BUILDING BLOCKS OF A GREEN FINTECH SYSTEM
- TOWARDS AN REGULATORY ANTIDOTE TO GREENWASHING -

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Abstract: Green FinTech is one of the latest buzzwords in finance, yet little is known about how the use of FinTech may support the transformation of the world's economies towards sustainability.

Assuming that information asymmetry paired with agency conflicts present the core issues of sustainable finance – as both together lead to 'greenwashing' and a 'green asset bubble' in the sense that investors overpay in relation to the true sustainability impact of a given asset – the paper analyzes how Green FinTech can be utilized for sustainability objectives, and details what law can do to further Green FinTech.

Borrowing other use cases from distributed ledger technologies, we showcase the use of tokenization for the inseparable pairing of cash flow data with sustainability data in a given token. Such token may then inform about the sustainability profile of the cash flow rights to which it is linked. This information flow may be relied upon by all financial and informational intermediaries across the financial services value chain, from the issuer (where tokenization takes places) to the end investor. If tokenization is paired with appropriate regulation, Green FinTech could contribute to addressing the main problem of sustainable finance, namely greenwashing.

For Green FinTech to become effective against greenwashing, the law must provide for standardized data points (and technologists need to develop the formats for such) for pairing sustainability and cash flow data, ensure reliability, responsibility and accountability of token originators for all sustainability data embedded in the token, and allow for the smooth flow through processing of the data embedded in the tokens.

Keywords: Sustainable Finance, Green FinTech, Tokenization, Decentralized Finance, Distributed Ledger Technologies, RegTech.

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I. INTRODUCTION

Green FinTech is one of the latest buzzwords in finance, yet little is truly known about how the use of this technology may support the transformation of the world's economies towards sustainability. In fact, the European Commission has already aired concerns about the increasing energy demand of data centers and decentralized financial services infrastructure.[3]

This paper is, to the best of our knowledge, the first that elaborates upon the *details* of Green FinTech from a *legal* perspective.[4] We focus on two questions: How can Green FinTech support the transformation of financial markets towards sustainability? And second, what can law and regulation do to further this type of Green FinTech?

The paper is structured as follows: In Pt. II, we present the archetypical sustainable finance value chain and identify the core issues of sustainable finance: enhanced agency conflicts, information asymmetry and an oversupply of green-seeking capital accumulate in the sustainable finance value chain, a phenomenon better known as 'greenwashing'.

In Pt. III, we then show what FinTech can do to address the issues identified above. In other words, we find that the core feature of FinTech, namely disintermediation, can be instrumental in remedying the impact of agency conflicts and information asymmetry on the sustainable finance value chain, and steering the available capital to truly sustainable financial products. Pt. IV then identifies how law and regulation can support Green FinTech, resulting in a list of regulatory building blocks of a Green FinTech system. Finally, Pt. V. concludes.

[3] European Commission, Sustainable Finance Strategy, July 2021, at ___.

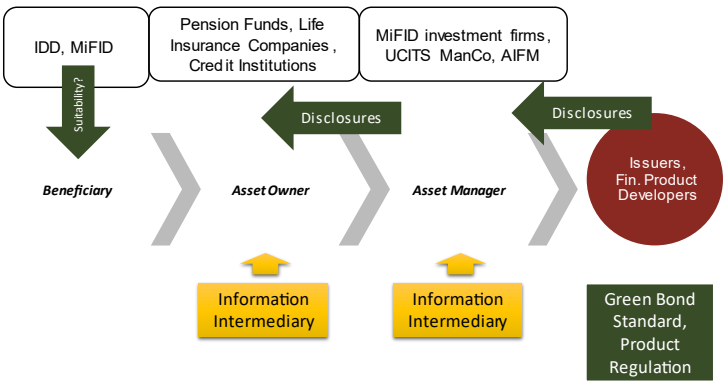
[4] We are aware of several contributions linking FinTech and sustainability from a general policy perspective. See, for instance, Douglas Arner, Ross Buckley, Dirk Zetzsche & Robin Veidt, *Sustainable Finance*, *FinTech and Financial Inclusion*, 21 EBOR 7-35 (2029), and Marco Dell'Erba, *Sustainable Digital Finance and the Pursuit of Environmental Sustainability* 61-81, in: Danny Busch, Guido Ferrarini, Seraina Grünewald (eds) Sustainable Finance in Europe (2021).

