#LET-Chain

LET-Chain provides the software architecture for designing efficient and transparent mobility policy solutions for governments and businesses. LET-Chain thereby promotes low emission transportation (LET) through financial incentives paid for appropriate measures.

The Challenge

The Paris Agreement calls for making finance flows consistent with a pathway towards low greenhouse gas emissions development. In 2012 anthropogenic greenhouse gas emissions reached 34.5 billion tonnes CO_2 eq [PBL 2013]. The transport sector has a big stake in this battle. In 2012 global transport accounted for GHG emissions of almost 7.19 billion tonnes of CO_2 eq [IEA 2014]. And latest data show that GHG emissions from transportation continue to grow. In 2014, GHG emissions of the global transportation sector accounted for 23% [IEA 2016].

One of the main ways to lower global transportation emissions is to reduce fossil fuel consumption and improve efficiency. Hence it is necessary to reshape the world's transport systems and to promote new green solutions – both on a technological as well as on an infrastructural/organisational level.

In Liechtenstein, one third (29,8 %) of all emissions come from the transportation sector [OE 2017]. It should be noted that the car-per-capita ratio is probably the highest in the world. In 2015, 39'000 inhabitants in Liechtenstein accounted for 38'000 motor vehicles [OS 2016]. While other sectors are successfully reducing their carbon emissions in Liechtenstein, transportation pollution has remained on a high level. Another distinctive feature of Liechtenstein is the large number of inward cross-border commuters. In 2015, 54% of Liechtenstein's workforce consisted of this group. This means that the "population" of Liechtenstein grows by around 20'000 persons during the work week, and most of them use their own car. Therefore public transportation enjoys a high priority in Liechtenstein and its attractiveness was already significantly improved in recent years.

However, predictions for future transportation developments seem to become even more challenging: Although Liechtenstein and Austria signed a treaty in 2009 to improve the railway infrastructure across Liechtenstein by establishing a cross-border regional suburban train [GOV 2014], the project was put on hold in 2016 due to unresolved issues between the two countries. Moreover, the city of Feldkirch (Austria) currently plans a tunnel below its territory to ease its city traffic. The tunnel exit will directly lead up to the boarder of Liechtenstein. Estimations of transportation experts predict a further increase of traffic in Liechtenstein as a direct consequence of this project.

The Solution

In order to speed up the development of global and local efforts to tackle emissions from the transportation sector, it is crucial to join the forces of all willing stakeholders. #LET-Chain believes that the challenges of reshaping the world's transportation systems may be tremendously accelerated if low emission transportation initiatives may use common implementation architectures. Such common architectures (e.g. in order to implement corporate mobility management systems) provide the infrastructure for financial incentives and enable the exchange of respective experiences while maintaining individual approaches based on individual circumstances. It is up to the respective stakeholders (governments/corporations/others) to decide upon the targeted low emission transportation activities/products/goods/services. This could e.g. include subsidising the use of public transportation or the purchase of renewable energy for electric cars as well as the purchase and registration of electric cars. The table below shows a list of effective transportation measures which could be implemented by both – the private and the public sector.

EFFECTIVE TRANSPORT POLICIES FOR CORPORATE MOBILTY MANAGEMENT [OECD 2010]

Travel types	Means of transport	Type of measures		
		Infrastructure	Organisation, incentives, disincentives	Information, awareness raising
Home to work travel	Public transport, company bus	Direct access and short distances from the public transport stop to the company ground; etc.	On-site ticket sale, Job-Tickets; company bus service; shuttle-bus service to main public transport stops; guarantee ride home; etc.	Information about services, tariffs and time-tables (printed, Intranet, etc.); action days; campaigns, free test rides; etc.
	Bicycle	Protected bike stands; lockers; showers; etc.	Cycling subsides on expenses associated with cycling to work; subsidies on bicycle purchase; on-site bike repair service; provision of rain gear; etc.	Information about cycling routes; bikers breakfast; action days; campaigns, safety and health recommendations; competitions; etc.
	Parking management	Rationing of parking spaces (or at least not extend the actual offer); etc.	Parking charges; parking allowances management adopting accessibility criteria; parking cash out	Information on parking allowances and parking charges; action days, campaigns; etc.
	Car-Pooling	Dedicated parking space for car-poolers; etc.	Reduced parking charges for car-poolers; on-site matching service; etc.	Information on car-pooling facilities; action days; campaigns; etc.
	General		Teleworking; compressed work week; etc.	
Business travel	Public transport	Same measures as for home to work travel	Business travel regulations in favour of public transport use, etc.	
	Bicycle	Same measures as for home to work travel	On-site bicycle pool for short distance business travels; etc.	Reservation facilities and information on offer; etc.
	Car-Sharing		Participation on Business Car-Sharing schemes of Car-Sharing provider	Information on offer; etc.
	General		Teleconferences	Information on offer; etc.
Energy efficient car use	Energy efficient driving		Participation in courses for Eco-driving	Information on offer; on-site action days with course provider
	Energy efficient Fleet management		Rationing vehicle fleet (or at least not extending the fleet); energy efficient company cars	
Customer travel	Public transport	Same measures as for home to work travel		Information on accessibility of the site with public transport; etc.
	Parking management	Same measures as for home to work travel	Parking charges	Information on parking management at the site; etc.

