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“Kultur-Token” Sustainable Business Model: Visualizing, Tokenizing, and Rewarding Mobility Behavior in Vienna, Austria

Paper

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Foster, Gillian Joanne [ORCID: https://orcid.org/0000-0001-6978-3830](https://orcid.org/0000-0001-6978-3830) and Lamura, Maddalena Josefin and Hackel, Jakob

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Gillian Foster  
Maddalena Lamura  
Jakob Hackel



## “Kultur-Token” Sustainable Business Model:

Visualizing, Tokenizing, and Rewarding Mobility Behavior in Vienna, Austria



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# **“Kultur-Token” Sustainable Business Model: Visualizing, Tokenizing, and Rewarding Mobility Behavior in Vienna, Austria**

**Gillian Foster<sup>1</sup>, Maddalena Lamura<sup>2</sup>, Jakob Hackel<sup>2</sup>**

<sup>1</sup>Institute for Ecological Economics  
WU WIEN

<sup>2</sup>Research Institute for Cryptoeconomics  
WU WIEN

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**Kultur-Token™**

## **Executive Summary**

The report "Kultur-Token Sustainable Business Model: Visualizing, Tokenizing, and Rewarding Mobility Behavior in Vienna, Austria" is the result of an ongoing scientific collaboration between the Research Institute for Cryptoeconomics and the City of Vienna.

This case study uses business modeling to understand the project Kultur-Token and serves as a strategic tool for both the management team as well as external stakeholders. The report documents the process of development of the Kultur-Token, describes its purpose and features, the goals and stakeholders involved until the suspension of the test phase at the end of March 2020, as the Covid-19 pandemic restricted both mobility and cultural activities.

The purpose of this case study is to create a comprehensive sustainable business model for the Kultur-Token. It employs the theoretical basis of the Strongly Sustainable Business Model Ontology and the Flourishing Business Canvas as its method. This allows for more comprehensively capturing the environmental and social interactions of the project while employing established language and categories that are accessible and well understood.

The Kultur-Token is an app that rewards citizens of the City of Vienna for sustainable mobility behaviors. It encourages low-carbon mobility choices with tokens exchangeable for free access to local cultural offers. The app is governmentally owned and developed without a profit motive. The Kultur-Token is evaluated with non-financial indicators including its contribution to Vienna's goal of reducing greenhouse gas emissions. It contributes to several United Nations Sustainable Development Goals and aligns well with macro-level sustainability goals.

Participating users download the app and are then able to track their mobility behavior. The four modes tracked are car, bicycle/scooter, walking and public transport. When a user travels by bicycle/scooter, walking or public transport (s)he is rewarded with a portion of one Kultur-Token. One full Kultur-Token, equivalent to 20kg CO<sub>2</sub>, can be exchanged in the included marketplace for one ticket to a cultural offer. Four cultural institutions are available to users in the pilot phase: Volkstheater, Wiener Konzerthaus, Kunsthalle Wien, Wien Museum.

The tickets to cultural events are represented as voucher tokens on a blockchain system. The blockchain is governed by three nodes through a "Proof-of-Authority" governance mechanism. While all three nodes are controlled by the City of Vienna in the pilot stage, intentions are to establish further nodes with trusted institutions in a later phase.

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## 1. Introduction

This report is a case study of the world's first Kultur-Token app (KT) developed by the City of Vienna, Austria<sup>1</sup>. KT is a new and innovative application of digital token technology to two critical aspects of urban development today and in the future, cultural life and low-carbon mobility. It encourages low-carbon mobility choices with tokens exchangeable for free access to local cultural offers. Austria is an international leader in supporting a vibrant and globally important cultural milieu for the creative arts. Many global cultural landmarks of historical significance such as the Vienna Opera House, the Musikverein, the Kunsthistorisches Museum, and the Volkstheater are located in the Austrian capital city Vienna. Low-carbon mobility in Vienna is critical because the Austrian government is committed to fossil-free mobility by 2050. In addition, the city's goals include reducing vehicle-related air pollution to improve human health. Vienna is the largest urban area in Austria. It is experiencing population growth and has the largest public transport system in Austria. Therefore, the project is a unique melding of national and municipal priorities in an innovative citizen-centric digital technology.

*"[T]he City of Vienna is committed to prioritising public transport, pedestrians and cycling as the most environmentally friendly mobility modes. Vienna embodies a future-oriented urban mobility policy that is not only ecologically, but also economically and socially acceptable and hence sustainable."*

Vienna's STEP 2025 Urban Mobility Plan

This case study defines the KT's business model. We use business modeling to understand how it works now, as proposed, and could work better in future. The business model is meant to be an internal strategic planning tool for the KT management team. It may be used by KT's internal and external stakeholders and partners in the City of Vienna as a template "to work together to sketch, prototype, design, improve, communicate, understand, measure, diagnose"<sup>2</sup> all aspects of the app, highlighting the economic, social and environmental perspectives. Accordingly, the report conveys the authors' recommendations for improving the long-term viability of the KT derived from the analysis and relevant business model literature.

The KT Sustainable Business Model case study documents the development of the app starting in 2019 and its pilot launch in 2020. The pilot of 1,000 users was launched on February 26, 2020; however, due to the Corona virus crisis, the pilot was halted in mid-March 2020. Rather than a setback, this pause provides the authors the opportunity to provide the current business model analysis to:

- Document the development of the KT;
- Describe what the KT does;
- How it achieves its goals;
- Present the actors who are involved in the development, operation and maintenance phases;
- and
- Demonstrate why it is a viable policy tool for Vienna and beyond.

<sup>1</sup><https://digitales.wien.gv.at/site/en/projekt/culture-token/>

<sup>2</sup><http://www.flourishingbusiness.org/the-toolkit-flourishing-business-canvas/> Downloaded May 25, 2020



In addition, this KT Sustainable Business Model may serve as a template for other Austrian and international municipalities embarking on similar initiatives. The business model will have a broad audience because the focuses of the KT are low-carbon mobility, citizen engagement, and cultural enhancement through digital technology, which are all topics high on the agendas of many city managers today.

### **1.1. What is a Kultur-Token?**

The KT is a governmentally owned app, developed without a profit motive. The KT's primary goal is to reward citizens of the City of Vienna, Austria, for sustainable mobility behaviors that reduce greenhouse gas emissions associated with cars. Greenhouse gases are the main cause of climate change. The primary greenhouse gas produced by cars is carbon dioxide (CO<sub>2</sub>). The KT encourages low-carbon mobility choices with tokens exchangeable for free access to local cultural offers. Thus providing a new way for citizens to explore and enjoy cultural institutions. The app engages citizens in co-implementing Vienna's STEP 2025 Urban Mobility Plan (MA18, 2015). The plan calls for "a new culture of mobility". This perspective is beyond the reach of governmental policy alone; therefore, demands citizen buy-in and behavioral changes to seed the envisioned new culture of mobility.

It is explicitly stated that there are "no corporate interests" in the project KT (Strauch, 2019). Consequently, it is primarily evaluated using non-financial indicators. Vienna has identified ten indicators of mobility behavior that define the preferred culture of mobility to be reached by 2025. Figure 1 presents Vienna's current mobility behavior goals and indicators (MA18, 2015). These indicators, such as increasing the number of cyclists and pedestrians (active mobility), depend on each citizen's decisions about how to get around the city. The KT intends to create "learning-by-doing", which is a pivotal strategy to cultivate a new low-carbon, less car-focused mobility behavior (Schwanen et al., 2012). In turn, these behaviors contribute to Vienna reaching its goals for reducing energy consumption and pollution related to transport and reducing traffic-related CO<sub>2</sub>. Figure 2 presents the city's energy and environmental goals and indicators (MA18, 2015). The KT is one method how the City uses a digital technology to interface between citizens and policy goals.