II. CORE ISSUES OF THE SUSTAINABLE FINANCE VALUE CHAIN

1. The Sustainable Finance Value Chain

The idea behind sustainable finance is that information on both financial and sustainability-related data is provided by the issuers of financial products and then forwarded over to, and assessed by, various intermediaries to the end beneficiary of financial investments.

Figure 1: Financial Services Value Chain



In this process, financial intermediaries select and assess the sustainability-related information provided by the issuers and product developers, and 'translate' them into their investment models through identifying factors that may be considered as part of the investment decision. A number of information intermediaries assist in the selection process, including rating agencies, index providers, auditors and sustainability advisors and consultancy firms.

2. *Core Issues*

All of the former intermediaries partly contribute to, and partly seek to deal with, the core issue of sustainable finance: a state of severe information asymmetry on which the firm or financial product truly delivers on the Green promise while providing financial returns. In light of the many intermediaries involved in the value chain, various agency conflicts are present: if there were no information asymmetry, many of the intermediaries would be superfluous to begin with. Hence, a certain degree of opacity is in the interest of many information intermediaries that form part of the chain: a wide range of so-called sustainability ratings[5] as well as ESG criteria and indices exist[6]. In light of the former, it may not be surprising that the results of these ratings are often not well understood.[7]

This situation of information asymmetry and agency conflicts meets capital seeking 'Green cash flows'. That capital stems from investors, such as pension funds, that either seek to meet political expectations or their own investors' expectation that every intermediary shall contribute to the sustainability transformation of the financial system and that long-term asset owners (ie. pension funds) pursue their investors' long-term interest, in addition to financial interests.[8] In turn,

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[5] See *Doni/Johannsdottir*, Environmental Social and Governance (ESG) Ratings, in: Filho/Azul/Brandli/Özuyar/Wall (eds). CLIMATE ACTION. ENCYCLOPEDIA OF THE UN SUSTAINABLE DEVELOPMENT GOALS, Springer, Cham, pp 435-449 (presentation of different areas of application, included data and methods of ESG rating agencies); *Dorfleitner/Halbritter/Nguyen*, Measuring the level and risk of corporate responsibility – An empirical comparison of different ESG rating approaches, 16 J. ASSET MGMT. 450, 465 (2015) (three main ESG rating agencies come to different measurement results in relation to ESG factors); *Berg/Koelbel/Rigobon*, Aggregate Confusion: The Divergence of ESG Ratings, MIT SLOAN SCHOOL, Working Paper 5822-19 (5/2020), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3438533 (six of the major ESG rating agencies have significant differences in how they categorize, measure, and weight these categories of ESG factors).

[6] See e.g., *Jebe*, The Convergence of Financial and ESG Materiality: Taking Sustainability Mainstream. 56 Am. Bus. L. J. 645, 685 (2019) (for the need to merge ESG and financial reporting); ferner *Möllers*, ZHR 185 (2021), 881 (885 et seq.).

[7] European Supervisory Authorities (ESAs), Letter to the European Commission,Public consultation on a Renewed Sustainable Finance Strategy, 15 July 2020, available at: https://www.esma.europa.eu/sites/default/files/library/2020_07_15_esas_letter_to_evp_dombrovskis_re_sustainable_finance_consultation.pdf.

[8] Cf. Danny Busch, Guido Ferrarini & Arthur van den Hurk, *The European*

many investors are willing to pay for green cash flow, which may, from a theoretical perspective, result in an asset price bubble, given a lot of capital seeks for few green investments. At the same time, there is uncertainty as to whether investors' cash flow truly stems from green investments. This uncertainty has promoted so-called greenwashing (or "green dyeing"), whereby a large number of issuers and/or intermediaries pretend to act sustainably, but in reality such sustainability is somewhat far-fetched when the relevant business models are examined.[9] Needless to say, the former issues render any suitability test provided by investment advisers or pension planners for retail investors a farce.

These core issues potentially threaten the sustainability-oriented transformation of the EU's financial markets. On the one hand, the portfolio value of sustainability-conscious investors is at risk, the expected hedge by opting into sustainable products is unrealistic, and overall investor support for the sustainability transformation is compromised. On the other hand, from a systemic perspective, we risk large-scale capital misallocation to an extent that easily dwarves the global financial crisis of 2007-08.

