WE KNOW

HOW 'FINTECH' CAN HELP FIGHT GLOBAL WARMING

To put a stop to global warming, drastic efforts are needed. And all sections of the economy and society must be on board. That includes the financial world, because it can ensure that the financing of cleantech investments and the creation of sustainable business models are given priority. In this report, at the request of Cleantech Flanders, Peter Adriaens, Professor of Engineering, Finance & Entrepreneurship at the University of Michigan, sheds light on this issue.

At my university in Ann Arbor, in the state of Michigan, I teach a course that focuses on the financing of infrastructure projects. It is part of the course for MBAs, engineers and policy economists and aims not only to impart knowledge but also to challenge students in a wide range of areas. From deal sourcing and due diligence on emerging technologies and markets and the impact of Internet of Things (IoT) on the venture and growth capital landscape to the role of 'fintech' in new asset financing models.

Recently, both a CEO of a blockchain technology company (Blockchain Triangle), a Managing Director of the digital group for a large engineering consultancy company (WSP) focused on resilient infrastructure, and an investment banker working for the US Treasury spoke in the course. We addressed this question: How are data and fintech likely to disrupt the financing, operations, and risk/return profiles of smart (cyber-physical) cities projects?

HYPE AND REALITY

Shortly before, I had participated in the Glasgow Climate Summit (COP-26), where I had joined Blockchain Triangle as a member of its advisory board to make investor and corporate connections. The company's value proposition as a blockchain-based ESG disclosure platform connecting infrastructure assets and investors is related to the EU and UK pronouncements to force banks to disclose their loan book portfolio exposure to climate change risks in their financing decisions. The US Financial Markets Authority (SEC) is also expected to take a position in the coming months on climate risk in investments.

During my course, this led to a discussion on the hype and reality around data-driven financing and business models for (climate)resilient infrastructure assets.
Indeed, experience with novel data-driven financing and business models is still largely relegated to operational efficiency and OPEX financing (for operating costs), , with examples of pilot applications in CAPEX structuring (for capital expenditures) and data monetization for different infrastructure assets. Not surprisingly, revenue-generating assets such as water, energy, mining, and concessionary contract agreements such as toll roads tend to lend themselves to new efficiencies and real time valuation.

This becomes clearer if we look at some relevant use cases in the table below.

SMART HIGHWAYS

Governments can use digital technologies to collect data on traffic patterns. They can use these data themselves, but they can also sell them to insurance companies who use this data for insights on risk underwriting and cash flow reserve position management. In the United States, experiments are underway to measure the impact of logistics on the life cycle of roads and to provide financial compensation (e.g. to transport companies). These so-called 'smart slabs' (an Integrated Roadways product) can be integrated in roadways and bridges and outfitted with sensor hubs to inform the KPIs (key performance indicators) of P3 (public private partnerships) contractual agreements on structural health, traffic type and driver demographics. While the business model and cash flows models are still under development and being tested, provisional P3 agreements are being negotiated between technology companies and state agencies.

SMART WATER PLANTS

Public water agencies in many municipalities are facing budget pressures and are turning to digital solutions by integrating data from various sources to gain operational efficiencies (e.g. so-called non-revenue water from pipeline breaks) and invaluable insights to help them avoid major outages and reduce risk. The data solutions also include the conversion of capital expenditures to long term operational cash flows to pay for the delivery of water services (i.e. water-as-a-service). Municipalities are forming public private partnerships to develop long term solutions to this problem. The municipalities mandate contracts that include rights to the data collected from sensors and in some cases stipulate on-premise solutions with high security measures.

VARIABLE INTEREST STORMWATER BONDS (OR EIBS, ENVIRONMENTAL IMPACT BONDs)

Also in the US, water agencies are working with investment banks to structure variable interest rate revenue bonds where the payout to the investor is dependent on the data-driven performance of the stormwater asset. The focus of this model is on green infrastructure to replace grey infrastructure at lower capital cost. In addition, flow sensors, water quality sensors and weather data inform the risk and performance of the asset, resulting in a low yield spread on the revenue bond, which can range over a few 100 bps. This model has been deemed attractive by investors due to it being uncorrelated to other financial assets.