## MOBILITY BEHAVIOUR

Indicator	Definition	Historical value	Most recent value available	Development sought by 2025
<b>Active mobility</b>	Share of those persons in the Viennese population who are in motion for at least 30 minutes a day in the course of Modal split share of bike and walking to cover the distances for "getting supplies", "spending leisure time", "taking someone to a destination or collecting someone from a place" <sup>(12)</sup>		2013: 23% <sup>(12)</sup>	30%
<b>Trips to get supplies, accompany someone or spend leisure time</b>		2010: 37.4%	2013: 38.8%	45%
<b>Car use</b>	Percentage of the population using a car several times a week	2003: 42% <sup>(4)</sup>	2013: 42% <sup>(6)</sup>	👁
	Utilisation of car capacity in persons	2009: 1.3 <sup>(15)</sup> 2011: 1.38 <sup>(10)</sup>	2013: 1.28 <sup>(11)</sup>	↗
<b>Average distances covered [km]</b>	Average distances the Viennese cover in Vienna [km]	2001: 5.1 km <sup>(14)</sup> 2006: 5.4 km <sup>(14)</sup>	2013: 4.1 km <sup>(11)</sup>	↘
	Share of errands which Viennese population does on foot within walking distances (1 km)	2006: 29.0% <sup>(14)</sup>	2013: 25.0% <sup>(11)</sup>	↗
<b>Average distances covered by car</b>	Average distances which Viennese population covers by car within Vienna [km] (2009: self-appraisal, 2013: calculation by route planner)	2009: 7.6 km <sup>(15)</sup>	2013: 5.4 km <sup>(11)</sup> (Änderung der Erhebungsmethode)	👁
<b>Modal split in passenger transport</b>	Modal split for the Viennese population, referring to the number of trips (eco-mobility:MIT)	1999: 64:36 <sup>(11)</sup>	2013: 73:27 <sup>(11)</sup>	80:20
<b>Modal split in passenger transport at city limits</b>	Modal split of destination traffic at city limits towards centre between 6 and 9 am total cordon (Eco-mobility:MIT) <sup>(13)</sup>	1995/96: 33.2:66.8	2008/09/10: 31.8:68.2	👁
<b>Share of walking and cycling in modal split</b>	Modal split walking summer half-year (April-October)		2013: 27.7% <sup>(11)</sup>	↗
	Modal split walking winter half-year (November-March)		2013: 25.8% <sup>(11)</sup>	↗
	Modal split cycling summer half-year (April-October)		2013: 10.1% <sup>(11)</sup>	↗
	Modal split cycling winter half-year (November-March)		2013: 0.5% <sup>(11)</sup>	↗
<b>Multimodality</b>	Percentage of population using at least two modes of transport within a week		2013: 52% <sup>(11)</sup>	↗
<b>Modes of transport on way to school</b>	Tendency among 6-10 year olds who walk, cycle or travel on public transport <sup>(12)</sup>		2013: 79.7%	↗
	Percentages of 6-14 year olds who walk, cycle or travel on public transport <sup>(12)</sup>		2013: 87.4%	↗

### Legend

👁	Indicator for the purpose of further monitoring, it is not useful to make a statement about development sought
→	Future development sought: Maintain level (for indicators which are already excellent)
↗ or ↘	Future indicator development sought: rise or decline
[Figure]	Quantitatively defined target values

**Fig. 1. Vienna's Mobility Behavior Goals and Indicators. Source: (MA18) with permission.**

## ENERGY AND ENVIRONMENT

Indicator	Definition	Historical value	Most recent value available	Development sought by 2025
<b>Energy consumption</b>	Final energy consumption of the transport sector in Vienna per year, adjusted for EMIKAT calculation [GWh] <sup>(21)</sup>	1999: 7,474 2005: 8,764 2010: 9,094 2011: 8,744	2012: 8,647 GWh	7.300 (rd.-20% ggü 2010)
	Energy used by Wiener Linien for operating public transport	2010: 625 GWh	2013: 594 GWh	↻
<b>Renewable energy</b>	Share of renewables in transport energy resources <sup>(24)</sup>	2005: 0.58% 2010: 5.95%	2012: 6.18%	↗
<b>Alternative propulsion systems</b>	Share of passenger cars with alternative propulsion systems (electric, LNG, hybrid) licensed in Vienna <sup>(16)</sup>	2008: 0.15%	2013: 0.52%	↗
<b>CO<sub>2</sub> emissions</b>	Traffic-related CO <sub>2</sub> emissions in Vienna, according to EMIKAT <sup>(22)</sup>	1999: 1,871 kt 2005: 2,219 kt 2010: 2,141 kt	2012: 2,062 kt	1.700 (rd.-20% ggü 2010)
		2011: 2,072 kt		
<b>Traffic noise</b>	Traffic noise nuisance in close surroundings of home (cumulative, marks 3-5) <sup>(6)</sup>		2013: 29%	↘
<b>PM10 concentration</b>	PM10 limit values exceeded: Number of days when limit value was exceeded (daily mean value >50 g/m <sup>3</sup> ) p.a. (mean value from 13 measuring stations) <sup>(7)</sup>	2006: 53	2013: 26	↘
	PM10 annual mean value mean value from 13 measuring stations <sup>(7)</sup>	2006: 32 µg/m <sup>3</sup>	2013: 25 µg/m <sup>3</sup>	↘
<b>NO<sub>2</sub> concentration</b>	NO <sub>2</sub> limit values exceeded: Number of half hours when limit value was exceeded (>200 g/m <sup>3</sup> ) p.a. (measuring station at Hietzinger Kai) <sup>(7)</sup>	2006: 59	2013: 0	→
	NO <sub>2</sub> annual mean value mean value (measuring station at Hietzinger Kai) <sup>(7)</sup>	2002: 57 2006: 74	2013: 51 µg/m <sup>3</sup>	↘

- (1) arealConsult (2013): Vienna traffic monitoring, annual overview, automatic permanent counting station 2012, done on behalf of MA 46, Vienna
- (2) Calculation by MA 18 based on figures published by Wiener Linien
- (3) Käfer A., Fürst B. et al. / TRAFFIX (2011): Straßenverkehrszählung Wien 2010 (Traffic Census Vienna 2010), analysis of main streets A+B, on behalf of MA 18, Vienna
- (4) MA 18 – Urban Development and Urban Planning (2007): Leben und Lebensqualität in Wien, Kommentierte Ergebnisse und Sonderauswertungen der Großstudien „Leben in Wien“ und „Leben und Lebensqualität in Wien“, (Analysis of two major studies on life and quality of live in Vienna) in: Urban Development Report No. 81, Vienna
- (5) MA 18 – Urban Development and Urban Planning (2009): Wiener Lebensqualitätsstudien, Sozialwissenschaftliche Grundlagenforschung für Wien 2008, Zusammenfassender Bericht (Summary of quality of life studies) in: Urban Development Report No. 102, Vienna
- (6) MA 18 – Urban Development and Urban Planning (2014): Wiener Lebensqualitätsstudien, Sozialwissenschaftliche Grundlagenforschung für Wien 2013 (preliminary results of quality of life studies)
- (7) MA 22 – Environmental Protection: Immission data
- (8) MA 23 – Economic Affairs, Labour and Statistics (2013): Statistisches Jahrbuch der Stadt Wien 2013 (Statistical Yearbook of the City of Vienna), Vienna
- (9) MA 46 – Traffic Management and Organisation (2014): Permanent bicycle counting stations (www.nast.at/verkehrsdaten)
- (10) Omniphon (2012): Market research for Wiener Linien, mobility behaviour 2011, on behalf of Wiener Linien
- (11) Omnitrend (2014): Market research for Wiener Linien, mobility behaviour 2013, on behalf of Wiener Linien, report dated 31-03-2014
- (12) Omnitrend (2014): Market research for Wiener Linien, mobility behaviour 2013, additional analysis on behalf of MA 18
- (13) Rittler C. (2011): Cordon study for Vienna 2008 to 2010, on behalf of PGO (joint planning organisation for Vienna, Lower Austria and Burgenland), Vienna
- (14) Socialdata (2007): Evaluation of the Transport Master Plan for Vienna, report and data 2001-2006, Vienna
- (15) Socialdata (2010): Mobility behaviour of the Vienna population 2009, on behalf of Wiener Linien
- (16) Statistics Austria: Number of passenger cars, calculations of MA 18 – Urban Development and Urban Planning
- (17) Statistics Austria: Accident statistics: Accidents according to provinces (www.statistik.at)
- (18) Wiener Linien information on operations
- (19) www.wienerlinien.at
- (20) MA 18 – Urban Development and Urban Planning (2014)
- (21) Calculations of the energy competence centre within tina vienna urban technologies + strategies GmbH based i.a. on the detailed energy balance sheet for Vienna by Statistics Austria, EMIKAT Vienna (as at 2014) and BLI (as at 2014)
- (22) Vienna Emission Cadastre (emikat.at), managed by MA 22, data provided by Chief Executive Office, climate protection coordination
- (23) Information from Wiener Linien, August 2014
- (24) Calculations of MA 20 – Energy Planning, based on the energy balance sheet by Statistics Austria