3. Regulatory Response

Regulators around the globe seek to address these issues through

- the development of uniform sustainability reporting standards
- enhanced disclosures on sustainability-related data (sustainability risks, PIAs on sustainability factors)
- capital surcharges for sustainability risks
- regulating sustainability rating and index providers, and
- tailoring financial intermediaries' fiduciary duties towards a

Commission's Sustainable Finance Action Plan and Other International Initiatives 19-60, in Danny Busch, Guido Ferrarini, Seraina Grunewald, Sustainable Finance in Europe (2021) (describing political initiatives); for details on the implementation of the European Sustainable Finance Action Plan see Dirk Zetzsche & Linn Anker-Sørensen, *Regulating Sustainable Finance in the Dark*, 23 EBOR 47-85 (2022).

[9] See on *greenwashing Ekkenga/Posch*, WM 2021, 205; *Kaustia/Yu*, Greenwashing in mutual funds, www.ssrn.com; *Kropf*, WM 2020, 1103; *Möllers*, ZHR 185 (2021), 881 (896 et seq., 901 et seq.); *Veil*, WM 2020, 1093; on the legal policy discussion *Hirte/Frohmann*, FS Windbichler, 2020, S. 1335 (1345); on liability issues *Chatzinerantzis/Hohm*, DB Beilage 2021, Nr 2, S. 9 et seq.

'double materiality' standard.[10]

Agency conflicts are - very traditionally - addressed by regulating the agents: rating agencies, index providers, and auditors. These measures are 'human-centered tools', and they focus on human-centered regulatory intervention.

Human solutions to human problems create human follow-up problems: all humans operating in the sustainable finance industries – as all intermediaries and gatekeepers –, have incentives to capitalize on their position as agents by rent-seeking, while regulators have limited resources to prevent it, and private litigation faces its own downsides and costs.[11]

However, technology is not seen as the solution to this problem, which prompts the question addressed in the next section, namely: How can FinTech contribute to sustainable solutions?

III. HOW GREEN FINTECH CAN REMEDY THE CORE ISSUES OF SUSTAINABLE FINANCE

1. ABCD as fundament of FinTech

To provide context, we understand FinTech as the different use cases related to algorithms, big data, cloud services and distributed ledgers (with blockchain and smart contracts) or 'ABCD'. ABCD allow for and support the current general trend towards decentralized finance and disintermediation.

Although many will be familiar with these concepts, a brief account of the underlying technologies will underpin the analysis of how FinTech can contribute to sustainable finance.[12]

a) Artificial Intelligence

The underlying idea of AI is of software that mimics human cognitive functions, such as 'learning' and 'problem solving'.[13] AI puts data

[10] See for an international overview [REF#]; for an EU overview cf. Dirk Zetzsche & Linn Anker-Sørensen, *Regulating Sustainable Finance in the Dark*, 23 EBOR 47-85 (2022).

[11] The literature on corporate governance on this aspect is abundant. Cf. REF.#

[12] This section is taken, in large parts, from Dirk A Zetzsche, Douglas W Arner, Ross P Buckley, Decentralized Finance, 6:2 *Journal of Financial Regulation* 172–203 (2021).

[13] *See* STUART J. RUSSEL & PETER NORVIG, ARTIFICIAL INTELLIGENCE: A MODERN

to use by drawing conclusions as to the probability of an event from prior knowledge of conditions related to the event; whereby the greater the volume of data, the more insightful and accurate the inferences drawn from the data will be.[14] Machine learning is a subset of AI that uses statistical, data-based methods to progressively improve the performance of computers in a given task, without humans reprogramming the computer system to achieve enhanced performance.[15] In practice, the learning is achieved through extensive 'practice' with multiple feedback rounds through which the machine is told whether it has passed or failed a task.

b) Blockchain, Distributed Ledgers and Smart Contracts (DLT)

