
https://www.oecd.org/ctp/taxg20countriesstrengtheninternationaltaxco-operation.htm
[148]OECD (2015), G20/OECD Principles of Corporate Governance, OECD Publishing, Paris,
[149]Ibid. 142

information about small and medium-sized firms (SMEs) courtesy of its parent company, Alibaba, as well as the fact that the company is able to apply artificial intelligence to profile borrowers down to the tiniest of details[150.] The use of big data and AI to evaluate a person's creditworthiness might have some unintended consequences[151]. Inadvertently, through learned pathway effects, or intentionally, creditworthiness algorithms can prevent certain groups from gaining access to credit if lending decisions are not solely based on the probabilities of delinquency. This is the case if decisions are not solely based on delinquency probabilities. There are several ethnic groups that could be undervalued as a whole, either because of a misunderstanding or for another reason. In addition, the door has been opened for "social credit" systems, which are typically developed by governments that have an interest in identifying unfavorable social deviations and seeking to incentivize the reduction of those deviations. The door has been opened for "social credit" systems because the door has been opened. It is essential to keep in mind that digitization, just like any other kind of innovation, is not devoid of the potential for negative consequences. The decreased costs of data, knowledge, and therefore risk pricing can bring a benefit to development in some circumstances, such as when it comes to supporting certain types of financial inclusion. One example of this would be if data and knowledge prices were reduced. The far-reaching impacts are often cloudy and impossible to foresee the majority of the time. The adoption of new tax rules may be avoided with the use of technology, which is a valuable instrument for ensuring compliance with the existing tax legislation. It is possible that digitalization will assist overcome the gap caused by laxity in compliance with tax legislation or inefficiency in the administration of taxes[152]. Developing countries may be able to enhance their tax enforcement by transitioning their tax administration to a digital format and using technologies such as blockchain to increase monitoring and lower the costs of audits. It is possible that the additional monies will help the achievement of the SDGs. If taxpayers follow the guidelines outlined in rule 15 of HM Treasury's document titled "Digit Financing and

[150]Idib. 146
[151]Bali Swain R., Ranganathan S. (2021), "Modeling Interlinkages between sustainable development goals using network analysis," World Development
[Online] https://doi.org/10.1016/j.worlddev.2020.105136
[152]Ibid.

Self-Financing of SDGs using Financial Technology, Legal, and Fiscal Tools of Law"[153] they will have the peace of mind that comes with knowing they are not unfairly bearing the burden of paying taxes while others evade their obligations. It would be simpler to draw a greater spectrum of taxpayers into the tax base if digitalization and automated tax collection were to reduce such expenditures. This is something that politicians are cognizant of, and it is something that would be easier to do.

Economists working for the International Monetary Fund (IMF) have said that improved data on economic activity is required in order to clamp down on tax evasion and fraud, as well as to improve the categorization of tax payments by fiscal year, which would allow for more accurate budgeting[154]. It is possible that an increase in compliance with rules, such as consumption taxes, may result in a reduction in the need for labor taxes as well. The digitalization of tax information might assist promote a greater sharing of tax information on a worldwide scale, which would further guarantee that high-value individuals and multinational organizations pay their fair share of taxes. Because of its capacity for automation, it is also capable of more effectively managing the taxes associated with online commerce[155].

2.5 Green Crowdfunding as a solution for Public-Private internship

Crowdfunding is a method that enables the financing of various projects (humanitarian, political, cultural, scientific, social, entrepreneurial, etc.) by the solicitation of funds from the general public using an internet-based platform. This innovation is one of the most significant to come out of the FinTech industry. Funding from the ground up Individuals who financially support a project of common interest, often with modest amounts, and not necessarily for purely economic reasons are the source of the funding. This means that the funding does not

[153]Sachs, J., Sachs J. D., Saks D. D., (2022), "Sustainable development report 2022: From crisis to sustainable development : The SDGs as roadmap to 2030 and beyond", Cambridge University Press.
[154]D. Strauss (2018), "Look at Issuing Digital Currency, IMF Head Tells Central Banks", Financial Times
[155]Ibid. 142

originate from a specialized topic, such as a bank or a credit institution, but rather from individuals. use of current technological methods. When an investor contributes money to a project, they should expect to get something of value in return[156]. The following are some of Switzerland's most well-known sites for crowdsourcing financial support: “I believe in you[157]”, “fundeego[158]”, “Kickstarter[159]”.

Crowd investing is a method that individuals use to fund business ventures. Lenders get interest, a stake in the company, and other benefits in exchange for their financial assistance. The objective of crowdfunding, on the other hand, is to provide financial support for an existing company rather than a particular initiative[160], the closest comparison that can be made is a loan from a typical bank to crowdlending. Donors give a certain amount of money to the organization under the premise that they will get their original investment back, together with interest. We might list a few of the most prominent ones in Switzerland where this type of company is thoroughly present inside the financial market: Cashare[161], Acredius[162], Swisslending[163].

This kind of crowdfunding, which is also known as invoice trading, is directed specifically toward companies. These businesses would in fact issue reduced invoices for services that were still outstanding on the website. The return on investment for the investor is calculated as the difference between the amount paid and the actual sum of the invoice. Therefore, firms will have access to more financial flexibility in the not-too-distant future. As a direct consequence of this, a completely new kind of financial instrument has come into existence. These platforms facilitate the matching of supply and demand for financing by making it possible for projects to be presented to potential financiers in a way that is easy, rapid, and cheap cost. Innovative applications of one's time spent online. People who are interested in

[156]Zurich Insurance Group Annual Report 2021
[157]I Believe in You Official Site: https://ibelieveinyou.fr/fr
[158]Fundeego Official Site: https://fundeego.com/
[159]Kickstarter Official Site: https://www.kickstarter.com/?lang=it
[160]A. Troisi (2014), “Crowdfunding e mercato creditizio: profili regolamentari”, Associazione ESSPER
[161]Cashare Official Site: https://www.cashare.ch/de/
[162]Acredius Official Site: https://acredius.ch/?lang=it
[163]Swisslending Official Site: https://www.swisslending.com/

the financing of a particular project and who are therefore united by the same interests form communities that use the Internet in a conscious and modern manner[164]. This is because these communities are not limited to passive use of the information received via the web, but rather actively participate in the realization of the project that is introduced. The coming together of several separate interests. It is possible that the financier of a particular project is motivated solely by economic interests, in the sense that they anticipate a return from the initiative that they are financing; alternatively, they may be motivated by other interests (such as those that are social, cultural, humanitarian, etc.) associated with the nature of the project itself[165]. Since it has the capacity to blend individual/private and collective/public needs and interests of diverse natures, crowdsourcing presents itself as a current strategy that may be used to sustainably finance projects. It is a component of the sharing economy and, by shifting from "firm production" to "common-based peer production"[166] it upends the traditional relationship between producer and consumer; in fact, the latter is not limited to the simple purchase of a good or service produced by others, but instead actively participates in its production by assuming the financial risk associated with it. The term "prosumer" refers to a new number that represents the aggregate of the often-distinct identities of the producer (producer) and the user (consumer) of a certain product or service. In order to be successful, crowdfunding projects often need the participation of a small number of people. In fact, one way to conceptualize the whole procedure is as a triangle, in which the platform, the supporters (also known as Crowdfunder's), and the project's proposer each play critical roles[167]. When it comes to carrying out the responsibilities of their job, every single person has a different set of priorities and reasons for doing so. The advocate, who may also be referred to as the creator, is the individual who makes the decision to finish the project via the use of crowdfunding. This last group tries to spread awareness about their venture by uploading a video pitch, photographic representations, or textual explanations to the site. A promoter is

[164]Hörisch, J. (2015), "Crowdfunding for Environmental Ventures: An empirical analysis of the influence of environmental orientation on the success of crowdfunding initiatives," Journal of Cleaner Production [Online] https://doi.org/10.1016/j.jclepro.2015.05.046.

[165]Gerber, E.M., Hui, J.S. & Kuo, P. (2012), "Crowdfunding: Why People Are Motivated to Post and FundProjects on Crowdfunding Platforms", CSCW Workshop

[166]Ibid.

[167]New York Times editorial staff. (2020). crowdfunding. Educational Publishing Books.

often a single person; but, depending on the model of crowdfunding that is being used, it might also be a company or a collection of individuals.

According to the findings of a research that was carried out by Northwestern University in 2012[168], the ambitions of entrepreneurs go considerably beyond generating money. To begin, this instrument may be use in order to develop long-term ties with financiers that go on after the completion of the financial transaction. These connections may continue for an indefinite period. Actually, it is possible, with the passage of time, to establish stronger connections that make it possible for campaign organizers to include Crowdfunder's in a collaborative process, and in some instances even to build a genuine community that is centered on the project itself. This is something that can be accomplished using crowdsourcing.

In addition to educating them on how to create general connections and arouse people's attention, promoters show them how to become recognized as creatives by the community of internet users. As a result, "replicating the success experience of others" might potentially serve as an extra source of incentive. The study that was stated earlier demonstrates, in addition, that the creators are motivated to establish a collection to raise their own level of self-awareness via the use of social media. In fact, particularly in the beginning of the campaign, they want to make as many people aware of their effort as possible, and they want to do this via media exposure in the hopes of attracting the attention of the media, the print media, and the television networks.

A proponent's sense of ability is boosted when an online project is validated, and as the proponent gains self-awareness, they are encouraged to continue developing their skills. Finally, the need to be recognized for one's efforts is brought to light gaining online project validation boosts the proponent's sense of ability.

The platforms act as a liaison between the people who are financially supporting the project and the people who are pushing for the initiative. Websites like this may be compared to

[168]Weng Y., Fesenmaier D. (2003), "Assessing Motivaiton of Contribution in Online Communities: An Empirical Investigation of an Online Travel Community," Electronic Markets

virtual hubs since they allow for the raising of funds and the formation of connections between artists and the audiences that support them.

Platforms make it possible for anybody to propose a venture and for a broad variety of investors to learn about it and decide whether to finance it. Platforms also make it easier for investors to communicate with one another. However, a platform also has a responsibility to remain watchful in order to avoid fraud and to disrupt efforts that encourage it. As a result of this, the monies that are collected are often put into guaranteed deposits, where they remain until the conclusion of the campaign. In Italy, there are now more than a hundred platforms, and each one distinguishes out not only because it supports a variety of crowdfunding methods but also because it caters to a certain business sector. Even though they are very important, these portals are not the only organizations ensuring that the process is carried out successfully by carrying out critical services. It is possible that we may announce the visual design and financial administration of the project being outsourced to a third party. The project manager will bring the consultants along with them everywhere they go. While "new advisors" give more specific advice on the campaign's message and advertising, advisors from the legal sector (such as merchant bankers, solicitors, and lawyers) assist platforms and the proposer if they are at danger of legal objections and civil liabilities (in particular, their focus is on digital marketing).

In the third and final stage of the crowdfunding process, those who have contributed to the campaign are the ones who are the project's supporters. They are required to sign a contract in which they commit to donating a particular sum of money to the cause that they have choose to support, and this contribution is then made via the platform itself. There is a broad spectrum of objectives that may be pursued by bankers. People may contribute financial resources to a project that is funded primarily via donations for several reasons, including lending support to an important cause or expressing gratitude to the individuals who initiated the effort. On the other hand, participants in a particular kind of financial crowdsourcing may be driven by the expectation that the venture they are supporting will be successful. One of the key reasons why people participated in crowdsourcing was to demonstrate their support

for artists or causes[169]. Philanthropic considerations play an important part in this kind of low-level fundraising since the flock is encouraged to support initiatives that represent the principles in which they believe. Investors are urged to support initiatives that reflect their own identities and the values that they uphold. An additional motivation to donate is the possibility that financial supporters would earn incentives, either in the form of tangible goods or experiences. In such a scenario, the promoters are expected to recompense all the supporters. As part of this obligation, occasionally the promoters would create several contribution levels, with the advantages associated with each level increasing in value with each succeeding gift.