**Fig. 2. Vienna's Mobility Energy and Environment Goals and Indicators. Source: (MA18) with permission.**

The KT belongs to an emerging class of apps that incentivize human behaviors to accelerate transition to an economy that consumes less materials and energy. In this work, we refer to these diverse types of apps collectively as sustainability behavioral change apps (SBCAs). These apps use ubiquitous personal mobile phones as their delivery systems because the devices are enabled with readily available interfaces with users, location, and tracking (GPS), motion sensors, and internet access capabilities. Whereas KT is an app that is intended to reduce the carbon footprint of its users, other SBCAs target reducing food waste, reducing energy consumption, improving worker's conditions through product traceability, and reducing consumption of materials used such as paper or unsustainable palm oil. SBCAs often share the three following characteristics.

First, they are designed to focus on an individual person's behavior (micro level). When providing information to the user, they focus on an impact that is measurable at the micro level such as individual fuel consumption. Alternatively, they provide users with real-time data at the micro level such as nearby vegan restaurants. Data may be provided to the user as graphic visualizations, notifications, interactive interfaces, or maps. The micro-level data provided to the user informs real-time choices as well as future choices.

Second, SBCA's goals are aligned with the macro-level goal of sustainability – generalized here as lower consumption of materials and resources in a low-carbon sustainable economy that operates within the earth's biophysical limits. The global vision of macro-level sustainability is summarized by the United Nations Sustainable Development Goals (SDGs). Existing SBCAs contribute to achieving the following SDGs:

- SDG 3: Good Health and Well-being;
- SDG 6: Clean Water and Sanitation;
- SDG 7: Affordable and Clean Energy;
- SDG 8: Decent Work and Economic Growth;
- SDG 11: Sustainable Cities and Communities;
- SDG 12: Responsible Consumption and Production; and
- SDG 13: Climate Action.

The KT is contributing to macro level sustainability goals too. SDG 11, SDG 12, and SDG 13 are the most relevant. Commuting by bicycle, thus avoiding carbon dioxide emissions, is influenced by attitudes and social norms (Heinen et al., 2010). Mobility is influenced by culturally determined values, beliefs, preferences, and social behaviors at a particular place and time. Hence, the KT seeks to further normalize and routinize walking and bike riding in Vienna.

Third, SBCAs apply behavioral modification methods to elicit results from their users, primarily through: information provision; tokens and rewards; and gamification. These methods are practical applications of theories of behavioral economics, psychology, and marketing. For example, reward programs are a common feature of retail customer loyalty programs. Theories of behavioral economics applied to individual behavioral change for sustainability topics, such as water or energy conservation, have shown that people can be 'nudged' to comply with societal sustainability goals by providing data on activities such as water or energy use in comparison to neighbors (Sunstein, 2014). Measuring the outcome of one's choices and making it visible in comparison

to benchmarks is often sufficient to inspire more environmentally friendly behaviors (Datta et al., 2015). Increasingly, governments are seeking creative methods to encourage sustainable behaviors (Benartzi et al., 2017). KT, like other SBCAs, are innovative digital methods of interfacing with citizens to encourage them towards new and more sustainable behaviors.

## 1.2. How does the Kultur-Token work?

**Overview:** After creating a personal user account on their phones, the KT app allows users to track their own mobility behaviors and be rewarded for low-carbon choices. Four different transport modes are tracked: car; bicycle/scooter; walking; and public transport (buses, trams, and trains). When a user travels by bicycle or scooter, walking or public transport, (s)he is rewarded with a “Kultur-Token” (KT). One KT is exchangeable in the app’s marketplace for one voucher for a ticket to various cultural events and venues in Vienna.

**User Experience:** For the initial account setup, the user decides to download and install the app for either Android or Apple iOS on their personal phone. (S)he registers a unique username and a valid e-mail address. The account setup is completed by marking data collection preferences (Figure 3), which include automatic tracking via smartphone sensors.

The app itself consists of four screens accessed by swiping left or right on its home screen. The first screen (Figure 4) depicts the user’s mobility behavior by visualizing the percentage share of distance traveled by bicycle, walking or public transport. Additionally, the app displays his or her annual CO<sub>2</sub> reductions due to the user’s mobility choices as well as all other participants’ aggregated CO<sub>2</sub> reduction. This feature allows the user to compare his or her own “CO<sub>2</sub> profile” to others.

On the second screen (Figure 5), users see the KT symbol. The KT symbol resembles the petals of a flower or a pie chart with distinct sections. It is an interactive visualization because the sections fill with color in response to the amount of CO<sub>2</sub> avoided over time. One KT symbol equals 20 kg of CO<sub>2</sub> avoided. Each segment of the KT symbol represents a portion towards achieving one full token.

The user’s goal is to fill up the KT symbol by choosing low-carbon mobility options that avoid CO<sub>2</sub> emissions in comparison to traveling in a private car. A user fills up a token to earn a KT (Figure 6). A user may hold up to five earned tokens at a time. The earned tokens may be spent in the marketplace.

The third screen (Figure 7) depicts the “marketplace” as a plant with leaves. Here, users can exchange earned tokens for cultural offers. The user clicks on one of the four leaves on the plant. Each leaf represents one of four participating cultural institutions. Each leaf leads to additional information about the institution, including the currently offered events (Figure 8).

The fourth and final screen (Figure 9) allows users to change settings, delete their accounts, and access additional information about data collection and mobility analysis.