A distributed ledger is "a database that is consensually shared and synchronized across networks spread across multiple sites, institutions or geographies, allowing a transaction to have [multiple private or] public 'witnesses'."[16] The sharing of data results in a database distributed across a network of servers all of which together function as a ledger.[17] Distributed ledgers are characterized by an absence of, or minimal, central administration and no centralized data storage. They are, hence, "distributed," in the sense that the authorization for the recording of a given piece of information results from the software-driven interaction of multiple participants. Coupled with cryptographic solutions, such features (decentralization and distribution across a network of computers) curtail the risk of data manipulation, thereby solving the problem of having to trust third parties, specifically data storage service providers.[18]

APPROACH at *viii*, *1-4* (3d ed., 2016) (*defining AI as devices that perceive their environment and take actions that maximize their chances of successfully achieving their task and* describing the origin of the term AI in the Turing Test where "a computer passes the test if a human interrogator, after posing some written questions, cannot tell whether the written responses come from a person or from a computer", and defining six core capabilities that together compose most of AI, including natural language processing, knowledge representation, automated reasoning, machine learning, computer vision, and robotics). The seminal work on AI is of course Alan M. Turing, Computing Machinery and Intelligence, 49 MIND 433 (1950).

[14] *See RUSSEL & NORVIG*, supra note 13, at 495-99.

[15] *RUSSEL & NORVIG*, supra note **Fehler! Textmarke nicht definiert.**, at *693-859 (describing the training methods).*

[16] WORLD ECONOMIC FORUM, INNOVATION-DRIVEN CYBER-RISK TO CUSTOMER DATA IN FINANCIAL SERVICES – WHITE PAPER 5 (Figure 2) (2017), http://www3.weforum.org/docs/WEF_Cyber_Risk_to_Customer_Data.pdf.

[17] *See* David Mills et al., *Distributed Ledger Technology in Payments, Clearing, and Settlement* 10-11 (Wash.: Bd. of Governors of the Fed. Reserve Sys., Finance and Economics Discussion Series 2016-095, 2016), https://doi.org/10.17016/FEDS.2016.095.

[18] *See* MICHÈLE FINK, BLOCKCHAIN REGULATION AND GOVERNANCE IN EUROPE 12-14

The modus operandi of distributed ledgers is best understood by looking at their counterpart, the concentrated ledger. Let us assume that a centralized register administered by a single entity contains all relevant data. That arrangement entails a number of risks. First, if the hardware where the register is "located" is destroyed, the information content, as well as the authority to ascertain that the information is correct, is lost. Second, disloyal employees of the database administration or an unfaithful administrator may manipulate the information content of the register. Third, a cyberattack may result in manipulations and data losses.[19]

Distributed ledgers address these problems by raising the barrier for manipulation. The underlying technology requires consensus of many data storage points ("nodes"). If there are *n* nodes (instead of one concentrated ledger) and *e* describes the effort necessary to break into any single server, all other conditions being equal (safety per server, etc.), the effort necessary to manipulate all the linked servers will be *n* x *e* rather than 1 x *e*.

Distributed ledgers are usually paired with a blockchain protocol. Blockchain refers to the storage of data in data bundles (the 'blocks') in a strict time-related series with each block linked, through a time stamp, to the previous and subsequent blocks. The blockchain renders data corruption even harder, because a successful cyberattack would have to simultaneously corrupt not just one set of data but all subsequent data sets (i.e. the whole blockchain) as well as the time stamps simultaneously.

Distributed ledgers have provided fertile ground for the application of another innovation that may solve the problem of trust in human interactions: smart contracts. While neither smart, nor contracts in a legal sense, they are self-executing software protocols that reflect some of the terms of an agreement between two parties.[20] The conditions of the agreement are directly written into lines of code. Smart contracts permit

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(2019). *See also* Sinclair Davidson, Primavera De Filippi, & Jason Potts, *Blockchains and the economic institutions of capitalism*, 14 J. INST. ECON. 639 (2018) (arguing that blockchain technology is a new governance institution that competes with other economic institutions of capitalism, namely firms, markets, networks, and even governments); PRIMAVERA DE FILIPPI & AARON WRIGHT, BLOCKCHAIN AND THE LAW – THE RULE OF CODE 55, 136-40 (2018) (arguing that widespread deployment of blockchain will lead to tech-based business practices that could prompt a loss in importance of centralized authorities, such as government, and urging a more active regulatory approach).