REVENUE-BACKED DEBT SECURITIES FOR WATER INFRASTRUCTURE

In Italy, local governments looking to upgrade and expand their water distribution and treatment systems have bundled unrated (and expensive) minibonds in a special purpose vehicle (SPV) and converted to rated debt securities which are sold to pension funds and development banks (EIB). The credit rating and liquidity of the Viveracqua Hydrobond securities were a financially attractive alternative relative to unrated bonds too small and lacking of sufficient data to justify the administrative cost while also spreading the credit risk.The SPV received a cash buffer, which can be backed by the utilities, performance options contracts or a liquidity facility and receive a favorable rating. Integration of performance data on - for example - changes in ratepayers, pipe leakage, or cost of water quality impairments can be structured in forward contracts. So-called asset-backed securitization of public private partnerships (ABS-PPP) is a new financing model that is being heavily studied as a form of structured finance for infrastructure projects, though it is not clear how many projects have been executed.

CREDIT ENHANCEMENT FOR INFRASTRUCTURE PROJECTS

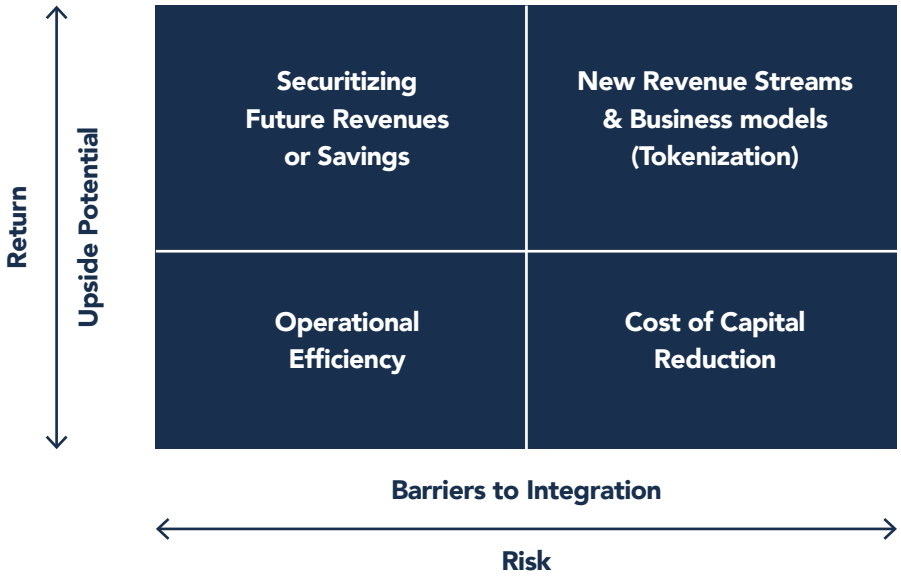
Proxy revenue swaps (PRS) are becoming a new data-driven options model to fix floating revenue of projects such as wind power and water provision for asset owners. The PRS serves to reduce uncertainties for debt or bond investors in the projects resulting in a higher credit rating and less conservative credit covenant requirements, thus rendering the project more bankable. PRS's are offered globally by insurance companies such as Nephila Climate short-term options, are structured against a long-term cash flow trend and are triggered by independent indexes for wind, rainfall or other metrics.

SMART MINING

Mining companies are increasingly moving towards digital twin technology to gain valuable insights into financial and environmental aspects. They have installed systems to gather multiple data points from their mobile assets such as trucks, shovels, etc. This helps them gain transparency into operating costs and emissions. In some cases, these companies worked with engineering firms to develop bespoke solutions to meet data acquisition needs.

NEW BLOCKCHAIN-BASED ENERGY AND MOBILITY INFRASTRUCTURE BUSINESS MODELS

In the US, Belgium, Germany and the Netherlands, technology companies are piloting blockchain applications to aggregate, distribute and manage decentralized energy supply and demand. The application allows for the residential owners to buy and sell energy within an energy marketplace of consumers using so-called smart (automated) contracts, and helps utilities to manage base and peak load demands. The applications of blockchain in mobility include pilots to have cars as unique identifiers (digital wallets) pay for infrastructure needs. As more data becomes available from infrastructure assets, more data-driven rules-based contracts can be coded and executed automatically, reducing costly middlemen and allowing for the design and payment systems for connected digital infrastructures (e.g. roads and stormwater assets) rather than siloed assets.



The above examples make it possible to display data-driven (digital) financing opportunities in a risk-return diagram. This maps barriers for integration against upside potential. For example, implementation may be hindered by technical (e.g. integration of cost and revenues with assets) and non-technical (e.g. stakeholder alignment) causes. The upside potential reflects the total possible return.

WHERE FINTECH, CLEANTECH AND CLIMATE-TECH MEET: SOME DEFINITIONS

Tokenisation is a technological process to replace confidential data with a unique combination of numbers and characters that contains necessary information without revealing the original related data (e.g. bank account numbers, credit card numbers, transaction details).

Securitisation is a financial technique that combines assets that are not tradable or difficult to trade into tradable securities.