Fig. 3. Data collection preferences

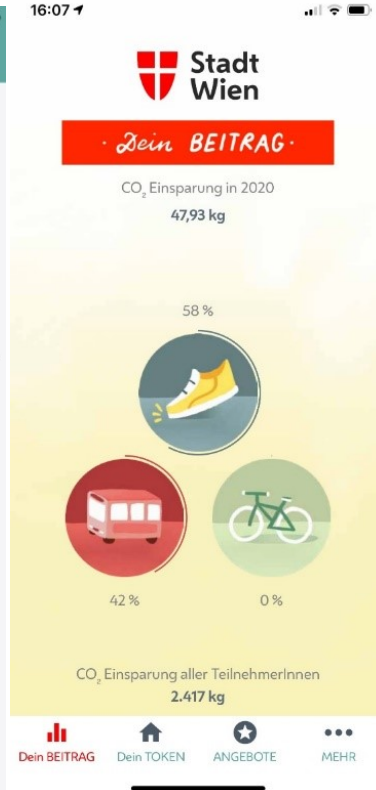


Fig. 4. First app page: user's mobility behavior

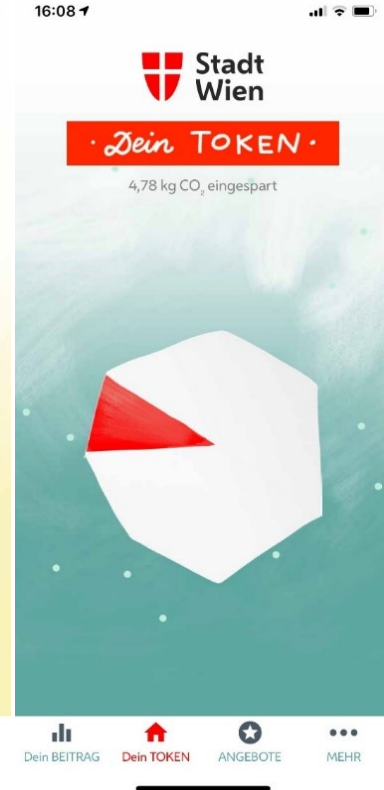


Fig. 5. Second app page: Kultur-Token



Fig. 6. Earned Kultur-Token

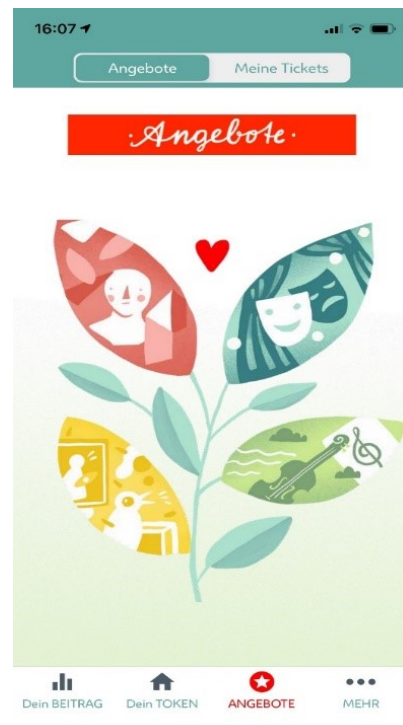
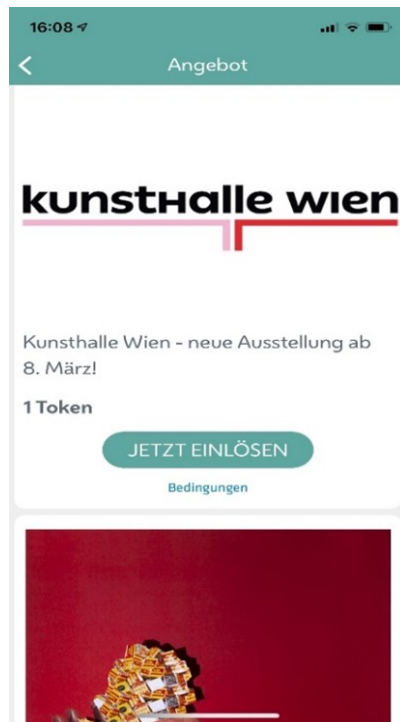


Fig. 7. The app's marketplace



**Fig. 8. Page with further information on the cultural institution**



**Fig. 9. Final screen of the app**

**How the KT app works:** The KT is an SBCA that analyses individual mobility behavior with data provided by users' smartphones. When users travel, sensors in their smartphones gather data on GPS locations, speed of travel, acceleration, etc. The data collected allows the app to calculate: the route traveled; the time it took to travel a certain distance; and the distinctive start-stop patterns that define the most likely transport mode. The process is and will not be fully accurate for each journey for several reasons. E-scooters and bicycles cannot be distinguished because of their movement similarities. Smartphone sensors provide differing data even if using the same modes. Network connection issues and battery energy level influence calculations. Despite these drawbacks, the KT achieves an average accuracy of 90% for the detection of travel mode and distance. Users are awarded KT's based on any distance not traveled by car. The result is a reward for any distance walked, even if a car could not have been used in that instance. As users travel by any mode other than by car, the algorithms calculate the CO<sub>2</sub> emission had an average car been used and award this amount as avoided CO<sub>2</sub>.

The app aims to recognize citizens transitioning to sustainable transport modes as well as providing additional access to cultural services for citizens. An increase in sustainable mobility is encouraged by providing individuals with an incentive to avoid travel by car and by visualization of their personal travel-related CO<sub>2</sub> profile. Further, the app provides citizens with a new way of exploring and gaining access to culture. As these offers are a bonus for the KT, they do not require entrance fees, thereby lowering financial barriers to access cultural institutions for the Viennese.

The KTs, as defined in the city's project, are neither e-money, payment instruments, nor virtual currency (Austrian financial market authority, 2020; Binder Grösswang, 2020). The Austrian Financial Market authority (FMA) and the legal counselors confirmed this fact. The definition relies on the current project configuration that prohibits the trade with and conversion of the Tokens into any form of currency.

**Examples of similar apps:** There are several apps currently available in many areas across the globe that incentivize sustainable and low-carbon mobility behavior. The KT app's mobility tracking capability is not unique to Vienna. The app was built by Changers, which offers a similar app to other municipalities and companies. A full accounting of similar sustainability apps is beyond the scope of this report. Therefore, the authors provide following links to internet articles (not related to the authors) to readers who would like information on similar apps. All links last accessed on June 3, 2020.

- Nine Simple Apps That Could Help You Live a More Sustainable Life  
<https://en.reset.org/act/nine-simple-apps-could-help-you-live-more-sustainable-life-04112017>
- Five apps that can help you adopt sustainable living habits  
<https://www.sustainability-times.com/green-consumerism/five-apps-that-can-help-you-adopt-sustainable-living-habits/>
- Top 10 apps for sustainable living  
<https://www.activesustainability.com/sustainable-life/top-10-apps-for-sustainable-living/>

### 1.3. Overview of Business Modelling

Business modeling originates in the fields of business administration and business strategy; therefore, most of the literature focuses on value. In general, value is defined as creating and delivering products and services to customers that pay a premium above operating costs, thereby generating profit for the company owners. As a strategy tool, business models include stakeholders, relationships, and activities of the enterprise. Authors Zott and Amit summarize business model thinking as follows:

“(a) business models center on the logic of how value is created for all stakeholders, not just how it is captured by the focal firm; (b) activities performed by the focal firm as well as by partners, suppliers, and even customers play an important role; (c) business models emphasize a system-level, holistic approach toward explaining how firms “do business”; and (d) the business

model is emerging as a new level and unit of analysis” (Zott and Amit, 2013). Despite its more narrow origins, business model analysis is applied to a variety of actors, including governments, not-for-profit enterprises, and social enterprises today (Burkett, 2013; Osterwalder et al., 2011; Upward and Jones, 2015). In addition, sustainable business models are increasingly developed and applied in the literature. Sustainable business models go **beyond defining value as profit**, embracing a wide array of value propositions and macro-level goals such as community, national, and global sustainability.

*A business model is the blueprint for an enterprise. By engineering and reviewing its blueprint, the successful enterprise may be replicated, modifications identified and implemented, and altogether new innovations may be envisioned.*



(Bocken et al., 2013; Rizos et al., 2016; Upward and Jones, 2015). Bocken et al. (2014) identify eight sustainable business model archetypes, which include “maximize material and energy efficiency” and “deliver functionality, rather than ownership” (Bocken et al., 2014). These archetypes are relevant to the KT because the KT encourages users to reduce high-carbon fuel use and to focus on functionality (various low-carbon transport modes) rather than car ownership. In addition, the KT is a not-for-profit enterprise, run by a local government. Therefore, the authors applied a sustainable business model analysis to the KT as presented in this report.

#### 1.4. Organization of the Report

The remaining sections of the report are organized as follows. Chapter 2 describes the sustainable business model methodology of the analysis. Chapters 3 to 5 present the findings of the business modelling analysis. Chapter 3 sets out the ecosystem context used to frame the KT Sustainable Business model. The Chapter reviews the desired financial, environmental, and social outcomes of the KT. Chapter 4 explains how addressing stakeholder needs creates value for institutions and individuals. Chapter 5, “People and Process”, discusses the “who” (e.g., stakeholders, relationships, and roles) that enable the “how” of the KT (e.g., resources, partnerships, activities, and governance). Chapter 6 concludes with recommendations for improvements to the KT based on the analysis. The challenge of organizing this report is to capture the interconnected links between the topics presented in each chapter. The format of most reports is linear, narrating a story from beginning to end. A business model is not a linear process because it rightly seeks to portray a complex system. To address this challenge, we rely on graphic representations and tables to highlight the interactions between the issues covered in each chapter. **A clarification of the terms used throughout the report:** The KT acronym in this report refers to three different objects, i.e. concepts. First, the **KT app** is the application for smartphones at the core of the project. Then, the **KT** is the overarching and comprehensive project, which is described in the report, and comprises the app as well as all services, actors and processes planned around and complementing the app. Finally, the registered **KT symbol** is the visual representation of the digital token that appears in the app display (see Figure 10).