[19] Any server *can* be manipulated with sufficient computing power and time (even if no other weakness in an encryption system is known to the attackers). *See generally* JEAN-PHILIPPE AUMASSON, SERIOUS CRYPTOGRAPHY: A PRACTICAL INTRODUCTION TO MODERN ENCRYPTION 10-18, 40-48 (2017).

the execution of transactions between disparate, anonymous parties without the need for an external enforcement mechanism (such as a court, an arbitrator, or a central clearing facility). They render transactions traceable, transparent, and irreversible. Since processes driven by smart contracts are often saved on distributed ledgers, we refer to these three technologies collectively as distributed ledger technologies (DLTs).

c) Cloud Services

Decentralized finance (DeFi), with regard to cloud computing, refers to the decentralization of server capacity. Meanwhile, cloud computing refers to the on-demand availability of data storage and processing power without the users owning or controlling the servers providing these services. Moreover, cloud computing relies on data centers operated by commercial providers that rent out capacity to their clients who access the capacity over the internet.

In order to provide for cloud stability in light of volatile demand and energy supply, to diversify against demand peaks, and ensure economic operations where energy costs fluctuate throughout the day, cloud service providers typically link server centers across different time zones, countries and economic regions, and channel excess demand to servers where data processing capacity is cheap, due to lower demand and energy costs.

d) Data

At the core of all of these innovations is data, resulting from the digitization of an ever-increasing range of processes: the idea here is the 'digitization of everything' that underlies theories of the Fourth Industrial Revolution. The ever-greater volume of data supports both traditional data analytics and 'big data' approaches. Big data analytics refers to the collection and processing of data sets that are too large or too complex for traditional data processing applications.[21] Big data applications look at the bulk of data points and apply advanced data analytics methods to detect unexpected correlations, test expected correlations for causation, or determine the probability of a predefined pattern.[22]

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[21] *See* VIKTOR MAYER-SCHÖNBERGER & KENNETH CUKIER, BIG DATA: A REVOLUTION THAT WILL TRANSFORM HOW WE LIVE, WORK, AND THINK 12-14 (2013) (predicting that big data will transform the organization of society).

[22] *See id.*, at 6 (stating that the volume of information in the last decades has outpaced IT engineers' manual data handling capacity so that engineers need to reinvent the tools they use for analyzing information; the latter will result in new forms of value creation that affect markets, organizations and other institutions).

2. Disintermediation as Potential of FinTech

a) Potential for Tech-based Disintermediation

The key impact of 'ABCD' is disintermediation, not only in an institutional sense, but also in a personal sense. If administrative processes exclusively depend on "if-then" binary conditions, human intervention cannot wastefully delay or derail execution. Think of the following simple process: if the declaration of a will is received, then send cash to a recipient. A smart contract detecting whether an "if-then" condition is met executes the action automatically and instantaneously; human intervention cannot tamper with the if-then condition, which in turn enhances the recipient's trust that the money will in fact be sent to her. That frees parties from the need to put in place security arrangements (such as margins, collateral etc.), thus addressing human opportunism.

The same mechanism can easily be used for sustainability-oriented disintermediation under the following conditions: assume an investment fund's investment policy restricts investments to sustainable assets only. The if-then condition programmed in a smart contract allows then the bundling of financial and sustainability conditions: only if the asset meets a given sustainability criteria in addition to a pre-set financial criteria are smart contracts allowed to send the "buy" order to the fund's broker.

The problem in that model is not, as we have shown, that such a strict if-then condition is difficult to programme or implement, because in principle all investment models function in a similar way. Rather, the issue lies in the data feed that drives the sustainability-oriented investment process: if the data feed that gives the smart contract the red or green light in itself is unreliable, all the technology on top helps very little.

b) Tokenization of the Investment Chain

Yet, technology may not only disintermediate the investment process, but also the data collection and data distribution process. In the following, we focus on one particular use case, namely tokenization.

If we leave technical features aside, from a legal perspective a token offering is a kind of securitization of cash flows (or other rights). The special feature of tokenized finance is the digital platform (the 'DeFi

stack'[23]) created and serviced by a technical service provider. That provider programmes the code and operates the digital ecosystem. Often, the service provider also holds 'governance rights' over the entire financial ecosystem.