Hedging is the covering of the financial risk of an investment by another investment.

Initial coin offering (ICO) or initial currency offering, is a form of financing using crypto coins. It is often a form of crowdfunding, although a private ICO that does not seek public investment is also possible.

For example, tokenization of infrastructure should be able to draw the maximum returns, because of new monetization mechanisms based on smart contracts, and unlocking of efficient capital (hundreds of billions of dollars). However, the technology is still immature, market demand very volatile, smart contracts not (yet) enforceable, and financial institutions not yet aligned with private contractors and government partners. Operational efficiencies could net benefits in the billions of dollars, and indeed projects have demonstrated how this can be done. Cost of capital reduction requires monitoring (digital infrastructure) to assure investors, underwriters and ratings agencies.

Securitization-based infrastructure financing is more mature and well understood (lower risk, but still a challenge for ratings agencies), has a significant capacity for forward selling of revenues and savings (note the increasing interest in asset backed security-public private partnerships (ABS-PPP) or aggregating sub-scale assets (too small for project finance) in novel SPVs.

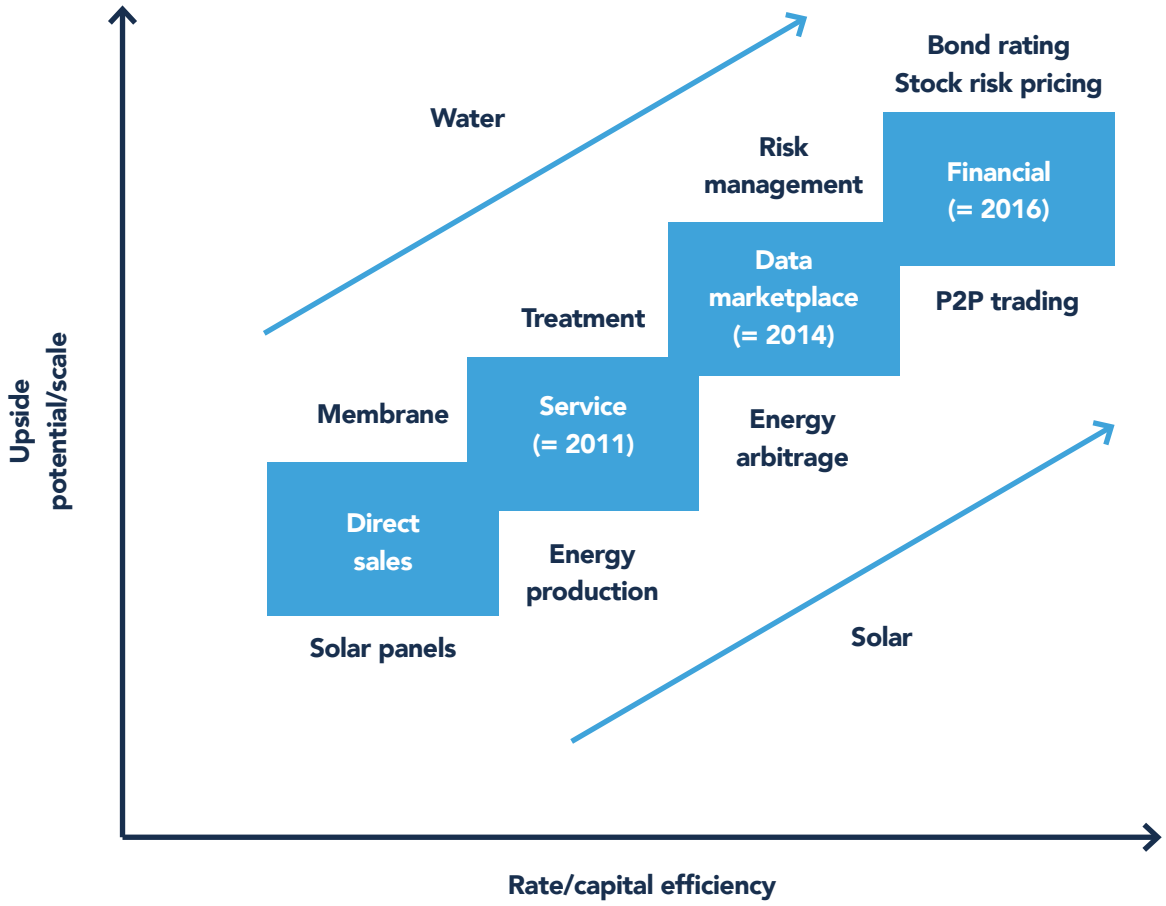
A BUSINESS MODEL SHIFT TO HEDGING

What do these financial innovations in the financing infrastructure tell us about business model shifts? I have been teaching and researching the cleantech industry for 30 years. First as a technology developer focused on microbial and chemical sensors, then as a deal flow analyst and early-stage equity investor at the Wolverine Venture Fund, and in recent years as an innovator in digital financing mechanisms with applications in the ESG and infrastructure space. The Center on Smart Infrastructure Finance that I lead at the University of Michigan is funded in part by Ripple, a blockchain company in the cross-border currency settlements space.