Fig. 10. Kultur-Token <sup>TM</sup> symbol

## 2. The Kultur-Token Sustainable Business Model Analysis Methodology

### 2.1. Methodology

The purpose of this report, “Kultur-Token Sustainable Business Model: Visualizing, Tokenizing, and Rewarding Mobility Behavior in Vienna, Austria”, is to create a comprehensive sustainable business model for the KT that may be used as a conceptual tool to replicate, improve and innovate the KT program. Zott and Amit have emphasized that a business model is a distinct “level and unit of analysis for organization and strategy research,... and it has shown it to be a robust, useful construct for strategic analysis” (Zott and Amit, 2013). As noted in the introduction, business modelling is now expanded to self-proclaimed sustainable enterprises, and several methods of sustainable business modelling exist in the literature. The authors of the KT Sustainable Business Model desired an established method with a clear theoretical foundation, definitions, and transparent framework in order to ensure the validity of the case study. The KT Sustainable Business Model is developed using the theoretical basis of the Strongly Sustainable Business Ontology and the Flourishing Business Canvas (FBC)<sup>3</sup> as its method. The Strongly Sustainable Business Ontology argues that a “business model is the definition by which an enterprise determines the appropriate inputs, resource flows, and value decisions and its role in ecosystems, whether natural, social, or economic” (Upward and Jones, 2015). The FBC is an extension of Osterwalder and Pigneur’s Business Model Canvas (Osterwalder et al., 2011), which is well-known in the fields of business management and strategy. Both canvases are clear, easy to understand and communicate. The FBC structures enterprise activities into four sections (Process, Value, People, and Outcomes) within three perspectives (Environment, Society, and Economics). Although the FBC is still under development, several published case studies exist<sup>4</sup>. Further, the 2016 article, “Leadership as an enabling function for flourishing by design” provides guiding questions for a general FBC that are applied to KT in this case study (Elkington and Upward, 2016). See Appendix 1 for the full list of the guiding questions per (Elkington and Upward, 2016). These questions have been adapted for use in the current analysis. The guiding questions applied to each component of the business model and are listed in the corresponding chapters. Figure 11 presents the blank FBC Version 2.0 template and Figure 12 illustrates the FBC for the project KT. In addition, for transparency and attribution, Appendix 2 lists verbatim the definitions for each segment of the FBC Version 2.0, which is the unlicensed version for academic projects. The definitions of the concepts are also clearly stated in (Upward and Jones, 2015).

The authors selected the Flourishing Business Canvas (FBC) method for the KT Sustainable Business Model for the following reasons:

- The FBC captures the environmental and social interactions of an enterprise more comprehensively than similar methods. The authors decided that the FBC was the most appropriate of existing models to apply for this case study because the KT does not fit the mold of a traditional profit-seeking business. It is a government program. Furthermore, the FBC’s conceptualization of the business

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<sup>3</sup>Ibid.

<sup>4</sup><http://www.flourishingbusiness.org/case-studies/>(Accessed on July 15, 2020)

or enterprise as embedded in a complex and interactive system dependent on the earth's resources aligns with an ecological economics approach. Therefore, the FBC is suited to an enterprise that is not inspired or motivated by profit such as the KT.

- The concept of flourishing as operationalized by the FBC is that businesses enable humans and the ecosystem to thrive. The goal of flourishing within the boundaries of the planet's carrying capacity and regenerative capacity requires a transdisciplinary viewpoint and leadership to align activities with societal goals. As the KT is designed to reduce carbon emissions from transportation, a flourishing conceptualization is appropriate.
- The KT business model joins the growing body of business model literature that use the Flourishing Business Model Canvas, and other "canvas" variations. This literature is well known. This report describes every aspect of the KT business model using the language and categories of modern business model literature. Therefore, the KT Sustainable Business Model is accessible and well understood by a wide audience.

The authors deviate from the established FBC method for the KT analysis in two important respects. First, the environment perspective's ecosystem services segment is expanded to better capture the cultural aspects of the KT with cultural ecosystem services. Cultural ecosystem services is traditionally part of the ecosystem service concept (Chan et al., 2012; Daniel et al., 2012; Hølleland et al., 2017; Milcu et al., 2013). However, so far, the authors did not find cultural ecosystem services in the published FBC guidance documents e.g., (Elkington and Upward, 2016; Jones and Upward, 2014; Upward and Jones, 2015). Although, "cultural services" is noted in Jones (2017). Second, the ecosystem service approach tends to imply monetary valuation of nature, which is a highly criticized and controversial concept (Costanza et al., 1997; Fu et al., 2011; Spash and Aslaksen, 2015). Therefore, the authors did not attempt to estimate the monetary value of the ecosystem services that the KT draws on when discussing environmental impacts in Chapter 3.

## **2.2. Research Data**

The data for this analysis is comprised of publicly available and non-public internal documents from the KT development process. The publicly available documents are posted on the Kultur-Token website, "Digitales Wien", hosted by the Vienna City Administration<sup>5</sup>. The unpublished internal documents were authored by various members of the KT program's core team who work for the stakeholder institutions (See Chapter 4). Therefore, these documents are considered unpublished work product. The Vienna University of Economics and Business (WU), who conducted this analysis, is a research partner of the KT. One of the co-authors of the analysis is a member of the core team of KT developers with access to the archive of unpublished work product and could request additional information from other stakeholder institutions. The other two co-authors are not involved in the KT program's development or pilot. The publicly available and unpublished documents that informed this research are included in the references.

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<sup>5</sup><https://digitales.wien.gv.at/site/projekt/KT/#toggle-id-8>(Accessed on July 15, 2020)