Tokenization allows for the technical disintermediation of the whole investment chain: rather than bundling their investments into legal products, investors can hold larger or smaller parts of a token. The advantage of these tokens in light of our topic is that tokens are mere bundles of data. In addition to any right or financial data, tokens can hold sustainability information on how the cash flow has been created, for instance which greenhouse gas emissions have been created or how the production process impacts on biodiversity or water resources.

c) Beneficial if aptly regulated

If an ecosystem is set up in a decentralized fashion using distributed ledger technology and advanced cryptography, and *if that ecosystem is set up in a sound way and is well-governed*, it may provide in all other aspects a transparent, yet immutable set of data, that is: uncorruptible and immutable sustainability information in a digital format on which the whole value chain can rely. While we will show how this may take place in the next section in detail, we want to underline again that only when good governance practices throughout the overall token chain are ensured can the benefits of tokenization for sustainable investments truly come about. For that reason, we will devote the last part of our paper to discuss which regulatory elements are indispensable for achieving said benefits.

3. Tokenizing the Sustainability Data Stream

a) Embedding Sustainability Information

As just laid out, a Green FinTech system can make use of the fact that FinTech enables cash flow and sustainability data to be bundled in a non-corruptible way.

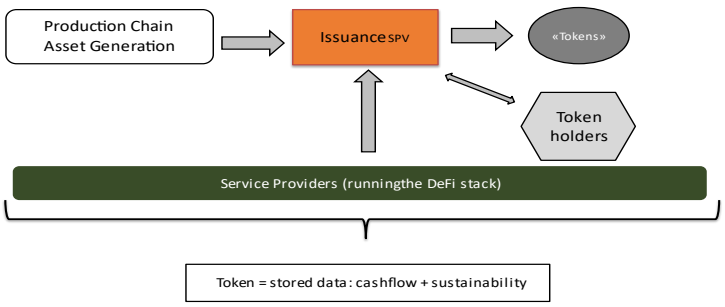
If the token is a mere piece of digital information, then it is in the hands of the token originator what data are stored on the token. We can

[23] See *Schär*, REF..

envisage a token on which, besides the cash flow related financial data and rights, the sustainability-related data are stored in a standardized manner. Such data would be, for technical reasons, both transparent and immutable, at least in principle.

When the core sustainability data are inseparable from financial data due to tokenization, every token holder can feed that data into her own assessment tool programmed according to their own processes, models and preferences (see Figure 2). Further, the tokens themselves could be stored in an open domain fashion, to render the related data accessible to any investor or intermediary further up the chain.

Figure 2: Tokenization of Green Cash Flows



As an alternative, the token issued by the original producer [first level token] could be merged in an inseparable manner with the new [second level] token issued by the next intermediary in the chain (that is the asset manager / investment fund), and the same may then happen vice versa with the second level token when the next intermediary in the chain (that is the asset owner / pension fund or life insurance company) embodies the second level token in its own third level token.

The important point here is that the token created by the 'real-economy' production or service company with embedded sustainability information finds its way in an immutable and uncorruptible manner into the system of all intermediaries further up the chain which then assess the data with their own models and systems.

b) Reducing Agency Conflicts by Reducing Agents

The 'double whammy' of transparency and immutability as a result of tokenization can remedy the core issues of sustainable finance: informational intermediaries, whose sole function is data collection, aggregation and transmission, become superfluous. At the same time, agents that assess data (like rating agencies) will judge themselves through competition with the assessment models developed by asset managers or preset models added to standard investment software. In turn, the number of agents will shrink; and agency conflicts due to relying on these intermediaries will also be minimized.

All in all, tokenization may address the agency problems in the sustainable finance chain, by technical means, aiming at *informational* rather than *financial* disintermediation.

What we describe here is not a vision of the distant but rather the very near future, with pilot projects already in the making. Examples of embedded sustainability information in tokens do exist, for instance, in the clothing chain where social and environmental information matter for socially conscious consumers. In this case, a tag opening tokenized information is added to an item of clothing, which allows any consumer to read about what sustainability impact it may entail. The same technical means may also address greenwashing, as a core impediment to sustainable financial markets.

IV. REGULATORY BUILDING BLOCKS OF A GREEN FINTECH SYSTEM

As outlined above, the potential of disintermediation may only materialize if technology is adequately regulated; so, in the absence of adequate regulation and governance, we may well see harmful effects that exceed the benefits the technology may provide.