In conclusion, the study that was discussed earlier revealed that one of the most common reasons Crowdfunder's contribute to a project is in order to feel like they are a part of a community. The sense of belonging to a group, sharing similar beliefs with other individuals, or having the ability to dispute the idea's promoter are all suitable incentives for providing financial support to an idea. In fact, the connection that is formed between the financier and the promoter is what distinguishes crowdfunding from other traditional ways of capitalization, and it is this relationship that is essential to the success of a crowdfunding campaign[170].

Crowdfunding presents itself as a modern tool for sustainable financing owing to its capacity to merge individual/private and collective/public needs and interests of diverse natures. As a result, crowdfunding presents itself as an option. As part of the sharing economy, this shift from "firm production" to "common-based peer production" inverts the traditional relationship between producer and consumer; in this model, the latter is not limited to the passive act of purchasing a product or service that was created by someone else, but rather actively participates in the production by taking on the financial risk of doing so. This inversion of the traditional relationship between producer and consumer is an integral part of the sharing economy. As a result of this, a new figure comes into existence: the prosumer.

[169] Ibid.

[170] Chu C.-C. et al. (2019), "Open innovation in crowdfunding context: Diversity, knowledge, and Networks," Sustainability [Online] https://doi.org/10.3390/su11010180.

This person combines the historically distinct functions of a product's producer (producer) and consumer (consumer). Lenders might get varied amounts of security and return on investment depending on the kind of crowdsourcing they participate in. Fundraising is done entirely online using individual donations. It is common practice for individuals to provide financial assistance to charitable, cultural, or social causes without the expectation of receiving anything in return for their generosity.

Fundraising using crowdsourcing with rewards. In return for loaning money, lenders get some kind of non-monetary remuneration, such as social or personal recognition. There are two distinct variants of this model of crowdsourcing: the "all or nothing" model, in which the funds will only be used to finance the project if the target amount is reached, and the "keep it all" model, in which the funds will be used to finance the project regardless of whether the target amount is reached. Both models are referred to as "all or nothing" models.

Crowdfunding in the form of loans. Individuals and corporations may get financial resources from other people via the establishment of loan agreements. You have the option of selecting one of these two separate forms: The two most common kinds of lending are consumer lending, in which individuals lend money to other individuals (consumer-to-consumer lending), and business lending, in which individuals or institutions lend money to businesses (business-to-business lending), frequently with guarantees from the borrowers. Consumer lending and business lending are the two most common kinds of lending.

A method of crowdfunding that uses the trading of bills. At a price that is decided by way of an online auction, firms may use the platform to sell outstanding bills or credits that have not yet been paid to a pool of investors. These investors are often financial institutions or subject-matter specialists. Crowdfunding in exchange for a percentage of future revenues or royalties. It is common practice to provide financial supporters of a business with ownership in the company in return for their financing; but, in order to avoid granting the shareholder title to the backers, certain contractual arrangements, such as silent partnerships, are occasionally used. The use of crowdsourcing to raise money for financial ventures. A variety of organizations meet their financial needs by selling bonds and/or shares of stock to the general

populace. Supporters participate in equity crowdfunding by purchasing shares in a company via an online platform. As a result, backers become equal owners of the business and share in its earnings and losses[171].

2.6 Fintech legal regulation regarding cybersecurity and GDPR

Following the financial crisis, significant reporting requirements prompted intermediaries and supervisors throughout Europe to digitalize in order to keep up with the rapidly evolving landscape. Europe's digitalization approach is multifaceted, beginning with the adoption of comprehensive digital reporting to regulators and ending with the enforcement of 'open banking,' where incumbent intermediaries are required to share customer data with rivals. What sets EU law apart from American law is its more stringent stance on data usage. The result of data protection regulations and protected elements is the same. Each method necessitates excluding some sensitive information before processing the input using an algorithm. However, the authority that makes the decision to omit data also has an impact on the data and factor protection rules that apply. While private factors are not open to private transactions due to data privacy, data users still need the data owners' qualified approval before using the data[172].

Information security is becoming increasingly critical in companies that depend extensively on digital technologies, such as the financial technology sector and if a network or information technology system that is used to deliver financial services is breached, it may have far-reaching ramifications for the industry as a whole and diminish the faith that customers have in the sector. In light of these concerns, the regulatory framework for information security is an essential component of the complex system of rules that may be applied either directly or indirectly to FinTech services. Because the breadth and volume of cyberattacks are becoming increasingly global, it is vital to turn to the legislation of the

[171]Ibid. 165

[172]Walker, B. (2019), "Facilitating sdgs by tax system reform," Sustainable Development Goals, pp. 303–316 [Online] https://doi.org/10.1002/9781119541851.ch17.

European Union for direction on how to effectively handle this problem. The European Union Agency for Network and Information Security (ENISA)[173] came into being in 2004 and assumed the role of driving forward the implementation of the first set of security[174] measures in this domain[175] by publishing a White Paper on national cybersecurity plans in 2012, in which it pointed out the existing disparities and presented a number of suggestions. Additionally, in December of that same year, ENISA adopted the "Practical Guide on Development and Execution,"[176] in which it asserted the absence of a common definition of Cybersecurity at the European level, a factor that could moderate the various approaches that Member States take to this topic and hinder international cooperation. This adoption came about as a result of the lack of a common definition of Cybersecurity at the European level, in addition, ENISA came up with a list of steps that, if carried out by member states, might eventually result in a single national plan that covers all disciplines. In the end, the organization devised a plan for the hypothetical life cycle of a cybersecurity strategy, which included the following stages: creation, implementation, assessment, and changes. The Communication entitled "*JOINT COMMUNICATION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Cybersecurity Strategy of the European Union: An Open, Safe and Secure Cyberspace*" was released in 2013 by the European Commission and the High Representative of the European Union for Foreign Affairs and Security Policy, and soon after the proposed directive (UE) 2016/1148 (directive NIS)[177] was produced as a reaction to this communication. This directive, which is the first official action taken by the European Union on this subject, requires member states to establish safeguards to guarantee that

[173]Regulation (EU) No 526/2013 of the European Parliament and of the Council of 21 May 2013 concerning the European Union Agency for Network and Information Security (ENISA) and repealing Regulation (EC) No 460/2004

[174]COMMISSION STAFF WORKING DOCUMENT IMPACT ASSESSMENT Accompanying the document PROPOSAL FOR A REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on ENISA, the "EU Cybersecurity Agency", and repealing Regulation (EU) 526/2013, and on Information and Communication Technology cybersecurity certification (''Cybersecurity Act'')

[175]Georgieva L. (2016), "The first EU-wide legislation on cybersecurity," European Energy & Climate Journal [Online] https://doi.org/10.4337/eecj.2016.03.06.

[176]ENISA (2016), National Cyber Security Strategies Practical Guide on Development and Execution

[177] Council directive 2016/1148, concerning measures for a high common level of security of network and information systems across the Union

networks and information systems are appropriately safeguarded[178]. This action was taken to mark the beginning of the EU's action on this issue, identifying guiding principles reveals and tight connections between cyber security regulations and policy decisions regarding internet governance. Priorities have been identified in the field of Communication that should be taken into account when tackling the challenges that have been mentioned above and can be summarized in achieving cyber resilience in order to combat trans-frontier cyber risks and cyberattacks and to facilitate the development of coordinated responses that can be implemented in times of crisis. The creation of industrial technical resources for cyber security needs to begin with the promotion of a unified market for cyber security goods and an increase in financing for research and development as well as innovation. In addition, there should be a significant decrease in cybercrime by strongly urging member states to promptly implement legislation enacted by the European Union in this area and by strengthening collaboration between various law enforcement organizations.

In response to the first of these newly outlined priorities, the European Commission created a proposal for a directive, which was first tabled during a contentious vote over the approval of the Communication and was subsequently accepted by the European Parliament. In addition, the Commission requested that ENISA provide assistance to member states in the development of cyber resilience. This assistance should include, among other things, the encouragement of the development of relevant competencies and the provision of backing for regular pan-European exercises on cyberattacks. These exercises should serve as a springboard for the eventual participation of the European Union in international exercises. Additionally, the Commission asked that companies lobby for investments that were aimed to assure a high degree of security, as well as the creation of best practices and information exchange with government authorities. The proposed directive had the following specific goals[179]: establishing binding minimum requirements for information security for all Member States; creating effective mechanisms for coordinating the sharing of information and mutual

[178]Ibid. 176

[179] Ibid.

aid between the Member States and their respective authorities; and calling for greater participation from the private sector, particularly with regard to issues of data privacy and protection[180].

As a result, the NIS Directive 2016/1148, has imposed stringent requirements on a variety of private actors, such as banks and internet service providers, in order to hold them accountable for assessing cyber security risks and enforcing effective risk management mechanisms to ensure the resilience of information networks and systems. This was done in order to hold private actors responsible for ensuring the resilience of information networks and systems. The NIS Directive has jurisdiction over two different categories of individuals at the same time. The first category consists of "operators of essential services," (such as energy, transportation, water supply, distribution, banking, financial market infrastructure, and digital infrastructure) and meets the criteria outlined in Article 5 paragraph 2 of the directive: "The criteria for the identification of the operators of essential services […] shall be as follows:

(a) an entity provides a service which is essential for the maintenance of critical societal and/or economic activities;

(b) the provision of that service depends on network and information systems; and

(c) an incident would have significant disruptive effects on the provision of that service."

[180]Crisanto J.C., Prenio, J. (2021), "Emerging Prudential approaches to enhance banks' cyber resilience," The Palgrave Handbook of FinTech and Blockchain, pp. 285–306
[Online] https://doi.org/10.1007/978-3-030-66433-6_13.

In addition, Article 6 of the Directive mandates that while evaluating unfavorable consequences, member states are required to take into consideration characteristics that cut across many industries. These factors include but are not limited to the number of users and possibly other sectors that depend on the service provided by the subject of interest, the impact of incidents, both in terms of magnitude and duration, on economic and social activities, and on public safety. In addition, the number of users and possibly other sectors depend on the service provided by the subject of interest. It is the obligation of member states to establish a list of the essential operators located in their territory for each of the sectors indicated in Annex 2 by no later than November 9, 2018, at the latest, the second group of persons who are subject to the NIS directive is the digital service providers. These individuals are able to be placed into one of three main categories: online marketplaces, search engines, or cloud service providers. Each of these groups is subject to the NIS regulation.

The directive details the relevant tools that the law of member states is required to offer in order to provide a sufficient degree of security for computer networks and systems. Article 7 discusses the national strategy for cyber security and identifies some of the elements that such a strategy is expected to address, such as objectives and priorities, as well as a governance framework that allows for the realization of such objectives and priorities through means such as legislation and regulation. In the first place, this provision addresses the national strategy for cyber security. In addition, this provision identifies some of the elements that such a strategy is expected to address. Second, the directive requires that each member state designate a single point of contact for cross-border cooperation between the various authorities competent in each member state, as well as one or more computer security incident response teams (CSIRTs), whose job it is to handle incidents and risks in accordance with a predefined procedure. Additionally, the directive requires that each member state designate a single point of contact for cross-border cooperation between the various authorities competent in each member state. However, at the European level, the directive has defined two coordination tools: the cooperation group (composed of representatives of the Member States,

the Commission, and ENISA)[181,] and a CSIRT network[182]. These tools have been established with the intention of promoting rapid and effective cooperation among the Member States, the exchange of information, mutual trust, and a high standard of oversight for all.