## Date:



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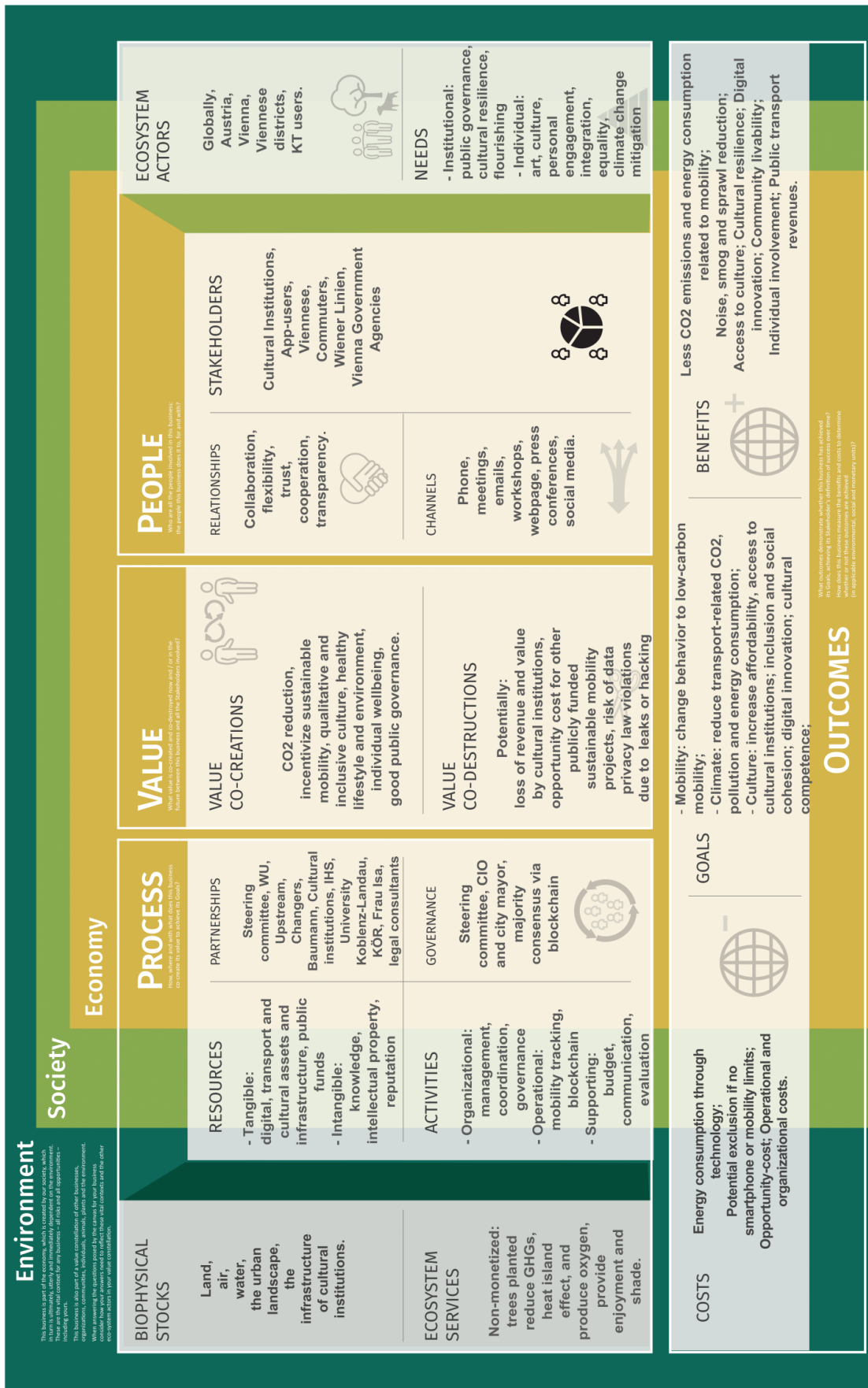
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# Flourishing Business Canvas v2.0

Designed for: **Kultur Token**

Designed by: **Gillian Foster, Maddalena Lamura, Jacob Hackel**

Date: **June 2020**



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Fig. 12. The KT Flourishing Business Canvas

### **3. Outcomes and Ecosystem Contexts (Environmental, Society, and Economic / Financial)**

This chapter analyses the expected outcomes of KT as goals, benefits, and costs. Each of these categories is embedded in the ecosystem context of the enterprise. First, this chapter clarifies the ecosystem context for the KT Sustainable Business Model. Second, the chapter describes the goals, benefits, and costs organized by the ecosystem context.

#### **3.1. Ecosystem Context**

The ecosystem context is the combined environmental, social, and economic or financial constraints and opportunities within which all aspects of the enterprise function. Clarity about the ecosystem context is critical to identify who pays the costs and who accrues the benefits of achieving the KT's goals. Two models clarify the ecosystem context for the KT. First, the socioecological systems concept prevalent in today's ecological economics. This model sees business as one element of the economy that operates within the human sphere, which in turn is dependent upon the biosphere (the planet earth). The FBC mirrors this model.

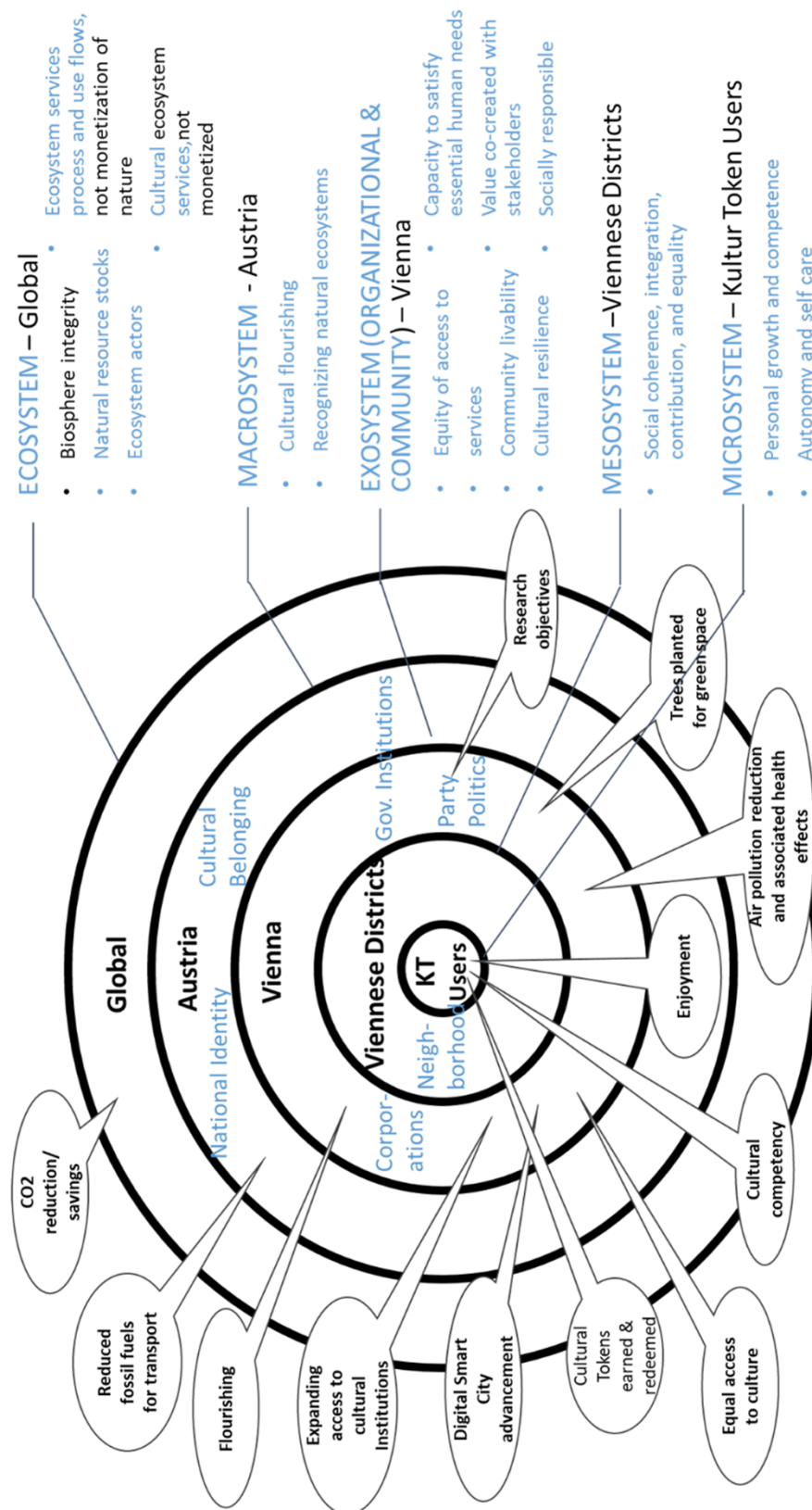
The ecosystem context framing the FBC is defined as Environment, Society, and Economy as indicated in the top row of the FBC in Figure 11. The FBC describes the ecosystem context as follows. "This business is part of the economy, which is created by our society, which in turn is ultimately, utterly and immediately dependent on the environment. These are the vital context for any business – all risks and all opportunities – including yours. This business is also part of a value constellation of other businesses, organizations, communities, individuals, animals, plants and the environment" (Upward, 2014).