Use Case

Company D offers its employees parking space on the company's premises but charges a daily fee of 15 Swiss francs. Bruce and Alice both work for Company D. Bruce comes with the car every day. Alice takes public transportation. Alice owns an annual card of the regional transportation association which she receives at low cost since Alice receives half of Bruce's parking fees via a mobility management program. One day Bruce gives Alice a lift to work. He learns that if he carpools he does not have to pay for parking. Company S is very fond of corporate mobility management systems because of their impact on lowering traffic. However, the company has only 10 employees, which is considered too small for the respective workload to implement such system. Nevertheless, Company S joins a corporate mobility management system when it learns that the company can easily access the same system used by Company D. The incorporation of carpooling as well as the enhanced accessibility of the system is provided by one Blockchain-based application – the LET-Chain.

Blockchain technology combined with the smart contracts can encourage low emission transportation in Liechtenstein. #LET-Chain was originally conceived as part of the Climate Ledger Initiative (CLI), exploring the general potential of Blockchain technology with respect to the ruleset of the UN Framework Convention on Climate Change (UNFCCC) and its legal instruments. #LET-Chain was selected as a specific CLI use case and shall now be developed into a working prototype. The objective is to arrive at a solution that:

- Facilitates providing (financial) incentives to corporations or individuals to use low emission transportation activities/products/goods/services;
- Enables automated execution of incentive activities via smart contracts;
- Enables the individual program managers to exchange, interact and to learn from each other's successes and difficulties;
- Builds a scalable infrastructure for an organic and dynamic inclusion of new activities, participants and audiences.

#LET-Chain establishes a universal Blockchain-based architecture for existing and new subsidy programs and initiatives. The goal is to provide the basis for a gradual build-up of a "living" accounting system, which takes advantage of smart contract applications in order to promote low emission transportation in the real world. Thus, #LET-Chain can be qualified as an innovative tool for making finance flows consistent with a pathway towards low greenhouse gas emissions development as required by the Paris Agreement.

#LET-Chain addresses public and private sector initiatives in order to reshape the current transportation system. Governments, corporations and other stakeholders may develop specific parameters for individual programs that aim at low emission transportation development by using financial incentives. These parameters and programs are implemented on a Blockchain network, which will enable the corresponding operations of smart contract applications. The necessary interlinkages of parameters, programs, Blockchain nodes and smart contracts will be enabled and facilitated by #LET-Chain. Every financial contribution, regardless of its source, shall be stored and tracked via Blockchain.

Due to the system of public/private keys (which are distributed to the participants) all stakeholders would be able to track the use of their financial means, from source to destination. #LET-Chain software will use smart contract applications with respect to the execution of the targeted destination of financial means (for this use case, linked to low emission transportation). A smart contract is a specific code that is stored on a Blockchain network instead of a centralized server. This means that no one can alter the code without altering all of the nodes in the network.

For the CLI use case, #LET-Chain establishes a specific corporate mobility management program, which, once it is in place, will provide a high level of scalability and accessibility. The program will enable big international firms to implement one corporate mobility management systems across their global subsidiaries. Moreover, the architecture also allows small firms to access the system while offering their employees comparable incentives as the ones from bigger firms.

Besides that, it also provides the possibility (e.g. for international firms, or government agencies) to get engaged in reshaping the world's transportation sector beyond their own operations/borders. For that purpose the use case will generate a pre-fixed share of proceeds and directs the respective revenues to an account earmarked for low emission projects (f.e. in emerging economies).