This directive creates a different disciplinary standard for vital service providers and digital service providers in terms of their specific security and incident reporting requirements, as well as the implementation and supervision systems for such responsibilities[183]. When it comes to the first, the directive requires that member states take the necessary precautions, both technically and organizationally, to manage cyber security risks, prevent and mitigate incidents that compromise the integrity of information networks and ensure the confidentiality, integrity, and availability of information systems and services. Managing cyber security risks involves preventing and mitigating incidents that compromise the integrity of information networks, preventing and mitigating incidents that compromise the integrity of information networks, and managing In addition, Member States are required to establish the obligation for operators to notify the competent authority or the CSIRT[184] of incidents that could have a significant impact on the continuity of essential services and provide the information required to estimate the incident's transboundary impact, as outlined by the directive. Operators are also required to provide the information necessary to determine whether or not the incident had a transboundary impact. To be more explicit, the regulation sets forth three criteria for proving the effect of the event, which are the number of users who were impacted, the amount of time that the service was interrupted, and the geographical spread of the area that was impacted. The competent authority may use the notice to tell other Member States whose essential service continuity has been impacted by the same incident. This may be done by using the notification to notify those Member States. In addition, the appropriate authority may choose, after discussing the matter with the operator, to inform the general public about the occurrence if it is determined that doing so is necessary to raise

[181] Directive (EU) 2016/1148 of the European Parliament and of the Council of 6 July 2016 concerning measures for a high common level of security of network and information systems across the Union
[182] CSIRT NETWORK Official Site: https://csirtsnetwork.eu/
[183]Markopoulou D.,Papakonstantinou V.,de Hert P. (2019), "The new EU cybersecurity framework: The NIS Directive, ENISA's role and the General Data Protection Regulation" Computer Law & Security Review
[184]Dr. Byström N. (2016), "First EU-wide cybersecurity rules: the NIS Directive", Aalto University, Helsinki

awareness among the general public in order to manage the problem and prevent additional incidents.

When it comes to digital service providers, the directive emphasizes that it is the obligation of member states to guarantee that such organizations (such as vital service providers) implement technological and organizational measures for risk management and the prevention and mitigation of incidents. This includes the focus that the directive places on foundations such as the security of systems and equipment, incident management protocols, business continuity planning, monitoring, auditing, and testing and conformity with international standards[185]. In contrast, when determining the impact of an incident, in addition to the elements already indicated for essential services, it is necessary to take into account the severity of the disruption to the normal operation of the service as well as the extent to which the incident affects economic and social activities. This is because when determining the impact of an incident, it is necessary to take into account the severity of the disruption to the normal operation of the service[186]. On the other hand, the need to report an incident is not triggered by the supply of essential services; rather, it is only activated when the provider has access to the data required to determine the scope of the event and its repercussions of it. When talking about the financial services business, which is unusually open to the general public and as a result is more vulnerable to cyber assaults, the challenges of maintaining adequate.

Computer network security comes into sharper focus. Despite the fact that the NIS directive seems to already present the potential for ensuring cyber security across a vast field of services, the question of whether or not the financial services sector requires a more specialized approach to the protection against cyber-attacks remains unanswered due to the fact that the FinTech industry is fraught with risks that are not present in other industries. Regarding the advantages, the existence of ad hoc regulations contributes to a greater knowledge of the existence of non-transferable risk profiles. Operators, in particular, should

[185] Ibid.

[186] Directive (EU) 2016/1148 of the European Parliament and of the Council of 6 July 2016 concerning measures for a high common level of security of network and information systems across the Union.

be aware of this fact and act in accordance with it. Adopting ad hoc rules may be counterproductive if a prescriptive approach was used, which would require the establishment of rules with minute details that are impossible to reconcile with the ever-evolving nature of both technology and cyber threats. This is one of the downsides of the strategy (in this case, it would be best to opt for a principle-based regulation that is more adaptable to changing circumstances). It is also important to keep in mind that in order for a specialist regulatory intervention to be truly effective (given the cross-border nature of the infrastructure used to provide financial services and cyberattacks), it should share the same matrix in European Union law, rather than merely operating on the level of individual states[187]. This is something that should be kept in mind. The Financial Stability Board released 2017 the article "FSI Insight on policy implementation No 2, Regulatory actions to strengthen banks' cybersecurity frameworks[188]." The level of collaboration that exists between various authorities will directly correlate to the level of success that can be achieved in the fight against and prevention of cyberattacks.

In regard to blockchain technology, it does not seem to be capable of meeting the requirements of European data protection legislation because of the very nature of the data it collects. The "General Data Protection Legislation" (GDPR) covers the transfer of personal data beyond the European Union (EU) and the European Economic Area (EEA)[189] and is a regulation on data protection and privacy in those regions. The General Data Protection Regulation (GDPR) is legally enforceable legislation based on the Data Protection Directive of 1995[190] One benefit is that it makes it easier for people to share their personal information freely inside the European Union. On the contrary, it establishes a legal framework for the safeguarding of some basic rights, establishing a framework of duties for data controllers (the bodies that determine the means of data processing).

There are two main factors that cause friction between blockchain and GDPR. The first tenet

[187]CBBH (2022), "Interview for Business Magazine: All goals of the payment operation reform have been fulfilled" [Online] https://cbbh.ba/press/shownews/1433?lang=en
[188]Carlos C. J., Prenio J. (2017), "FSI Insights on policy implementation No 2 Regulatory approaches to enhance banks' cyber-security frameworks", Financial Stability Institute.
[189]"Article 67 Exchange of Information," The EU General Data Protection Regulation (GDPR)
[190]DIRECTIVE 95/46/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of the GPDR is that there must be (at least) one identifiable person or entity that data subjects may approach in order to exercise their rights with regard to their personal data. On the other hand, blockchains were developed with decentralization in mind, with the goal of replacing a central authority with a network of independent players. As a result, the existing regulation's hazy definition of "joint controllership" makes it difficult to determine who is responsible for what. Therefore, the lack of legal clarity on the definition of entities that qualify as "joint controllers"[191] adds an additional layer of complexity Art. 26 GDPR: "1- Where two or more controllers jointly determine the purposes and means of processing, they shall be joint controllers. They shall in a transparent manner determine their respective responsibilities for compliance with the obligations under this Regulation, in particular as regards the exercising of the rights of the data subject and their respective duties to provide the information referred to in Articles 13 and 14, by means of an arrangement between them unless, and in so far as, the respective responsibilities of the controllers are determined by Union or Member State law to which the controllers are subject. The arrangement may designate a contact point for data subjects.

2- The arrangement referred to in paragraph 1 shall duly reflect the respective roles and relationships of the joint controllers vis-à-vis the data subjects. The essence of the arrangement shall be made available to the data subject."

Second, the GDPR is premised on the idea that data may be updated or removed if that's what's needed to meet legal obligations, such as those laid forth in paragraphs 16 (which state that data must be updated) and 17 (which state that data must be canceled, in certain circumstances). The blockchain makes it difficult to alter information for two reasons: to ensure data integrity and to foster confidence in the network. However, existing concerns over existing European data protection regulations only serve to increase the widespread skepticism of blockchain technology. The question of whether or not (hash or encrypted) data kept on a distributed ledger constitutes personal data for the purposes of GDPR is still up for dispute. Data reduction and purpose limitation are two further examples. Due to the nature of

[191]"Article 26 Joint Controllers," The EU General Data Protection Regulation (GDPR)

DLTs as append-only databases that increase in size whenever new data is added, complying with GDPR's requirement that personal data be handled exclusively for methods and purposes indicated in advance presents significant challenges. Furthermore, such information is stored in several locations. For this reason, it presents a challenge from the perspective of data minimization, and it is also not apparent how the personal data processing principle of "least privilege" should be applied to the blockchain. The "right to erasure" (sometimes known as the "right to be forgotten") is likely the most hotly contested topic with regards to blockchain technology, since they often make the 17 Data Protection Regulation (Directive 95/46/EC) was an EU directive that attempted to regulate the free movement of personal data throughout the European Union and its member states. it's difficult, if not impossible, to change the data. Once again, this presents difficulties in meeting the standards set out in paragraphs 16 and of the GDPR. There are two primary inferences we can make from this data. Primarily, it might be challenging to meet the standards of the General Data Protection Regulation (GDPR). To begin, the primary issue is the lack of clarity in European data protection legislation about the appropriate legal treatment of blockchain technology. We discovered that the technical architecture of blockchain and the data governance of DLTs are often at odds with the standards of the GDPR. Attempts to legislate blockchains only highlight the growing legal ambiguity surrounding this technology. However, it is not necessary to rewrite the GDPR. When new technologies emerge, there is a need for updated (and transparent) regulatory advice to improve legal clarity. For more detailed advice on how to apply the GDPR to blockchain technology, regulatory bodies should work together with the European Union's Article 23 Data Protection Board.

Recently a major step forward was made regarding the realm of payment services, the European Payment Services Directive,[192] more often known as the Payment Services Directive, has achieved its second iteration as the law that has formalized all the mechanisms essential to assure the effective running of digitally occurring transactions, The legal foundation for electronic payment services in the European Community is spelled out in the first Payment Services Directive (Directive 2007/64/EC), which was released on November

[192]Payment services (PSD 2) - Directive (EU) 2015/2366

13th, 2007. In November 2009, the plan was approved and became effective the following month. With the legislative decision issued on January 2, 2010, the directive became effective in Italy on March 1. More specifically, the PSD allowed for payment service providers other than conventional banking institutions and mandated price and exchange rate transparency at a higher level. And last, it has sped up the creation of SEPA as a unified euro payment area, improving the efficiency and speed with which financial transactions may be carried out. Providing customers with more options in terms of secure payment methods and insurance coverage was another priority. Payment Services Directive 2 (PSD2) aims to protect consumers while also fostering an efficient and competitive industry[193].

[193]Gaynor B. (2020), "Payment services directive 2 - all you need to know (no date) Payment Services Directive 2 - all you need to know", JPMorgan
[Online] https://www.jpmorgan.com/europe/merchant-services/insights/PSD2-all-you-need-to-know

Chapter III

Solutions and challenges of FinTech around the world: a look at Europe, Asia and Africa

3.1 Abstract

After having understood the impact that fintech firms and distributer ledge technologies are having on shaping a new form of smart city, in this chapter I will look at three different parts of the world and how (despite the different socio-economic backgrounds), with the implementation of this technologies are able to overcome the 2030 Agenda for Sustainable Development[194], especially in regard of sustainability, economic growth, and climate action.

3.2 Switzerland and "Green Fintechs": New interest in sustainable finance

The dramatic transformations that are now taking place in the financial services industry are being driven in large part by digitization efforts as well as worries over the long-term health of the financial system. Although each of these concepts has been investigated on its own over the course of the last several years, there has been a disproportionately little amount of focus directed into the intersection of them, which has been called "green FinTech." Despite the fact that the financial system is an essential component in greening the global economy[195.] Emerging "green FinTech" solutions are important to policymakers, particularly in developing and underdeveloped countries, as they seek implementation of the Paris

[194]United Nations (2023), "Transforming our world: the 2030 Agenda for Sustainable Development", Department of Economic and Social Affairs Sustainable Development
[Online] https://sdgs.un.org/2030agenda

[195]Puschmann, T., Hoffmann C.H., Khmarskyi, V. (2020), "How green fintech can alleviate the impact of climate change—the case of Switzerland," Sustainability 12.
[Online] https://doi.org/10.3390/su122410691

Agreement and support for the Sustainable Development Goals (SDGs). These solutions attempt to alleviate the risks posed by climate change. Customers, (central) banks, insurers, non-banks (startups, major tech businesses), suppliers of (technology), regulators, and other parties are all connected to one another in the value chain by means of green financial technology. Since the financial system is responsible for providing essential services to a variety of other industries, it is becoming increasingly intertwined with those industries as a result of the opportunities presented by digitalization. One example of this is the energy sector, which now provides digital infrastructures for peer-to-peer payments and many others. Blockchain technology has a wide range of potential uses, one example of which is investment solutions that focus only on environmentally responsible businesses and products. However, at this point in time, the development that was mentioned may only be considered to be in its infant stages. The presently available research has not yet presented a comprehensive analysis of this topic, and there is no structure in place to provide a more in-depth investigation of green FinTech solutions and the consequences they have.