The second ecosystem context model is the four nested social systems authored by Peter Jones in (Jones, 2017) referring to his 2015 publication, "Can we design for a Flourishing society?" which is in turn based on the ecological theory of human development by the psychologist Urie Bronfenbrenner in 1979 (Härkönen, 2001). Herein, Jones' four nested social systems model is adapted to the KT case study as shown in Figure 13. This model describes how the KT enterprise operates and serves the individual user at the Microsystem level, whilst achieving environmental, social, and cultural outcomes at the Exosystem level (city government), and environmental and social benefits at the macrosystem level (national) and environmental benefits at the Ecosystem level (global). The authors' interpretation of the Ecosystem level is explicitly oriented towards ecological economics. The authors interpret the Ecosystem context as "biosphere integrity" per the planetary boundaries concept (Rockström et al., 2009; Steffen et al., 2015). In general, the original model is broader in scope than the present adaptation. For the purposes of the KT Sustainable Business Model, the nested social system components are limited to those directly related to the KT as it contributes to a flourishing Vienna.

In general, enterprises analyzed with the FBC are assessed in terms of harms and benefits, expanding the traditional cost-revenues analysis with non-quantifiable indicators. Environmental, social and economic harms and benefits are evaluated in the ecosystem context. They are considered and measured in their respective units (monetary,

non-monetary, psychological, etc.). This is distinctively different from for-profit and triple bottom line business modelling approaches, that either calculate economic value only, or monetary valuation is applied to the social and environmental field, i.e. monetizing and using “a common currency” for all the different types/dimensions of harms and benefits (Upward & Jones, 2016; Norman & Macdonald, 2004). The following sections of the KT Sustainable Business Model report use these two models to document the ecosystem context.





**Fig. 13. Ecosystem Context for the KT Sustainable Business Model**

This socioecological systems model is adapted from Jones (2017). The blue text are quotes from Jones (2017), which follows Bronfenbrenner's Ecological Theory of Human Development. The black text is the adaptation for the KT unique to the present work.



### **3.2. Kultur Program Goals and Benefits are Determined by Public Policy**

What goals have the KT stakeholders agreed? What metrics are used to define the benefits of its success or failure given its ecosystem context? The traditional business canvas focuses mainly on financial profit maximization, especially in the short term (Elkington and Upward, 2016). Differently, the Kultur-Token's goals and hence its definition of success are elaborated in a system thinking perspective and strongly sustainable ontology. Hence, the KT combines “financial rewards, social benefits, and environmental regeneration” in its goals (Elkington and Upward, 2016). Given that the KT is a government strategy to implement its policies more efficiently, the multi-dimensional goals of the KT can be tracked to three clear policy initiatives. These are: 1) the “STEP 2025 Urban Mobility Plan” described in the introduction; 2) “#Mission 2030 Austrian Climate and Energy Strategy”; and 3) under the banner “Culture for All with All”, Vienna promotes cultural institutions and cultural experience as integral to the Viennese lifestyle and emphasizes social inclusion, access to culture, and developing citizens' cultural competence. The three policy initiatives: mobility; climate; and culture are all included in the overarching “Smart City Wien Strategy”, outlined by Vienna's Magistrate for the period 2019-2050 (Magistrate of the City of Vienna, 2019). This strategy is based on the SDGs of the UN Agenda 2030. The KT represents a step towards multiple and often interdependent goals of the Smart City Strategy, as is highlighted in the next paragraphs.

### **3.3. Environmental Goals, Benefits, and Impacts: Low-Carbon Mobility Against Climate Change**

The environmental ecosystem context is defined as the biophysical stocks and ecosystem services that the KT relies on and draws from. Relevant biophysical stocks are the land, air, and water that the Viennese use for living space, resource extraction and waste absorption. The urban landscape is the stock of materials and energy from nature that allow for urban life. This includes the stock of natural resources embodied in the infrastructures of cultural institutions. Vienna's land use is approximately 42.5 thousand hectares, which is 50% green space, 36% built-up space, and 14% traffic space<sup>6</sup>. Trees planted in Vienna produce the relevant ecosystem services, reductions in atmospheric CO<sub>2</sub> and production of oxygen. In addition, the trees provide enjoyment, shade, and reduce the heat island effect.

The environmental benefits relevant to the KT are the amount of traffic related CO<sub>2</sub> emissions and the final energy consumption of the transport sector. The Smart City plan is set to reduce individual CO<sub>2</sub> emissions arising from the transport sector by 50% until 2030 and by 100% until 2050 (Magistrate of the City of Vienna, 2019). This is in combination with the national goal of decreasing the final energy consumption for transportation per person by 70% by 2050 (Magistrate of the City of Vienna, 2019).

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<sup>6</sup><https://www.wien.gv.at/english/administration/statistics/#urbana>(Accessed on June 3, 2020)

*“We want future mobility to be active, shared, digital and sustainable.”*

Forward to Mission 2030 Austrian Climate and Energy Strategy, Federal Minister for Transport, Innovation and Technology

Active Mobility is a core goal of both the Step 2025 Urban Mobility Plan and the Mission 2030 Austrian Climate and Energy Strategy. For Vienna, this refers to the “Share of those persons in the Viennese population who are in motion for at least 30 minutes a day”(MA18, 2015) i.e., biking or walking. Active mobility is linked to the objectives of “efficient resource usage and availability of reliable mobility modes without a necessity to own a personal means of transport” (Hackel & Grosch, forthcoming), as well as the optimization of the modal split.

Although the mechanisms to achieve environmental benefits are clear, the complete dataset is not yet available to set a suitable goal for the KT program. KT aims to reduce CO<sub>2</sub> emissions by influencing users to select low-carbon mobility options. Users are motivated by the incentives (tickets to cultural events) and information indicating the level of CO<sub>2</sub> they create and avoid, since one KT corresponds to 20 kg of CO<sub>2</sub> saved. Once the pilot of the KT is completed and evaluated, the developers will be able to gauge the rate at which users earn KT's. This data is visible to users and is collected for research. With this data, an average number of KTs per user can be calculated. The number of users multiplied by the number and rate of KTs earned will allow the city to estimate a realistic yet ambitious target for CO<sub>2</sub> savings in future.

**Calculation of Carbon Dioxide Avoided:** The KT app developer, Changers, estimated the CO<sub>2</sub> savings using life cycle analysis data made available by the German Federal Ministry for the Environment and the lifecycle inventory database, Ecoinvent. The greenhouse gas emissions equivalent CO<sub>2</sub> produced by an average private car driven 1 km is the benchmark against which other modes of transport are compared to estimate CO<sub>2</sub> savings. A 1 km trip in a private car emits 0.142 kg of CO<sub>2</sub>. In comparison, each 1 km trip by walking or cycling saves 0.142 kg of CO<sub>2</sub>. A 1 km trip by public transport (bus, trains, and long-distance trains) saves 0.065 kg of CO<sub>2</sub>. Likewise, plane travel emits 0.230 kg of CO<sub>2</sub> per 1 km.

In addition, KT users further reduce CO<sub>2</sub> in the atmosphere through tree planting conducted by the city. The KT's impact through tree planting is estimated using Changers' calculation of 300 kg of CO<sub>2</sub> is “the average bound carbon dioxide of a tree” throughout its lifecycle (Changers.com, 2020). One tree is planted for each KT spent by a user, in the “Garten der jungen WienerInnen” during the annual reforestation event for families organized by the city's Administrative Group for the Environment. Estimating the number of trees planted and potential CO<sub>2</sub> sequestration is also not yet possible without the data on citizens' uptake of the KT.

**Additional co-benefits of the KT:** Reducing the number of car trips and planting trees provides benefits beyond CO<sub>2</sub> savings. Environmental and health benefits due to fewer

cars include: reduced air pollution and associated negative health effects; increased visibility due to less smog; reduced city sprawl; reduced noise (Bongardt et al., 2010). Trees remove CO<sub>2</sub> from the atmosphere whilst producing oxygen. In addition, they provide greenspace that lessens the urban heat island effect and has recreational benefits.

**Environmental impact / costs:** The primary environmental impact of all smartphone apps is energy consumption. It is difficult to accurately measure how much energy (electricity) an app consumes due to differences over battery life, various settings, etc. (Mittal et al., 2012). Any smartphone app uses energy to deliver its service including using the phone's battery and the app's data centers (servers). The International Energy Agency reports that data centers consume 1% of global electricity demand<sup>7</sup>. Apps are not inherently carbon neutral.