Pilot and Impact

To implement the Pilot of #LET-Chain, the Blockchain Büro team will develop a software prototype for a "decentralized" mobility management program. The software will be used by at least one international company headquartered in Liechtenstein (LiCo), LIEmobil, which provides public bus services, and the Liechtenstein Government. A portion of LiCo´s employees use the public bus system provided by LIEmobil to travel to and from work; however, the majority of employees still commute with their own cars without carpooling. The aim of #LET-Chain is to reward employees that carpool or take the bus to the work. In order to achieve this goal, digital currency, referred to as "LETcoins", will be "paid" to employees that carpool or use public transportation. The LETcoins (which could also be referred to as token) correspond to a specific amount of Swiss francs.

LiCo runs a corporate mobility management system which generates revenues by making employees pay a certain amount of Swiss francs / day if they want to use the employees parking premises. The revenues from the corporate mobility management system, issued in Swiss francs, will be collected into an escrow account, under the custodianship of a private company, such as the Blockchain Büro, or a governmental institution, such as the Amt für Umwelt, which is referred to as the "LETcoin Issuer." The money in the escrow account will be used to "back" the LETcoins. Each LETcoin will represent one Swiss franc.

In Phase I of the project, the LETcoins can be spent on bus tickets issued by LIEmobil. All of the transactions will be recorded on a private Blockchain, referred to as LET-Chain and developed by the Blockchain Büro. In contrast to the energy-intensive public Blockchain structure implemented by cryptocurrencies such as Bitcoin, a private Blockchain consumes significantly less energy to verify and record transactions. The private Blockchain structure enables the custodian of the escrow account to tightly control the users of the network and the transactions on the network. To complement the LET-Chain, Blockchain Büro will also develop a cryptographic wallet/app, referred to as "LET-wallet." The LETwallet will store LETcoins held by participating merchants and employees.

In addition to the development of the software, the Blockchain Büro will be responsible for managing the LET-Chain ecosystem and for periodically updating the software. The former task involves identity creation, referred to as LETwallet generation, whereby new merchants and employees are issued new LETwallet addresses in order to participate in the LET-Chain ecosystem. There will be two types of LETwallet addresses. Merchants will be provided with a wallet that can easily be cashed out to Swiss francs, whereas employee wallets will only be able to be spent within the LET-Chain ecosystem. This will ensure that LETcoins are spent on sustainable activities. Additionally, the LETcoin Issuer will be responsible for coin creation, when new Swiss francs are added to the escrow account, and coin, when Swiss francs are removed from the escrow account.

Basic structure of #LET-Chain
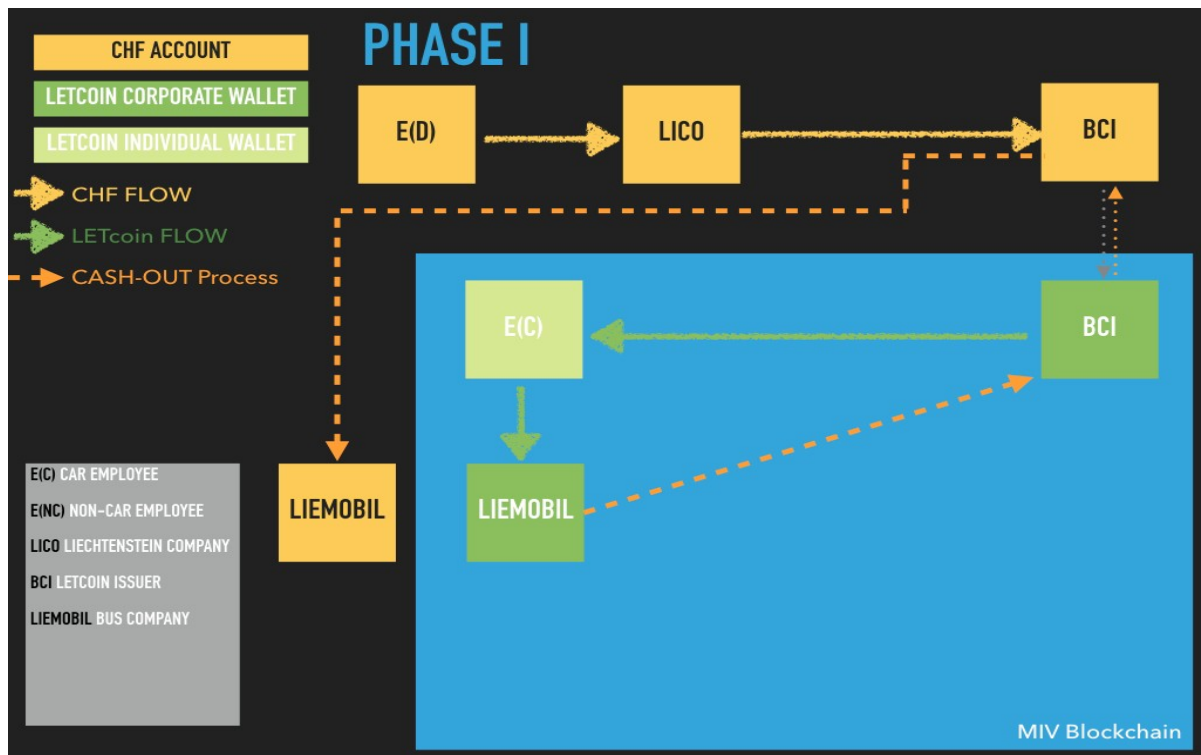
Transaction 1 = T₁ = LiCo will charge CHF 15 per day for employees that drive to work alone (without carpooling) and use the company's parking lot. LiCo will use 10 CHF to cover internal costs of operating a parking lot, and the remaining 5 CHF will be sent to the LET-Chain escrow account.