The intersection between the protection of the environment and the management of financial resources is the focus of discussion with regard to the concept of "green finance." Green finance encompasses a wide variety of subcategories, one of which is climate funding[196]. In addition to this, it incorporates a wider range of environmental objectives, such as the control of polluting businesses, the development of better water infrastructure, and the protection of a diverse range of biological species. Financial flows that are examples of mitigation include investments in projects and programs that help reduce or prevent emissions of greenhouse gases (GHGs). Financial flows that are examples of adaptation include investments that help reduce the susceptibility of products and people to the effects of climate change. Examples of financial flows that are examples of mitigation include investments in projects and programs that help reduce or prevent emissions of GHGs. the phrases "green finance" and "green investment" are often used interchangeably. This is a typical practice, however, when

[196]Höhne N., Khosla S., Fekete H., Gilbert A. (2012), "Mapping of Green Finance Delivered by IDFC Members in 2011", Ecofys: Netherlands
[Online] https://www.idfc.org/wp-content/uploads/2019/03/idfc_green_finance_mapping_report_2012_06-14-12.pdf

green finance is really put into practice, it covers more than simply investments[197]. The usual definition of such investments does not take into account the costs that are connected with the upkeep of green assets; this is the characteristic that stands out as being the most important aspect of the model. Primarily, this would be comprised of costs such as those involved with project planning and the purchase of land, both of which are not only significant costs but also have the potential to provide their very own special financing challenges.

While the term "green finance" refers to a broad perspective across banking and finance covering all fields from payments, investment, and financing, the term "green FinTech" refers to a subarea that has been rapidly expanding in recent years and is more focused on issues that are discussed in the context of environmental protection and finance, which are based on technological innovations. While the term "green finance" refers to a broad perspective across banking and finance covering all fields from payments, investment, and financing, the term "green finance" refer.

Switzerland is in a class by itself when it comes to issues relating to the effect on the environment and the significance of the financial services industry. Two-thirds of all greenhouse gas emissions are caused by activities that take place outside of the nation, and the banking sector is a highly significant one since it manages about one quarter of all global assets. As a consequence of this, and in light of the one-of-a-kind circumstances offered by Sustainability 2020[198]. Switzerland has one of the most sophisticated financial systems in the world and is the largest international center in terms of the assets under management[199] and has committed to working toward a future in which the 17 Sustainable Development Goals are accomplished by the year 2030 as part of its adoption of the 2030 Agenda. Switzerland accomplished this goal by putting into action steps taken directly from an all-encompassing strategy for sustainable development. The responsibility of organizing the work rests on the

[197] Zadek, S. Flynn, C. (2022) "South-Originating Green Finance: Exploring the Potential; The Geneva International Finance Dialogues" UNEP FI: Nairobi, Kenya; SDC: Nashville, TN, USA; IISD: Winnipeg, MB, Canada

[198] Arner D., Buckley R., Zehzche, D. Veidt, R. (2020), "Sustainability, FinTech and Financial Inclusion", Eur. Bus. Organ. Law

[199] UN Environment Inquiry. Digital Finance and Citizen Action in Financing the Future of Climate-smart Infrastructure; Report; UN Environment Inquiry: Geneva, Switzerland, 2019.

National Working Group on the 2030 Agenda. At the leadership of this institution are the Federal Office of Spatial Development[200] (ARE) and the Swiss Agency for Development and Cooperation (SDC)[201.] A proactive approach to mitigate the consequences of climate change has been adopted by Switzerland as part of the Sustainable Development Goals (SDGs) movement. This will assist accomplish the internationally agreed-upon objective of limiting global warming to far below 2 degrees Celsius. The applicable CO2 Act places a significant emphasis on Switzerland's domestic emissions as its principal area of concern. On the 28th of August 2019, the Federal Council of Switzerland came to the conclusion that Switzerland should reduce its emissions of greenhouse gases to net zero by the year 2050. The country also has plans to reduce its domestic emissions of greenhouse gases by at least 20% from their levels in 1990 by the year 2020 and by 50% by the year 2030[202]. Examples of new policies that have been put into effect include carbon dioxide (CO2) taxes, emissions trading, buildings, CO2 emission limitations for autos, CO2 emission compensation, climate training and communication program, technology fund, and sector agreements. According to the Environmental Protection Act (EPA, Art. 41a)[203] and the CO2 Act[204], the Swiss Confederation has the authority to negotiate and conclude agreements with various sectors of the economy (Art. 3 para. 4). There are now two agreements that have been achieved up to this point: The Federal Department of the Environment, Transport, Energy, and Communications (DETEC) has set a target agreement with waste-recycling plants in the state of Switzerland to reduce carbon dioxide (CO2) emissions from waste incineration by 200,000 metric tons CO2 in 2020 compared to 2010 and by a total of 400,000 metric tons CO2 by 2050. These reductions are part of a larger goal to reduce emissions by 400,000 metric tons CO2 by 2050[205]. Moreover, the rise of green financial technology in Switzerland may be

[200]Switzerland Federal Department for Spatial Development: https://www.are.admin.ch/are/en/home.html
[201]Switzerland Federal Department of Foreign Affairs (2021). "Swiss Agency for Development and Cooperation" [Online] https://www.eda.admin.ch/eda/en/fdfa/fdfa/organisation-fdfa/directorates-divisions/sdc.html
[202]Switzerland Federal Council (2021), "Climate protection: Federal Council adopts Switzerland's long-term climate strategy"
[Onine] https://www.admin.ch/gov/en/start/documentation/media-releases.msg-id-82140.html
[203]Federal Act on the Protection of the Environment (Environmental Protection Act, EPA) of 7 October 1983 (Status as of 1 January 2022) The Federal Assembly of the Swiss Confederation, based on the Article 74 paragraphs 1 of the Federal Constitution,' and having considered a Federal Council Dispatch dated 31 October 1979,
[204] Federal Act on the Reduction of Greenhouse Gas Emissions (CO2 Act), (13/06/2021)
[205]Ibid. 196

somewhat attributed to the country's growing interest in sustainable finance. Within the context of the financial sector, the practice of incorporating environmental, social, and governance (ESG) considerations into investment decisions is referred to as sustainable financing. Environmental concerns may refer to climate change mitigation and adaptation in a broader sense, whereas social elements may include issues of inequality, inclusion, and human rights. The rising interest in sustainable finance over the last several years is reflected in the increasing relevance of sustainable financial investments for wealth management and investment guidance, in addition to pension funds and insurance companies. The Swiss Sustainable Investment Market Study 2020, which was prepared by Swiss Sustainable Finance and the Center for Sustainable Finance and Private Wealth (CSP) at the University of Zurich, found that the market for sustainable investments in Switzerland experienced growth in the double digits in 2019, with volume increasing by 62% to reach over CHF 1,163 billion. The study was commissioned by Swiss Sustainable Finance[206.] In June of 2020, the Swiss Federal Council gave its approval to a research and set of recommendations about sustainability in the financial sector. This was done with the intention of establishing Switzerland as a center of excellence for environmentally responsible financial services worldwide. As a direct reaction to the increasing significance of technology in the Swiss financial sector, the Federal Council of Switzerland established the Green Fintech Network in November 2020[207] with the intention of accelerating the development of environmentally friendly fintech innovation. The Green Fintech Network was established with the intention of easing the communication barriers that exist between green fintech companies, industry associations, potential investors, academic institutions, and consulting and legal services. The committee will make suggestions to the Swiss government and the financial industry on how to promote environmentally friendly financial technologies and submit recommendations. The SFI and the Secretary of State want to foster close cooperation with Swiss professionals

[206]Swiss Sustainable Investment Market Study (2022), Swiss Sustainable Finance, University of Zurich, Switzerland [Online] https://marketstudy2022.sustainablefinance.ch/downloads/SSF_2022_MarketStudy.pdf

[207]Macchiavello, E., Siri M. (2022), "Sustainable Finance and Fintech: Can Technology contribute to achieving environmental goals? A preliminary assessment of 'green fintech' and 'sustainable digital finance,'" European Company and Financial Law Review 19(1), pp. 128–174.
[Online] https://doi.org/10.1515/ecfr-2022-0005.

in this ecosystem via the network. There has been a 62% increase in spending this year. Companies in the green fintech industry, related groups, VC firms, academic institutions, professional service providers, and legal and consulting firms make up the bulk of the network's members[208]. During the last decade, sustainable investment in Switzerland has expanded dramatically. Increase of 62 percent in 2019 alone brings total to CHF 1.16 trillion ($ 1.2 trillion), up from CHF 40.6 billion ($ 42.7 billion) in 2009[209]. To promote long-term stability in the financial system, the Federal Council issued two foundational directives in June of 2020. In particular, they call on Switzerland to "actively contribute to sustainability" while also "continually improving" the competitiveness of its financial core.

3.3 The case of Zurich

According to the report that was published by Startupticker in 2017[210], the biotech and fintech sectors are responsible for eighty percent of the growth that was seen in the creative start-up industry in Switzerland in comparison to the prior year. In particular, Zurich has shown remarkable expansion in the fintech sector, with 77% of loans in this category reflecting the total invested in start-ups[211.] Because of the presence of the ETH Zurich Polytechnic (ETHZ)[212], which has a positive influence on the city's entrepreneurial activity, the Canton of Zurich is particularly attractive from the point of view of the invention of new businesses. In addition to this, one must take into account the part that business angels play in the Swiss financial system, which is a considerable part. In 2004, there were a total of 290 people who were members of business angel's networks, according to Engelhardt and Gantenbein[213,] "structures that enable business angels to become aware of entrepreneurial realities that demand cash and management abilities" is how Engelhardt and Gantenbein define "business

[208]Sachs, J., Woo T., Yoshino N., Taghizadeh-Hesary, F. (2019), "Handbook of Green Finance Energy: Security and Sustainable Development" Springer, Singapore
[209]Ibid.
[210]StartupTicker (2017), "Meet the Top 100 Swiss startups 2017"
[Online] https://www.startupticker.ch/en/news/meet-the-top-100-swiss-startups-2017
[211]D. Nikolic (2020), "La rivoluzione FinTech e il settore bancario svizzero" , Bachelor Thesis, Scuola Universitaria Professionale della Svizzera Italiana Dipartimento economia aziendale, sanità e sociale, Switzerland
[212]ETHZurich Official Site: https://ethz.ch/en.html
[213]Engelhardt, J., Gantenbein, P. (2010), "Venture Capital in Switzerland: An Empirical Analysis of the Market for Early-stage Investments and Their Economic Contribution", Austria

angel's networks." The most important networks in Switzerland are those run by Business Angels Schweiz Riffelmacher[214] elucidates the essential qualities that are characteristic of Swiss business angels and fifty percent of them are now employed in the Zurich region. This might be due to the fact that the city of Zurich offers so many opportunities to aspiring business owners. We Can look at a couple of examples to understand how Zurich's green FinTech's are having a strong impact on the Swiss's race to climate neutrality.

Two important InsurTech startups CelsiusPro and RepRisk are both based in Zurich, and both are oriented on the b2b sector. Both provide non-life insurance, with CelsiusPro additionally providing advisory and claims management services. Amongst the two, CelsiusPro has dedicated itself more to climate actions, life on land and sustainable cities goals, while RepRisk mostly tries to engage in a strategic partnership with other counterparties[215].

RepRisk differentiates out from the competition because it was an early user of ESG data science and quantitative solutions and because it has become the industry leader in ESG risk analysis. Both of these factors contribute to RepRisk's position as a market differentiator. It is a commonly held belief that RepRisk is able to "catch" any business that is susceptible to ESG risks throughout the whole of the search process. The most effective strategy for achieving this goal and gaining the lead is to combine AI, ML, and FinTech (and, ultimately, human intelligence)[216]. Users of the RepRisk data now have access to the most comprehensive and up-to-date collection of data that has been verified independently that is currently accessible. asserts that the reason RepRisk has been able to maintain its lead over the industry for such a significant amount of time is due to the considerable experience of its employees as well as the data that the company has accumulated over the course of its history. The first level of data analysis consists of doing a daily evaluation of more than 500,000 documents originating from more than 100,000 public sources using sophisticated and intricate algorithms derived from artificial intelligence and machine learning (for reasons of transparency it does not analyze the news that the companies themselves give but only

[214]Ibid.
[215]Ibid. 196
[216]Bastos Pinto D. (2021), "Implementare la finanza sostenibile attraverso il FinTech", Bachelor Thesis, Scuola universitaria professionale della Svizzera italiana Dipartimento economia aziendale, sanità e sociale, Switzerland

information outside the companies analysed). In contrast to conventional financial institutions, the Swiss company Yova, which was established in 2017, is only concerned with offering sustainable investing services. It is a digital advisor that assists you in investing in a manner that is congruent with your values and preferences for your way of life, while also taking into consideration environmental, social, and governance (ESG) aspects.