In addition, we have industry partners in financial services, technology and construction sectors who work with us to design and test value-added digital solutions. Working with these commercial partners has provided insight into the business model shift in cleantech since 2003, when the term ushered in a new technology investment industry . It also has provided a broader perspective in how new startups are figuring out new value capture and scalability opportunities in the digital landscape, and how corporations are transforming their own lines of business through partnerships, joint ventures and acquisitions. Ranging from startups such as Blockchain Triangle, InfraClear, Integrated Roadways and Equarius Risk Analytics, to corporate strategic and venture investors like Ford, WSP, Macquarie, and Kurita, and to financial services including the US Treasury, Nuveen, Ripple, MSCI and CitiGroup, new value propositions are emerging.

FROM 'A THING' TO 'THE WAY WE DO THINGS': THAT TOO IS CLEANTECH

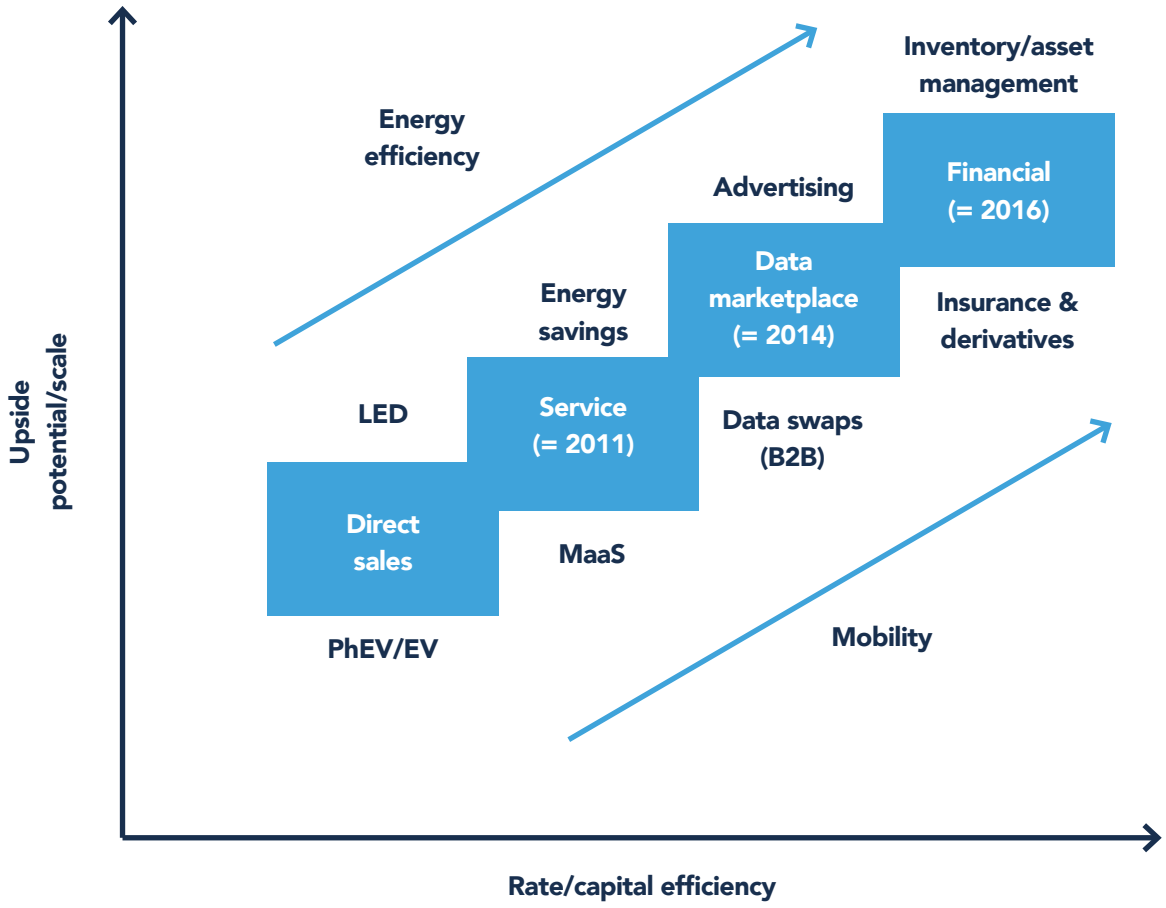
The digitization of the economy, and the integration of IoT in industrial and financial systems and processes, shifted cleantech from 'a thing' to 'the way we do things' about half a decade ago. A lot has been written about that transition and how it has influenced investment in new cleantech companies. These investments are driving resource efficiencies with software-as-a-service and anything-as-a-service. The evolution of business models in the 'Rate of growth vs. capital efficiency vs. upside potential/scalability' space in water and solar is shown in the chart below. Direct sales models shifted to service models about a decade ago, and into a data marketplace driven by arbitrage and risk management values five years later, after full integration of cloud computing. .