T₂ = LiCo employees will be sent an email inviting them to participate in a sustainable transportation program that will reward them for not driving to work alone. LiCo will provide an anonymised list of all employees of LiCo to LET-Chain.

T₃ = Employees that participate in the program will be given a newly generated LETwallet account with an initial allocation of 5 LETcoins worth 5 CHF. This amounts to a payment of 5 CHF from "fossil" employees to "clean" employees. LiCo employees will then have the option of spending the 5 LETcoins at several participating merchants, including LIEmobil. As long as revenues of the economical parking management system outnumber the amount of LETcoins the respective surplus of LETcoins will be kept by LiCo.

T₄ = A LiCo employee can board any LIEmobil Bus in Liechtenstein, and pay for the bus ticket using LETcoins via a mobile version of the LET-Chain wallet/app. The bus driver will instantly "see" that the LETcoins have been received into the LIEmobil LETcoin wallet/app, and then the driver can issue a physical or digital receipt to the employee. The real-time process may also apply a QR code approach, which directly issues subsidised tickets to the entitled employee.

T₅ = LIEMobil can hold onto the received LETcoins and use them to incentivise their own employees or convert them into CHF by sending the coins to the LETcoin Issuer's LETcoin wallet. If the LETcoin Issuer receives LETcoins from a participating merchant, an automatic transfer of CHF will be issued from the escrow account to the merchant's bank via a smart contract.

Beyond the Use Case

In Phase II, which is not part of the initial pilot use case, the implemented pilot use case will be extended to other businesses (incl. SMEs), governmental agencies or communities that wish to incentivize their employees or citizens to use low emission transportation. Finally, governmental aid or private donations can be integrated into the system in order to further incentivize participation. The use case provides a level of transparency that allows specific funds collected from unsustainable transportation activities to be earmarked for specific sustainable transportation activities. The LET-chain is both scalable and flexible.

The pilot use case aims at establishing the basic architecture to implement the described corporate mobility management system. The Blockchain-based system, including the usage of tokens (or coins), will also allow for an enhancement of other subsidy programs. At later stage #LET-Chain may be used for subsidising renewable energy supply at public charging stations for electric cars. Its basic architecture also enables financial contribution for the purchase and registration of low emission vehicles (e-cars, fuel cell cars etc.). As already mentioned, the pilot use case will also have an integrated system of generating share of proceeds to cover administrative costs and/or use these revenues to finance low emission transport in emerging economies. Especially the latter option states an innovative approach to get the private sector actively engaged into international climate finance cooperation under the Paris Agreement.

Specific Deliverables for Use Case

For the presentation planned for at COP23 in November 2017, the project initiators develop a software running on an appropriate Blockchain network, which incentivizes its participants to use public transportation and car pooling. In addition, the software will feature the generation of shares of proceeds with the aim to provide a contribution to international climate finance.

Background on Project Initiators/Participants

Blockchain Büro is a Liechtenstein based company that provides informational resources linked to Blockchain technology. This includes educational presentations, consulting, project management, event coordination and community work. Most activities are focused on the Liechtenstein region. The company is also operating the country's first Bitcoin ATM.

LIFE Climate Foundation Liechtenstein is a PPP based non-profit foundation under Liechtenstein law. The goal of the LIFE Climate Foundation is to constructively help shape the development and advancement of market-based instruments in the area of climate protection. The foundation's board is led by Liechtenstein's Prime Minister H.E. Adrian Hasler. The board is further comprised of representatives of the University and Liechtenstein's financial sector. The office of LIFE Climate Foundation will be in charge of coordinating the interested private and public sector participants within the implementation of the #LET-Chain pilot.

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