The purpose of Yova is to make the world a better place via environmentally responsible investment. ESG (impact investing) can be entered into with as little as CHF 2,000.-[217], which means that even with a modest sum of money, you can already invest sustainably and help in the proper direction of capital. This is in contrast to traditional investments, which require a larger sum of money up front before you can put any of it to work for you. Traditional investments also have a higher risk profile than ESG (impact investing)[218.]

There is a user-friendly and uncomplicated platform available online in the shape of a Robo-advisor that makes it possible to invest in the impact domain. The first thing that has to be done before we can start making sustainable contributions via Yova is to establish which causes have the greatest significance for us. It's possible that these reasons are connected to things like renewable energy, clean water to drink, human rights, gender equality, and so on. We'll have no choice but to steer away of such tedious material sooner or later (nuclear, pesticides, ...). The risk profile will next be analyzed by asking a few straightforward questions, as a second step. Following completion of all steps, you will be in possession of your very own long-term investment strategy. Using the online interface to accomplish this goal is a fast and simple process that requires very little effort overall[219]. Yova is aware of the multiple beneficial consequences that might result from adopting FinTech in order to achieve sustainable funding. Because the website is so simple to use, almost anybody can sign up to utilize it. With a beginning capital of 2,000 Swiss Francs, you are able to make donations that, individually, may not be significant but, when added together, might have a significant

[217]Ibid.
[218]Inyova Official Site: https://inyova.ch/en/
[219]Simonetti, L. (2022), "Finanza sostenibile e Banche centrali. Nuovi attori per una geografia finanziaria in Evoluzione.," Bollettino della Società Geografica Italiana, pp. 3–14.
[Online] https://doi.org/10.36253/bsgi-1622.

influence. When you open an account with us, you won't have to wait more than a few days to have access to your personal account, and your investment strategy will be prepared for you in a matter of minutes. The ability to direct money in the appropriate direction while keeping everything entirely transparent and honest for the client enables the customer to make an educated choice about the sort of sustainable investment he wants to make in accordance with his own personal goals. strategy that is built using inputs that are completely arbitrary can provide an allocation of 60% shares and 40% bonds when investing in clean energy, clean water, sustainable forests, and the elimination of harmful gases and pesticides while maintaining an initial investment of CHF 2,000[220]. Additionally, Yova has a substantial internet presence, and it often posts updates to its social media platforms about its most recent environmentally friendly advances. However, they are responsible for more than only renovations.

It is possible to achieve sustainability goals by using the Robo-Advisor platform and by integrating the platform with social media. This will boost the informational capillarity of the platform, which will, in turn, have a greater influence on customers. As a consequence of this, you may find that your perspective on investment shifts toward one that is more contemporary and forward-thinking. Both insurance firms are devoting resources to developing eco-friendly InsurTech. Zurich Risk Advisor and SwissRe provide these options in the insurance industry. While SwissRe focuses on the B2B market and strives to achieve all climate change SDG targets, the Zurich Risk Advisor is more concerned with the C2C market and climate change action in general. Zurich Insurance also works to make its policyholders and the communities in which they live more robust to the effects of weather extremes and natural catastrophes[221].

3.4 China and Fintechs: New approaches of sustainable urban planning

A surge in citizen-led, bottom-up initiatives can be witnessed in nations all over the world,

[220]Ibid.
[221]Ibid. 196

and this growth has occurred concurrently with the expansion of technology[222] follow the growth of ODOs, CHOs, and CBISOs, which are abbreviations for community-based information service organizations. They do this by examining online content and conducting in-depth interviews. All of these organizations have engaged in data-driven activism in order to solve issues that are of interest to the public or the community. "Living Lab" and "Lo-Fi" technologies, which enable local digital innovation and community civic hacking around Europe, are attracting a growing amount of attention from academics working in related fields[223]. 22@Barcelona is a well-known innovation area located in Barcelona. It is noted for its bottom-up growth with the assistance of digital companies.

More than 450 million people currently live in China's 40,941-square-kilometer urban region. 1 Against this backdrop, people and social organizations have become more worried about the quality of urban public services, driving up demand for their growth[224]. As a result, novel approaches to urban development and energizing residential communities to generate new dynamics have emerged as pressing concerns in China's urban administration[225]. Hearings and other forms of public participation have been tried out recently, from the national to the local levels, as well as public participation in environmental evaluations and decision-making committees. We are experiencing lots of bottom-up initiatives such as Open Knowledge in 2013 as a component of the worldwide Open Knowledge Network was a necessary step[226]. The Urban Data Party was created in 2014 and is a member of the Open Knowledge Foundation in addition to being an online open data platform for urban research. The Urban

[222]Niederer S., Priester R. (2016), "Smart citizens: Exploring the tools of the urban bottom-up movement," Computer Supported Cooperative Work (CSCW) 25, pp. 137–152.
[Online] https://doi.org/10.1007/s10606-016-9249-6
[223] Cardullo, P., Kitchin R. (2018), "Smart urbanism and smart citizenship: The neoliberal logic of 'citizen focused' smart cities in Europe.
[Online] https://doi.org/10.31235/osf.io/xugb5
[224]Liao, L., Zhang, C., Feng, J. (2019), "The Involvement of Planners in Community Planning: A Promising Model for Chinese Local Governance?", China Perspectives, pp. 55-61
[Online] https://doi.org/10.4000/chinaperspectives.9491https://doi.org/10.4000/chinaperspectives.9491
[225]Department of Ecology and Environment of Guangdong Province (12 August 2019), "Annual Report on Urban Administration"
[Online] http://gdee.gd.gov.cn/
[226]Open Knowledge Foundation Official Site: https://blog.okfn.org/2013/12/

Data Party was established by Li Wen, who is also the party's namesake[227]. Li Wen worked as an urban planner in the past for the Shenzhen Institute of Urban Planning and Design. The Urban Data Party not only heralded the entry of start-ups based on big data, but it also coincided with the growth of bottom-up smart city initiatives in China[228.] There's also UrbanXYZ[229]and CityDNA[230], to name a few more. Since its founding in 2016, the firm known as UrbanXYZ has been focusing its efforts on the design of urban neighborhoods on a smaller scale. The incubation project of the "Beijing Institute of Urban Planning and Design was the City Online Participatory Platform" (BIUPD). During the same year, CityDNA was founded with the purpose of developing mobile phone applications to facilitate public engagement in the process of urban planning. The China Sustainable Transportation Center (CSTC), a non-profit organization located in Beijing, was the driving force behind its establishment[231]. Is interesting to notice how much China is experimenting with neighboor-level initiative making the citizens protagonist of the urbanization process, especially as we look at the peculiar story behind China's urban planning. The growth of cities in China is generally considered to be a state-directed initiative[232.] In China, the spatial and social effects of the government's role in urbanization have been felt most keenly at the neighborhood level. Before the year 1998, urban Chinese society and the physical environment were structured according to the 'danwei,'[233] a fundamental socio-spatial unit in which members carried out shared lives. However, the communist socio-spatial structure did succeed in achieving both mixed land use and social equality, despite the terrible living circumstances under the "danwei system". The widespread use of land finance, which favored large-scale urban

[227]Wang, J. (2012), "Shifting Boundaries between the State and Society: Village Cadres as New Activists in Collective Petition." The China Quarterly 211.
[Online] DOI : 10.1017/S030574101200087
[228]Wu, F. and Zhang, F. (2022), "Rethinking China's urban governance: The role of the state in neighbourhoods, cities and regions," Progress in Human Geography 46, pp. 775–797
[Online] https://doi.org/10.1177/03091325211062171
[229]UrbanXYZ Official Site: http://www.urbanxyz.com/
[230]Lu Xinjian Official Site: http://www.xinjianlu.com/
[231]Tian L., Jinxuan L., Yinlong L. and Yaxin W. (2022), "A participatory e-planning model in the urban renewal of China: Implications of technologies in facilitating planning participation", Environment and Planning B: Urban Analytics and City Science, Sage Journals.
[Online] https://doi.org/10.1177/23998083221111163
[232]Ibid. 219
[233]Zhao P. (2017), "An 'Unceasing War' on Land Development on the Urban Fringe of Beijing: A Case Study of Gated Informal Housing Communities." Cities 60

master plans and the sale of property in bulk, coincided with the 'marketization' of urban activity organization at the neighborhood level. Local government officials favored these big urban designs, despite the fact that they led to social division due to a "spatial mismatch" between urban planning and social demands[234]. The concept of the urban "community" as a form of city administration began to take shape. Residents' committees have been established and granted expanded powers to assist local governments in carrying out their role as the fundamental institutions responsible for the political and social management of the city[235.] Increasing focus has been placed on the public engagement of people and social organizations in these areas in order to support their dynamic interactions with different levels of government. Promoting public engagement and the role of social organizations were two important topics highlighted during the 19th National Congress of the CCP in October 2017[236]. Society in China, however, was "framed" by state-sponsored organizations due to the country's history of centralization of government and the "danwei system"[237] under the planned economy and the authoritarian regime. Digitalization, also, has fostered the growth of numerous big data-based startups using bottom-up methods, in this context of new people's engagement we experience the rise of community duty planners, (known as CDPs), a new mechanism for neighborhood planning in China presenting opportunities for bridging the gap between bottom-up and top-down approaches to the creation of smart cities[238]. The purpose of CDPs, is to act as intermediaries between the municipal government and the residents that they are responsible for serving improving both the built environment and the quality of life in the city connecting decentralized and centralized efforts to improve smart city infrastructure at the neighborhood level. Workshop for a "co-created community"[239] is a

[234] Zhang C., Chai Y. (2014), "Un-gated and integrated work unit communities in post-socialist urban China: A case study from Beijing", Habitat International 43, Elsevier, pp. 79–89
[Online] 10.1016/j.habitatint.2014.01.011
[235]Ibid. 223
[Online] https://doi.org/10.4000/chinaperspectives.9491https://doi.org/10.4000/chinaperspectives.9491
[236]Zexi H. (2017), "Op-ed: World seeks clues on China's future path from 19th CPC National Congress", People's Daily, Beijin.
[Online] http://en.people.cn/n3/2017/1025/c90000-9284851.html
[237]Ibid. 219
[238]Zhou, S., Fu, H., Tao, S., Han, Y., & Mao, M. (2021), "Bridging the top-down and bottom-up approaches to smart urbanization? A reflection on Beijing's Shuangjing International Sustainable Development Community Pilot", International Journal of Urban Sciences 19, pp. 101-123
[239]Ibid.

paradigm that has been investigated by various CDPs enabling planners to actively include citizens. The Ministry of Housing and Urban-Rural Development piloted the program in Xiamen and Shenyang between 2013 and 2016, and by the end of 2017, the program had been rolled out to 15 cities, including Zhuhai, Chengdu, Changsha, and Shanghai[240]. These cities have established a wide range of methods for citizen input, but they all have one thing in common: they highlight the planners' crucial role. there are distinct roles[241]: The first kind are government workers who are engaged directly by government entities like the Planning Bureau. The second category consists of "registered professional planners" and focuses on those who work for community projects and are employed by the government or planning research organizations. The third category consists of people who are involved in planning but do not work for a formal organization but do it as volunteers. In general, there are three distinct phases to community urban planning experiments. The first step in bridging the gap between the government and the people it serves is for planners and academics to do fieldwork in the community, conducting in-depth analyses, and reporting back to local authorities, most notably the municipal government. Second, without referring to overtly political criteria, planners reached communities through surveys and one-on-one discussions to better connect with individuals and assist them in defining urban planning needs. At this point, planners' duties were providing citizens with technical assistance by sketching out their ideas. Planners did things like organize discussions in which residents actively took part; construct models of buildings to aid residents in pinpointing the precise location of issues; create videos and PowerPoint presentations to aid residents in communicating with one another; direct residents in formulating creative approaches to problems; and instruct residents in the basics of community planning. Thirdly, citizens made the ultimate choices on community initiatives, such as via displays or voting on ideas organized by the planners, to boost community acceptance of participatory planning results. The government ultimately agreed with and executed these conclusions. Inside this procedure the implementation of ICT

[240]Bray D. (2005), "Social Space and Governance in Urban China: The Danwei System from Origins to Reform", Stanford: Stanford University Press.
[Online] DOI: 10.1515/9781503624924
[241]Arnestein R. (1969), "A Ladder of Citizen Participation." American Institute of Planners

and data technology was mandatory and lead to interesting experimentation opening room for integrating bottom-up initiatives into top-down frameworks[242].