Financial technology now is further shifting how cleantech companies capture value from the next generation of business models. I am not referring to the initial coin offerings (ICOs) where companies issue tokens (classified in the U.S. as shares) for sale to retail investors to finance a startup. Rather, I refer to the integration of fintech in the value proposition of technology solutions as an operational efficiency gain driving increased valuations. Consider how real-time data insights are impacting the valuation of assets and enabling a financial model structured to deliver returns using peer-to-peer (P2P) trading for microgrids with companies. Or as companies use water and weather data in an artificial intelligence supported model to reprice company shares and bond ratings and inform insurance capital reserves, while participating in portfolio performance returns.

The integration of IoT in products and systems builds data oceans, which can be parsed and processed to uncover trends that create value as monetizable data streams. I refer to my recent piece (https://www.bloomberg.com/news/articles/2021-04-07/use-data-not-taxes-to-pay-for-infrastructure) in Bloomberg CityLab on financial innovations. Whether in mobility, water, lighting, energy, waste or agricultural tech, business models of innovative CleanTech companies increasingly are adopting what I broadly term financial hedging models resulting from the increasing integration of IoT, monetization of data and (re)pricing of risk.

Based on the CleanTech Group's i3 Platform, similar trends as in water and solar are emerging in the LED/lighting/energy efficiency and transportation mobility subdomains.
The transportation mobility industry comprises a mix of sales and service models addressing different customer segments, such as environmental, technology-savvy and autonomy, but the value capture shift towards derivative market and financial revenue streams is evident.



Analysis of the data supply chain in the mobility industry not only reveals their value for operational efficiency, but further drives data auctioning marketplaces resulting in 'data swaps' and 'pooled derivatives' between cross-industry partners, and insurance models. More recently, these contracts are being included in blockchain networks for transparent transactions. These models not only help to expand customer access and market scale, but inform asset allocation of operational investments in different geographies, for example.

WHAT CAN WE LEARN FROM THIS?

The trends, developments and examples described here are not limited to the mentioned investment domains, as recycling and waste management, grid-scale energy generation and storage, and biofuels/biomaterials are being similarly disrupted by data-driven startups with financial risk transfer business models. If 'CleanTech IoT' becomes a financial risk hedge or assess value proposition, its integration will permeate and be felt across all sectors. It is a systemic, cross-sector and silo-crossing value proposition. Real assets become data carriers for derivative value generation and income generation. If 'CleanTech IoT' becomes a financial risk hedging or rating value proposition, its integration will be felt across industries. It is a systemic, not an industry vertical value proposition. Real assets are becoming data vehicles for derivative value generation and monetization. Our conversations with the Asia Infrastructure Investment Bank (AIIB) and TESIAC, an infrastructure-as-a-service (IaaS) platform, indicate that data oceans, insights extraction and monetization are being integrated across energy, mobility, housing and other verticals.

My course panel discussion on the importance of data and fintech value propositions to integrate fintech and IoT in resiliency finance reflected caution in the applications of these financial hedging business

models. Data contracts are still too short term, volatile, and uncertain in their valuation to serve as collateral for loans or private equity financing in infrastructure. However, pension fund investors like Nuveen are betting on the repricing of bonds and municipal infrastructure finance using ESG data models, and banks like CitiGroup are exploring the opportunity of data assets to drive new revenue streams and reduce risk. If it is up to Blockchain Triangle and Equarius Risk Analytics, the nascent development of digital asset repositories to unlock new value through efficient capital and tokenization of financial instruments is key.

PETER ADRIAENS
Director, Center for Smart Infrastructure Finance;
Co-founder, UM FinTech Collaboratory;
Professor, Environmental Engineering & Finance;
Professor of Entrepreneurship w/o tenure (2006-2016; Ross School of Business);
Professor w/o tenure, School for Environment and Sustainability, The University of Michigan at Ann Arbor