The question then is: What are the regulatory preconditions for a well-functioning Green Fintech system? And how can law support a socially beneficial disintermediation of sustainability information?

Below, we identify three regulatory building blocks of a Green FinTech system.

1. Taxonomy of sustainability risks and sustainability factors

First, the sustainability token presented herein requires standardized terms on how to disclose data relating to sustainability risks and the impact on sustainability factors.

That taxonomy must be accompanied by an international standard on how this information may be disclosed and stored, which will therefore require cooperation between the new International Sustainability Standards Board (ISSB) and technical standardization providers.

We note that the requirement of global sustainability reporting standards does not entail a legal judgment on any matter disclosed like it does in the EU's Taxonomy Regulation and its technical screening criteria (TSC). Rather, the assessment on whether or not a given conduct is sustainable will be left to those actors further up the value chain. It is merely *important* that the factors which allow for the judgement are collected in a harmonized and standardized manner. Further, the rules on how to deal with missing data must also be harmonized, given that very often some sustainability data will be missing as they cannot be measured at the point of production or service. Two potential solutions can be discussed which may be adopted separately or together. First, missing data must be reported as such. Second, where data are missing, the real economy firm (ie. the non-financial firm) may give a datapoint that represents its best estimate.

2. Enabling approach to data transmission

Second, the embedded data must be allowed to flow smoothly

through the financial data chain. Data privacy and protection laws are a minor concern as long as disclosure relates only to business-related data; however, data transmission may become a challenge if the token and hence the data shall be personalized (like in peer-to-peer lending tokens).

Further, financial regulation as well as the overall legal environment must further flow-through transmission of data, open access to tokenized data and/or secure the embedding of first level tokens into second and third level tokens respectively.

3. Accountability and liability of the 'data originator'

Third, the actors that embed the data in the tokens are the weak link in a tokenized Green FinTech system herein referred to as the 'ultimate data providers'. Ultimate data providers often include the entities formally acting as issuers or real economy firms producing goods, both of which have very strong incentives to disclose greenwashed data.

The informational disintermediation system works only if the ultimate data providers disclose sustainability data in a transparent, reliable and faithful manner. A legal way to move towards such reliability is strict public and private sanctions for wrongful disclosure.

On top of that, we suggest standardizing and adding a certificate of origin of the sustainability data to each token, paired with legal accountability and liability for the validity of assets and the embedded sustainability data. Each token must bear the digital stamp of the ultimate data providers and an internal auditor certifying that the methods applied to measure and implement the data were, by and large, in line with the internationally standardized methods defined.

Further, for large issues of financial products we could ask investment banks and auditors to co-sign, to ensure further diligence processes.

In addition, if the technical service providers that run the DeFi stack for the token chain modify the underlying code and stored data, we could also ask the service provider to co-sign, with responsibility limited to the immutability of the token code.

Naturally, all of these signatures remain fully digital, yet they allow for an accountability trail leading from the data source to the end investors.

With regard to the ultimate data providers, we acknowledge that

no system of private and public enforcement will be perfect. In other words, there will always be someone who seeks to manipulate the system. As such, our tokenized Green FinTech system is, thus, not a perfect antidote to mitigate the negative effects of greenwashing in the sustainable finance value chain.

V. CONCLUSION

We have argued herein that the sustainability transformation of financial markets may be supported by the disintermediation function of FinTech, potentially resulting in transparency, immutability and the straight through processing of sustainability data by way of tokenization.

This may be achieved by imprinting a sustainability mark on the cash flow, the consequences of which are potentially severe. Tokenization may allow, for instance, sustainable finance to be segregated from non-sustainable finance: retail and institutional investors (but also the state) could, with standard IT tools, directly identify which financial products cater to their sustainability preferences – and forego the informational intermediaries with additional agency conflicts and costs that currently form the sustainable finance industry.

As we have laid out such a model requires legal support in three ways:

(1) a uniform disclosure standard for ESG factors that contribute to sustainability risk and sustainability factors,

(2) data rights and governance adjusted to the cause, resulting in a flow through transmission environment, and

(3) reliable 'ultimate data providers', with private and public enforcement institutions that collectively seek to secure the validity of the data trail.