3.5 The case of Beijing: "Shuangjing International Sustainable Development Community Pilot"

The Chaoyang District includes the Shuangjing Neighbourhood, which is located to the east of Beijing. The Shuangjing Neighborood Office (SNO), a subdistrict office of the Chaoyang District Government, is responsible for the area's administration. UN-Habitat, the "China Centre for Urban Development" (CCUD), SNO, UrbanXYZ, and the Beijing Community Research Centre have selected the area as the pilot for a new joint initiative (BCRC)[243.] the first project of its sort to be tried out on a small scale in China Targets for enhancing the community's built environment and achieving social, economic, and ecological sustainability. The Sustainable Development Goals (SDGs) framework was localized and integrated with Beijing's Refined Urban Management under SNO's direction, with assistance from UN-Habitat and CCUD (RUM). In June of 2019, SNO selected UrbanXYZ and BCRC to serve as the CDPs for the Shuangjing Neighborood. Both were tasked by SNO with carrying out the action plan and assisted in designing project activities in accordance with RUM criteria using the SDGs framework. An array of results, including the Street Brain dashboard, a mobile environmental monitoring system, a barrier-free smart cane, and two public space renewal projects at the Well No.1 and Well No.2 sites[244], were produced thanks to the action plan's adaptability and the Pilot's incorporation of bottom-up activities. The'smart neighborhood's' four foundational layers—infrastructure, data pool/centre, algorithmic modeling, and end devices—provide the technological underpinnings for these outcomes. Tools for gathering and processing internet data, Internet of Things (IoT) sensors,

[242]Müller A., Park J. , Won Sonn J. (2023). "Finding the old in the new: Smart cities in the national and local trajectories of urban development", International Journal of Urban Sciences 27, pp. 1-9

[243]Breuer J., Walravens N., Ballon, P. (2014), "Beyond defining the smart city: Meeting top-down and bottom-up approaches in the middle", Journal of Land Use, Mobility and Environment, Special Issue.
[Online] https://doi.org/10.6092/1970-9870/2475

[244]Powered by Disruptive Technologies Participatory Community Regeneration, A case study of Shuangjing Subdistrict, Chaoyang District, Beijing" (2021). World Bank Group
[Online]https://www.thegpsc.org/sites/gpsc/files/participatory_community_regeneration_powered_by_disruptive_technologies_jan_2021_0.pdf

community smart cards, and grid-based neighborhood survey procedures all make up the architecture[245]. The five data sources feed into a central data pool or center that is hosted on a cloud server that collects and organizes all social sensing, real-time, survey, and static data. The algorithmic modeling layer employs a variety of tools, including a built environment indicator system based on local neighborhoods, a life-circle model that can be updated every 15 minutes, and a simulation model of urban planning and design.

With the Shuangjing Street Brain dashboard, local officials can see the big picture of their city in real time and coordinate their activities and resource allocation appropriately. The dashboard is built on those four foundational levels, and it consists of four operational modules: activity monitoring; evaluation; modeling and simulation; implementation and management. As time goes on, the four modules are adapted for the mayor's huge LED display and shown there, while also being made available on the mayor's website and the PCs and mobile phones of neighborhood employees. Functional modules are tailored to the needs of SNO's operations. Shuangjing's socio-demographic and environmental data may be seen via the use of activity monitoring. The data pool/center incorporates information on things like garbage collection and community events. Using the UHC framework and the self-generated daily/weekly reports on the cases, evaluations are conducted using the SDGs and the built environment indicator system[246]. Using models and simulations, this layer illustrates how various reforms could affect public infrastructure and the surrounding area. Public facility placement and public space layout may both be improved via the use of multi-agent simulation. All spatial intervention and building projects, including micro-space regeneration, non-barrier facilities, and others, are integrated into implementation and management. By detecting environmental problems before they're reported to the mobile monitoring system hopes to lower the number of emergency calls. It consists of a tablet computer kept in the patrol vehicle and a mobile environmental sensor mounted in the patrol cars used by officers. The GPS-enabled sensor operates throughout the urban management department's daily

[245]Ibid. 238

[246]Alibaba Cloud (2018) “Official Launch of ET City Brain 2.0 and Future City Lab by Alibaba Cloud’s President Simon Hu” [Online]https://www.alibabacloud.com/blog/jack-ma-at-the-computing-conference-2018—-exploring-the-role-of-data-in-new-manufacturing_594084 [Google Schola

patrols across the neighborhood, recording humidity, PM2.5, and PM10 concentration, odor, and noise levels, all of which are shown on the mayor's Street Brain dashboard at SNO. The data center receives data in real-time over the NB-IoT network. The data center then performs an analysis of the incoming information and sends notifications of 'abnormal values' to tablets carried by the on-duty personnel. Consequently, workers will be able to check in on the environment and take preventative measures as needed. Very important for the revitalization were also the initiatives “Well No.1” and “Well No.2”.

Through resident participation in the design process, "The Well No.1" regeneration aims to reshape residents' emotional connection to the community space, stimulate the vitality of the community through a high-quality public space for all, and cultivate integrated community relationships through a variety of continued onsite activities. Shuangjing Subdistrict Government and the Community Empowerment Fund of the ZhongShe Social Work Development Foundation funded the rehabilitation and building of the area during the first phase of revitalization. The Shuang- jing Subdistrict Government has continued funding maintenance and operations even after the space regeneration was finished. Bottom-up community members, led by the Shuangjing Subdistrict Office, will investigate ways to introduce and manage the supports from private firms and social groups in the neighborhood, which have shown early enthusiasm for funding the initiative. Created in 2017 in the Chinese province of Sichuan, aobag.com is a private venture that uses social media to promote recycling by tracking users' recycling activity and rewarding them monetarily for their efforts. Although aobag’s recycling facilities are separate from MSF departments, they are integrally connected to the SWM system, with their drop-off locations for recyclables functioning as a vital component of the SWM system's front-end community recycling network. By offering a comprehensive service, including online resources like social media as well as physical aids like recycling bags and community recycling drop-off places, they want to raise China's total recycling rate. Using this method, recycling is not only a pleasant experience for the user, but also less of a hassle for the person responsible for collecting and transporting the recyclable trash to the sorting facility. Under the present business model, aobag.com pays solely for the collection and transportation of recyclable garbage and does not cover any other operating

costs (such as those associated with energy, Internet, or cleaning). As of the end of the year 2020, aobag.com has 97K users and 264 community drop-off points in Chengdu, Xi'an, Beijing, Shanghai, and Shenzhen[249].

The Beijing Community Research Center and other interested parties started the initiative to revitalize "The Well No.2." The goal of the Recycling Club's revitalization project, "The Well No.2," is to provide a convenient location for residents to drop off recyclables and to teach them about the importance of recycling. Beijing Community Research Center launched the initiative in July 2020 with the help of Shuangjing Subdistrict Government and recycling service cooperation. Space planning, construction, and the assembly of instructional materials for "The Well No.2" were all wrapped up by August of 2020. Opened to the public in September of 2020, "The Well No.2" Recycling Club. The Pilot saw the CDPs try three different routes to integrate the top-down and bottom-up perspectives. First, using 12345 hotline data, CDPs assisted SNO in identifying discrepancies between RUM/UHC regulations and resident demands, and they created "smart apps" to enhance SNO's ability to take preventative measures. The second thing they did was incorporate the Pilot's action plan into the CDP's already-in-motion growth and operations. Finally, the Pilot incorporated further bottom-up smart initiatives into the top-down structure.

In the first case, we have the mobile environmental monitoring system. It gives instant feedback to the UHC indication system. As a result, SNO may take preventative measures to enhance its standing on built environment evaluation indicators and lower the volume of resident complaints. The CDPs created the smart cane for barrier-free access and the Well No.1 kid-friendly micro space site through the second route. The RUM framework allowed for the inclusion of outcomes that weren't part of the original action plan. While the smart cane was originally designed for an awareness-raising event, the Well No. 1 site project was able to take use of the design competition and channel external financing resources to support the renovation project. Meanwhile, the organization built "smart infrastructure," or Internet of Things components like environmental sensors and gyroscopes, to monitor the premises

[249]Ibid. 225

where children were housed.[250]

Well No.2 was located on Route 3. Using the social entrepreneurship solution created by Aobag[251,] it is supported by a charitable organization's budget. Data acquired through Aobag was also completely incorporated into the Street Brain dashboard, thus the program worked well with BMG's own top-down garbage sorting guidelines. In addition, it is important to remember that the CDPs require'smart tools' to aid in their planning and spatial interventions as they work to create'smart applications' and'smart places. Cameras, sensors, and simulated models were used in the public space redesign process during the revitalization of the Well No. 1 and Well No. 2 sites[252.] Additionally, the Pilot created a public domain mobile-based land survey application to aid the CDPs in their work. These programs are naturally incorporated into top-down frameworks thanks to the efforts of the CDPs using third parties to bridge the gap between grassroots and government-led initiatives

CDPs in the Pilot are often seen as players in the middle. The Pilot's problem-solving strategy involves translating between the government's long-term plans and the communities' short-term demands. They then combine the two logics verbally and technically to create a system that can accommodate a variety of bottom-up uses. In the meanwhile, they serve as facilitators of public-private sector partnerships by bringing together the necessary resources. Sharing knowledge in this way fosters growth and development, as well as bottom-up experimentation and innovation.

For instance, the Street Brain interface uses a top-down approach. The goal of SNO is to provide a more complete picture of a neighborhood's health by consolidating socioeconomic-demographic data and environmental statistics. Because of this, SNO can conduct quantitative self-assessments in real time, take preventative measures, and do well in the broader RUM/UHC evaluation undertaken by departments higher up the administrative ladder.

[250]Ibid. 233
[251] AOBAG Official Website: https://www.expo2020dubai.com/en/understanding-expo/expo-initiatives/expo-live/global-innovators/aobag
[252]Ibid. 245

Bottom-up efforts and applications include the mobile environmental monitoring system, the smart cane, the Well No.1 and Well No.2 sites, and the tools aiding the CDPs' work[253]. They were made up on the spot by CDPs as solutions to issues that had been recognized. Though the Pilot's impromptu nature may be seen as disjointed, the word "incremental" may be more appropriate. As a first step, all four apps seek to better the built environment and achieve social, economic, and environmental sustainability on a local level under the overarching frameworks of RUM and UHC. They contribute to the dashboard by adding data for use by SNO in resource management. Second, in a city with an established infrastructure, it is more typical to see careful, step-by-step growth.[254]

Though crucial to connecting top-down and bottom-up strategies, CDPs may have their own set of limitations. Despite CDPs' ability to highlight where the top-down and bottom-up methods diverge, many smart initiatives tend to focus on meeting top-down criteria instead. This may lead to a narrowing of the field by favoring initiatives that address problems already getting government attention. In addition, because the Pilot's primary system, Street Brain, is not an open system, CDPs' authority lies in their ability to choose which grassroots efforts will be integrated into Street Brain. Based on what we learned from the Pilot, the ideal intermediary actors for smart city development possess the following six qualities: familiarity with top-down government policies and long-term plans; a good grasp of urban knowledge for identifying bottom-up needs; the ability to translate and combine the two logics of top-down and bottom-up; IT knowledge to technically connect the two approaches; openness to stakeholder diversity in their collaborations and the ability to mobilize multiple resources. In smart city development, only the middlemen possess the specialized IT skills required for some of these functions.

The CDPs in the Pilot are also responsible for creating the intelligent apps, albeit this is by no means required. This, however, suggests that it would be preferable if, in the near future, components of ICT could be included into education programs for community planners in

[253]Ibid. 218
[254]Martin C., Evans, J. Karvonen A., Paskaleva K., Yang D., Linjordet, T. (2019), "Smart-sustainability: A new urban fix?" Sustainable Cities and Society 45, pp. 640–648
[Online] doi:10.1016/j.scs.2018.11.028

addition to conventional urban planning training. Although community organizations and private businesses are the most common types of intermediary actors, the role can also be played by groups or individuals with expertise in information and communication technology (ICT) and a solid understanding of urban knowledge and planning in settings where mechanisms similar to CDPs do not exist. The Pilot also implies the need of an open system for bridging top-down and bottom-up efforts. If the core information system is not completely available to independent developers, intermediary players may assist bring about technological linkages. The problem is that this method may result in biased choices being made. Future smart city development should prioritize an open-source top-down framework that welcomes bottom-up apps.[255]

3.6 Case study Nigeria Fintech Hub a legal overview of fintech inside a developing country

This transition to a sustainable future is being led by Nigeria, a country in west Africa. Nigeria is essentially a one-industry economy due to its reliance on fossil fuels[256]. Therefore, for Nigeria to achieve sustainability and the 17nr Sustainable development goals (SDGs), it needs a fully diversified economy supported by well-planned and environmentally friendly infrastructure[257]. However, in order to maintain development via infrastructure projects that will promote balanced expansion of the built environment in parallel with the social, environmental, and economic components of the physical and built environment, adequate and sustainable finance is required. According to the 2022 Fintech Times study[258], the financial technology environment in Nigeria includes 220–250 fintech startups, important players (banks, telecom providers, and the government), enablers, and financing partners (i.e universities and research institutions, investors, incubators, technology and consumers). The sheer size of Nigeria, along with its relatively robust financial and technological environment,

[255]Ibid. 239
[256]Alade I. , Muse-Sadiq A. , Olumide O., Bellani S. (2021), "FinTech 2021 Guide", Banwo & Ighodalo, Lagos [Online] https://www.mondaq.com/nigeria/fin-tech/1077120/fintech-2021-guide
[257]Official Journal of the European Union, C 395, (29 September 2021)
[258]R. Santosdiaz, (2022) "Nigeria's Fintech Landscape in 2022", FintechTimes [Online] https://thefintechtimes.com/nigerias-fintech-landscape-in-2022/

creates favorable conditions for the development and implementation of a robust Fintech industry in the country. According to the EFinA[259] study from 2021, less than 30% of adults in Nigeria have accounts with or have utilized the services of a non-bank financial institution. Not only that, but 97% of Nigerians lack access to basic financial services including health insurance, investment opportunities, and international money transfers. Half of Nigeria's population is under the age of 19, and over 65% is under the age of 35; this makes it the most populous country in the Middle East and North Africa (MEA) area[261]. There are over 187 million mobile connections (90 percent of the population), with 10 to 20 percent of the population utilizing smartphones and the remainder relying on more basic mobile devices.[262] Additionally, around 50% of the population has access to the web[263]. While not as high as in the industrialized world, these numbers are far superior than those of other African countries. However, this enormous industry has plenty of space for solutions like fintech to expand. Despite the fact that Nigeria did not accomplish its goal of 70% financial inclusion by 2020 as set forth in its National Financial Inclusion Strategy (NFIS)[264], efforts continue to this day to reach that goal. It is important to recognize the progress made by Nigeria's fintech sector. It is generally agreed that Nigeria, and more specifically South Africa, Kenya, and Egypt, are the continent's foremost fintech centres and participants. Using the criteria of investment for financial technology startups, Nigeria has gained this distinction by receiving $1.37 billion of the $4 billion funded in Africa (followed by South Africa with $838 million, Egypt with $588 million, and Kenya with $375 million)[265]. Nigeria is one of just a handful of Middle Eastern and African nations to develop fintech unicorns and to contribute to the export of its know-how. Nigeria has more financial technology unicorns than any other country in Africa (five)

[259]"Access to financial services in nigeria 2020 survey dissemination event" (2021), Efina research
[Online] https://a2f.ng/
[261] Ibid.
[262]Ajibade P., Mutula S. M. (2020), "Big data, 4IR and electronic banking and banking systems applications in south Africa and Nigeria", Banks and Bank Systems
[Online] https://doi.org/10.21511/bbs.15(2).2020.17
[263]Elegbe J. A. (2018), "Determinants of success of employer branding in a Start-up firm in Nigeria", Thunderbird International Business Review, 60(3), pp. 265-277
[Online] https://doi.org/10.1002/tie.21897
[264]"National and Financial inclusion strategy, Financial inclusion in Nigeria" (2021) Federal Ministry of Finance and National Planning, Nigeria. [Online]https://www.cbn.gov.ng/out/2013/ccd/nfis.pdf
[265] Ibid. 259

and is second only to Israel in the Middle East and Africa (two). Interswitch and Jumia were the first Nigerian fintech unicorns; Flutterwave[266], Opay[267], and Andela[268] have since joined them. One of the most talked-about events in the Middle East and Africa (MEA) was Nigeria's introduction of a digital central digital bank currency (CDBC) named the e-Naira[269] in October of last year. In 2021, the Central Bank of Nigeria (CBN) ordered all banks to cease trading with and with companies dealing in cryptocurrencies, making headlines comparable to the CDBC statement[270]. The CBN also urged banks to cancel accounts of people or businesses that are engaged in cryptocurrency transactions. Some news outlets emphasized the anti-money-laundering and security measures that motivated this action. In spite of this, cryptocurrency use is widespread in Nigeria. Many people speculate that Nigerians sought refuge in Bitcoin and other digital currencies in 2016 because of the country's economic downturn. The falling price of oil, the primary contributor to Nigeria's GDP, precipitated this (GDP)[271]. As a result of this shift in consumer habits, Nigeria now boasts Africa's biggest crypto market and one of the world's largest user populations. Despite the CBN's efforts, cryptocurrency use continues to rise. In April, KuCoin released research revealing that 33,4 million Nigerians between the ages of 18 and 60 have purchased cryptocurrencies[272]. Across the Middle East and Africa, payments have been the biggest subsector, drawing the greatest attention from both investors and authorities. According to Tellimer, the payments subsector of fintech is the most successful, with 28% of the market share. Lending comes in second with 25%, followed by software solutions at 15%, wealth tech at 11%, blockchain at 9%, insurtech at 4%, and financial management at 3%. A new kind of banking license, "payment service banks," was created by the CBN in relation to mobile money, as reported by the Global System for Mobile Communications (GSMA) in 2018. (PSBs). The idea was to take use of the advantages offered by firms like mobile network carriers while sticking to a

[266]Flutterwave Official Site: https://www.opayweb.com/
[267]Opay Official Site: https://www.opayweb.com/
[268]Andela Official Site: https://andela.com/
[269]eNaira Official Site: https://enaira.gov.ng/
[270]Ibid. 257
[271]Ibid. 259
[272]Mbachu D. (2022), “Nigeria’s cryptocurrency problem has central bank scrambling”, African Businesses, Nigeria [Online]https://african.business/2022/05/technology-information/nigerias-cryptocurrency-problem-has-central-bank-scrambling/

banking model that was driven by banks rather than telecommunications companies. Although the Nigerian people is not yet on board with the idea of mobile money as it is in East Africa, there is room for expansion in this sector. With barely 3% of the population using a credit card (Nigeria ranked 124th out of 137 nations in this category), buy now pay later (BNPL) is another option that might play a significant part in the future of Nigeria's financial ecosystem. The use of BNPL may assist eliminate this barrier to participation. According to projections, BNPL consumption in Nigeria would increase from $325m in 2017 to $1.195bn in 2028[273]. Credpal[274] is a good example of a local firm that is expanding the BNPL market outside Nigeria. To "harmonize all pieces of law regulating startups and contributing to the formation of an enabling environment for growth, attractiveness, and protection of investment in digital start-ups," the Nigeria Startup Bill initiative was launched last year. The Central Bank of Nigeria is only one of several important organizations in Nigeria's financial technology ecosystem. Others include the Securities and Exchange Commission, the National Insurance Commission, the Fintech Association of Nigeria, and the Nigerian Insurers Association. Nigeria, the most populous nation in Africa, has an opportunity to improve the lives of its citizens and assist its neighbors by implementing a universal financial inclusion system. Providers of financial technology have rapidly expanded their presence in the financial services industry, spawning a plethora of new products and services that streamline and simplify the administration of personal finances. Over two hundred financial technology companies call Nigeria home; among of the most known include Flutterwave, Interswitch, Paystack, Paga, Carbon, Remita, VoguePay, OPay Libya, Kuda, and Piggyvest. Crowdfunding, mobile payments, robo-advisors, insurance technology, and regulatory technology are just some of the services offered by these Fintech companies[275]. The assumption that Fintech will disrupt banking has been bolstered by the industry's meteoric rise. However, banks and Fintech companies will advance their interests via partnership, not rivalry. The absence of defined policy and law is the biggest obstacle in the fintech industry.

[273] Ibid.

[274]CredPal Official Site: https://credpal.com/

[275]C. Okeke, A. Adebajn (2021), "Nigeria: Resolving the Legal And Regulatory Challenges Of Fintech In Nigeria", Olisa Agbakoba Legal (OAL)
[Online]https://www.mondaq.com/nigeria/fin-tech/1132836/resolving-the-legal-and-regulatory-challenges-of-fintech-in-nigeria

This article discusses the difficulties fintech providers in Nigeria have from a legal and regulatory perspective and offers suggestions for addressing such difficulties. The Central Bank of Nigeria (CBN) released a Framework for QR Code Payments in Nigeria at the start of 2021, marking the beginning of regulatory changes for the Nigerian fintech business. The new QR code law rode on the heels of the COVID-19 outbreak, which rendered most physical currency payment systems inoperable, to promote the rise of contactless payments as a more secure means of doing business in Nigeria. Crowdfunding for investments in Nigeria has a formal legal and supervisory framework according to the Securities and Exchange Commission's (SEC) Rules on Crowdfunding ("Crowdfunding Rules"), published in January 2021. CBN also published the Framework for Regulatory Sandbox Operations ("CBN Sandbox Regulations") in January 2021, with the intention of facilitating innovations by start-ups in the face of strict regulation.[276] The Central Bank of Nigeria ("CBN"), in an effort to make financial data more accessible, published the Regulatory Framework for Open Banking in Nigeria ("Open Banking Framework") in February 2021[277]. In April 2021, the Securities and Exchange Commission ("SEC") published the Major Amendments to the Securities and Exchange Commission Rules and Regulations, 2013 ("SEC Rules")[278], mandating that digital sub-brokers (i.e., entities that are not a dealing member of a Nigerian exchange but act on behalf of a sponsor It's important to note that this acknowledges the possibility of a sub-broker using a digital platform to solicit investment from investors, which would ultimately encourage new developments in the financial sector. Chaka received the first SEC-issued digital sub-broker license in June 2021. The Securities and Exchange Commission (SEC)[279] of Nigeria also unveiled its Regulatory Incubation (RI) initiative in June 2021 with the aim of providing a level playing field for financial technology companies (FinTech's) already active in or looking to enter the Nigerian capital market. The CBN developed the Supervisory Framework for Payment Service Banks (PSBs) to, among other things, standardize the

[276]Ibid. 273

[277]Central Bank of Nigeria (2021), "Regulatory Framework For Open Banking in Nigeria" [Online] https://www.cbn.gov.ng/Out/2021/PSMD/Circular%20on%20the%20Regulatory%20Framework%20on%20Open%20Banking%20in%20Nigeria.pdf

[278]Ibd. 276

[279]Usa Security and Exchange
[Online] commissionhttps://www.sec.gov/

procedures of PSBs, promote openness about such procedures, and provide sufficient protection for their customers. Most notably, the CBN issued authorization in principle (AIPs) to the subsidiaries of telecom giants MTN and Airtel to operate PSBs in the month of November 2021. The Central Bank of Nigeria (CBN) introduced the eNaira, a digital version of the country's currency, in October 2021[280]. The Central Bank of Nigeria (CBN) has released a digital currency called the eNaira, which may be traded for other digital currencies issued by other central banks. The eNaira is a sort of legal money that circulates alongside the paper naira. The Central Bank of Nigeria (CBN) has produced Guidelines for the Operation of the Pan African Payments and Settlements System ("PAPSS Guidelines")[281], which establishes a standardized framework for a pan-African payments system operating beyond national borders. The regulatory advancements have been mostly beneficial, although there have been certain measures that have been met with concern by those involved in Nigeria's fintech industry. For instance, the CBN reminded all DMBs, NBFIs, and OFIs in a letter dated 5 February 2021 (the "CBN Letter") that they are not allowed to engage in cryptocurrency trading or facilitate payments for cryptocurrency exchanges[282]. In addition, the CBN ordered the closure of all accounts belonging to people and organizations involved in the buying, selling, and operation of cryptocurrencies in Nigeria. While this doesn't overtly prohibit virtual currency trading, it does have a chilling effect on how crypto transactions are conducted in Nigeria, with most users instead resorting to peer-to-peer mechanisms for exchanging cryptocurrency. Mobile payments, loan services, crowdfunding, personal finances, and wealthtech are the most common types of fintech businesses in Nigeria[283].

Payments

The Central Bank of Nigeria (CBN) issues periodic instructions that apply to both established

[280]Albert.A. Adu, S. Okwilague (2022) "ENaira – A New Dimension to Payments In Nigeria" Alliance Law Firm, Lagos [Online] https://www.mondaq.com/nigeria/fin-tech/1181108/enaira--a-new-dimension-to-payments-in-nigeria
[281]Ibid.
[282]Ukwueze, F. (2021), „Cryptocurrency: Towards regulating the unruly enigma of fintech in Nigeria and South Africa" Potchefstroom Electronic Law Journal 24
[Online] https://doi.org/10.17159/1727-3781/2021/v24i0a10743
[283]Ibid. 257

companies and fintechs in this sector, although the Banks and Other Financial Institutions Act, 2020 (BOFIA)[284] is the primary piece of legislation governing the industry at the moment. Financial technology companies offering PSP services are legally obliged to get a CBN license.

Investors and government agencies in Nigeria are particularly interested in the payments segment of the fintech business. Payment services include both business-to-business applications, like payment processing providers and solutions for taking payments, and consumer-facing apps, including mobile wallets and payment applications that allow users to pay on the move and perform peer-to-peer transactions. Financial technology companies and established firms like digital money banks make up this industry subsector.

Lending

Governed by BOFIA and several CBN standards (including prudential ones) that apply to both traditional financial institutions and new fintech firms as they develop. Fintechs in Nigeria need a commercial banking license (national or regional), merchant banking license (national or regional), specialized banking license (national or regional), microfinance banking license (national or regional), or finance company license (national or regional) from the Central Bank of Nigeria (CBN) before they can accept deposits or make loans[285].

However, fintechs that don't want to store deposits or provide loan services nationwide may be able to operate with a moneylender's license under the moneylender rules of the state or states in which they do business. In comparison to the BOFIA system, the requirements for obtaining a moneylender's license are less stringent, which is why the industry is popular with fintech companies. The third option is for the fintech to develop partnerships with organizations that already possess the necessary lending licenses and act only as the technological platform through which the loans are disbursed. Similarly, mobile lending apps and BNPL services—also known as "point of sale instalment loans"—have developed in

[284]"Banks and other financial institution act" (2020), Federal Republic Of Nigeria.
[285]Ibid. 283

Nigeria's burgeoning fintech sector. With an estimated annual growth rate of 111.2%, BNPL payments in Nigeria are projected to reach USD1920.3 million in 2022, according the results of a survey conducted in Q4 2021[286]. This strategy has an edge over conventional lending since it can provide loans more quickly and with less hassle (and sometimes without the need for collateral). However, traditional lenders are also launching solutions that are similar in nature.

Crowdfunding

Micro, small, and medium-sized companies (MSEs) are allowed, under the Crowdfunding Rules, to use intermediaries to generate capital by means of crowdfunding, which includes the offering and sale of shares and other instruments using online platforms. The Securities and Exchange Commission limits the amount of money that regular people may put into crowdfunding projects at 10% of their yearly take-home pay. However, those with substantial financial resources are exempt from this cap[287].

Crowdfunding apps in Nigeria have become interesting venues for generating cash for ventures/projects because of the high cost of getting funds from conventional banks. Crowdfunding accounts for the vast majority of revenue for Nigeria's agritech startups[288].

Family Budgeting

Fintechs must acquire one of the CBN's banking licenses listed under "Lending" before they may begin accepting client deposits. However, personal financial application fintechs in Nigeria often work in tandem with already-established MFBs or DMBs. Microfinance banking licenses have also becoming more sought after by fintech companies so that they may provide their services to the market. The management of one's own finances, including one's bills, accounts, and/or credit, is another common focus for Nigerian fintech companies.

[286]Ibid. 257
[287]Phillips O. (2019), "An Overview Of The Regulatory Framework Of FinTech In Nigeria" S.P.A. Ajibade & Co., Lagos [Online] https://spaajibade.com/an-overview-of-the-regulatory-framework-of-fintech-in-nigeria-olayanju-phillips/
[288]Ibid. 283

Wealthtech

Companies that provide investing services are considered "capital market operators" and must file appropriate paperwork with the SEC. Wealthtech businesses have started collaborating with authorized operators of capital markets, just way personal finance apps have done.

Many of Nigeria's financial technology companies[290] are dedicated to providing investors and savers with simplified, more accessible platforms and services. There are three main ways in which Nigeria's fintech assets are having an influence: by increasing economic activity, by having a multiplicative effect, and by accelerating the country's progress toward its development objectives. Increases in domestic and international income will have the greatest effect on the economy. Benefits to the economy may be unlocked via the digitalization of financial services, which can boost production, capital investment, and human hours. Indirectly, a rise in fintech activity might boost the digital economy by facilitating the expansion of the Nigerian e-commerce sector by making technologies like payment integration on social media platforms available to business-to-consumer (B2C) marketplaces[291]. Furthermore, fintech is assisting in Nigeria's human capital development by promoting financial inclusion and literacy via the distribution of novel, low-cost financial products to previously unbanked and disadvantaged demographics. Student aid, online education, and low-cost medical coverage are just a few of the social issues that might benefit greatly from fintech's application. Fintechs have been slow to build economically viable use cases to service the mass market segment because to the high costs involved. This is a major barrier to the industry's full potential.

[290]Ibid. 257
[291]Ibid. 288

IV *Conclusions*

Before approaching the future of Smart Cities (will it be on a sociological, political or scientific way), is mandatory to understand on an empirical level their key elements and how the absence or incorrect application of them can lead to inefficiencies or, at the very least, a decrease in the quality and effectiveness of the services offered by cities to the inhabitants there. different conclusions of the concept of Smart City can be recognized, but one unifying dogma clearly rises and unifies the research and is the concept of "city as a common good" and is the essential concept with which to begin to change a city into a genuinely Smart one[292].

Starting from this point, understanding what means to build a climate neutral city brings the policymakers inside a deep open sea of different subjects and topics in which can be very challenging to swim. First, understanding the basic concept behind sustainability and climate neutrality can be a challenge itself despite the Paris agreement and the successive

[292]Festa G. (Academic Year 2021/2022), "Reimagining The Smart City. The Keys For The City Of The Future", Bachelor Thesis, Libera Università Internazionale Degli Studi Sociali LUISS Guido Carli, Facoltà Di Giurisprudenza, Italy

Commission attempt to underline a series of rules and good practices. And then we face problems regarding infrastructures, legal issues with privacy and compliance, financing problems, administrative misunderstanding and the list can even go as far as touching sociological conundrum regarding the rapport between city and citizen. Having to do analytically with Smart cities and climate neutrality has been shown quite complex, and many countries (in and outside Europe), struggle meaningfully start a real process, sure they can reduce CO2 emissions closing some factories or driving more bicycles, but create an actual climate neutral state means much more than that. When the state fails the private thrives, and in this elaborate we had multiple occasions to see how private FinTech firms has heavily outreached the "state", not only in terms of ideas or technological applications but also on actual importance regarding the reaching of climate neutrality. FinTechs have so far surpassed banks and BigTechs by focusing on simple, practical and consumer-centric services that address real customer needs shaping the city itself and his inhabitants. In addition to investments, they offer specialized skills, in-depth knowledge of consumer segments and networked resources. Companies that invest in customer experience will be able to build, scale and survive, regardless of market conditions or the location of smart cities (We can see for example the achievements obtained in Lagos).

The key element behind the concept of FinTech is the simplification of financial transactions thanks to the application of AI, big data, and encrypted blockchain technology to facilitate highly secure transactions amongst an internal network, eliminating potentially unnecessary steps for all involved parties. For example, a mobile service like Venmo or CashApp allows you to pay other people at any time of day, sending funds directly to their desired bank account. However, if you paid instead with cash or a check, the recipient would have to make a trip to the bank to deposit the money. In Europe is still under legal scrutiny by the commission, the only think we still have been pieces of EU legislation that only covers singular aspects of FinTech. We can witness legal and institutional uncertainty resulting from some of the new financial systems made possible by new technologies, FinTech raises not only technical issues, but also deep conceptual questions about relevant institutes, tools, and also regulatory needs. When in Europe struggle to implement a single block-chain bound by

legal issues or lack of founding, we have Fintech firms that utilizes distributed-ledge technologies inside multiple apps dedicated to a green purpose (the case of green Fintech in Switzerland). Is also important to monitor the same Fintech seeing as the use, or in a lot of cases, abuse of digital technologies can create a chain of consumption, waste and emission even worst then without it. The lifecycle of a computer is still firmly connected to fossil fuels one way or another. computers and cooling systems, IOTs, cloud computing, mobile phones, all technological devices and their life cycle in that sense nursery gas emanation of hardware ought to be considered in a life cycles life deep and dangerous carbon footprints. The dematerialization process triggered by FinTech's firms if not properly regulated, can lead to disastrous environmental problems, and the only proper countermeasure is to enforce digital sobriety and guidelines to the companies leading to a stricter control from the state.

As said at the start the better way to handle the situation is a triangle of "check and balances" between public sector (state) private sector (Fintech) and citizen, not so dissimilar as the one created in the Shuangjing Subdistrict. The idea behind mutual decentralized cooperation can easily bring the objective of climate neutrality a step forward even revolutionizing the idea of city. Citizens as active builder and policymakers with the public sector as their delegates and as watchdog of private sector which on his part brings technology, infrastructures and has a near infinite influx of clients in the citizens. Even if it seems a utopia, that's what is slowly happening in and out of European union. This scheme of control is also fundamental to keep the sovereign of the state intact or we can find ourselves in a pathologic situation like Nigeria in which the massive amounts of Fintech firms founded came to fruition so quickly a had so much economic impact that started to alienate the state, incapable to stay behind with a complete legislative framework, and started to operate de facto outside the boundaries of the law.

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