Blockchain technologies such as Bitcoin are noted for high-energy consumption because they use “proof-of-work” (PoW) races where computers solve equations. PoW blockchain technology verifies that transactions, operated on a publicly accessible blockchain, are reliable on the basis of the high energy, cost, and time intensity spent by the member (Wien Energie, 2018). Alternatively, Proof of Authority (PoA) blockchain technology uses a consensus mechanism based on authorizing validating members instead of energy expenditure (Baumann, 2019). This type of blockchain is permissioned, i.e. only invited members can choose to take part. These members control one another and know each other's identity. This contributes to the reliability of the transaction. The main benefit of PoA is that it uses less energy (electricity) than PoW.

The KT uses a PoA blockchain technology, which is an adaptation of Ethereum blockchain (Baumann, 2019; Lutz, 2018). This is a less energy intensive option than PoW. The KT's PoA based energy consumption is not expected to be higher than the consumption of a traditional database. However, these data (the energy consumed to operate and maintain the blockchain and the app) are not yet available. Better estimates of environmental benefits and impacts are needed to more accurately portray the life cycle costs of the KT app and its use. Arguably, if the app functions as intended, the CO<sub>2</sub> emissions resulting from the app's energy consumption are likely to be a small fraction of the transportation-related CO<sub>2</sub> emissions it helps users abate.

### **3.4. Social Goals, Benefits, and Impacts: Cultural Vibrancy, and Smart City Digital Diffusion**

The KT's social outcomes (social goals, benefits and costs) discussed in this section accrue to the stakeholders of Vienna. Vienna's population in 2019 is 1.9 million. According to the city's population projections, the number of residents will increase by 289,000 (+15.5%) between 2018 and 2048<sup>8</sup>. The ecosystem context depicted in Figure 13 explains who benefits from the KT. In this section, the outcomes of the program at the exosystem (Vienna) level. The identified needs of specific stakeholders should be answered by the proposed benefits of the KT, thus creating value. The needs and values of stakeholders are discussed in Chapter 4.

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<sup>7</sup><https://www.iea.org/tcep/buildings/datacentres/>(Accessed on May 28, 2020)

<sup>8</sup><https://www.wien.gv.at/statistik/pdf/pop-proj-2018-sum.pdf>(Accessed on June 2, 2020)

The social goals and benefits relevant to the KT are guided by Vienna's macro-level policies. The KT is in line with the objectives of the Smart City Strategy of fostering integration and social cohesion through affordable cultural offers (Magistrate of the City of Vienna, 2019). An investigation on Viennese cultural involvement (Schönherr & Oberhuber, 2015), commissioned by the Office of the Executive City Councilor for Cultural Affairs and Science (OCAS) in 2015, found a high participation and satisfaction with the cultural offers among citizens. However, 40% of Viennese identify as "culturally inactive", visiting only cinemas or concerts once or twice a year. Additionally, social background emerged as a decisive factor influencing the type and intensity of cultural participation. The KT responds directly to these needs by facilitating access to and enjoyment of artistic and cultural institutions (Strauch, 2019; Hackel & Grosch, forthcoming). The KT are an addition to existing analog bonus-systems aiming at providing free access to cultural institutions.

The KT aims to be a platform for cultural institutions. Within the project, cultural objectives and plans are co-developed by OCAS. Currently four cultural institutions offer tickets for KTs. These are traditional cultural venues located in the city center. The list of participating institutions is likely to expand over time. It would be beneficial in the long term, if additional cultural institutions, with varied focuses and locations dispersed throughout the city, join the project KT. This initiative would support the Smart City goal of a variety of local cultural offers in the city districts (Magistrate of the City of Vienna, 2019).

In alignment with the Smart City plan, the KT contributes to digital innovation, using blockchain technology to achieve socio-environmental benefits for the citizens (Lutz, 2018). The Executive City Councilor for Cultural Affairs indicated the project as an example of "digital humanism" (Lutz & Strauch, 2020). Consequently, the KT contributes towards another social goal - diffusing new technologies and digitalization that make Vienna a digital pioneer.

**Additional social co-benefits of the KT:** KT's research objective is to learn from the KT implementation and particularly from the pilot phase of the project. This testing phase would then inform the potential roll-out and long-term goal of extending the KT to the entire City of Vienna, potentially combining it with other services or apps (Strauch, 2019). This contributes to the goal of equality in access to and large-scale involvement in the KT initiative. Participation of citizens is central both as a means and as a goal in the KT as well as in the Smart City (Magistrate of the City of Vienna, 2019).

**Measurement of social benefits:** Overall, all these social benefits are directly linked to the environmental benefits since one digital token is generated per 20kg of CO<sub>2</sub> saved and in turn corresponds to one voucher for a ticket to access a cultural institution or event. Thus, social benefits may be measured with the number of tickets for artistic and cultural institutions earned and redeemed. Other potential indicators measuring social benefit include:

- The percentage of commuters using the KT app.
- Assessment of whether the KT increased the number of cultural events and increased interest/demand for cultural events.

- On the individual user level, involvement in the project might contribute to satisfaction through the feeling of contributing to a positive goal, personal growth, and cultural competence. User surveys could provide this information.

While not explicitly stated in the KT, flourishing can be considered a broad goal of the KT, since it summarizes the social and environmental objectives outlined. Particularly at the microsystem level, the project KT contributes to pursue personal growth of the individual citizen, since the app encourages learning and first-hand involvement. At the mesosystem level, social objectives pursued by the KT are coherence, integration, contribution, and equality. Indeed, flourishing and wellbeing are pursued at the individual and community level. For the KT this translates at the exosystem level by expanding the satisfaction of essential human needs. Community livability, as pointed out by Jones (2017), is a dimension of social flourishing and a social goal of the KT. Similarly, the KT contributes to cultural resilience, where Jones (2017) refers to McKenzie's interpretation as the promotion and valuation of "positive aspects of disparate cultures" (2004). Further, as pointed out in section 3.1, the KT is developed to achieve outcomes, which belong to four different nested social systems, as displayed in Figure 13 adapted from (Jones, 2017), to highlight the KT's relevant objectives and benefits. Together, these goals are factors that enable social and individual flourishing.

**Social impacts / costs:** The primary social costs of the KT arise from the fact that taxpayers fund the project. All citizens contribute to the project by paying taxes; thus, incur a cost. As with most public spending, the opportunity cost is the potential of allocating tax money to other projects with higher social benefits. Further, potential social costs might arise in terms of social exclusion, for instance if the app is not equally accessible to all citizens. While social equality in access to cultural institutions is a goal of the project, project features such as smartphones or rewarding an amount of sustainable mobility might exclude or hinder people with mobility disabilities or without smartphone devices.

### 3.5. Economic / financial goals, benefits, and impacts

The economic ecosystem context for the KT is the City of Vienna. The total budget expenditure in 2018 is 14 billion Euros<sup>9</sup>. Seven percent of which is spent on road construction, traffic, and transport. Comparatively, 2.2% is spent on arts, culture, and religion.

The KT is a not-for-profit governmental enterprise; however, a goal of the project KT is responsibly using taxpayer funding. As a municipal initiative, it is in the interest of the KT steering committee that the costs are rational in comparison to similar initiatives and defensible in public budgets. The financial source is Vienna's digital innovation budget.

Using the app is free of charge. However, the KTs are based on mobility data shared by the app users. Some movements, such as the "data as labor" movement call for a monetization, hence compensation for data by firms that generate profit from data (Goodman, 2019). This is not the case for the KT, because it is a not-for-profit enterprise

<sup>9</sup>[urlhttps://www.wien.gv.at/english/administration/statistics/pubadmin/](https://www.wien.gv.at/english/administration/statistics/pubadmin/)(Accessed on July 15, 2020)

with goals, of environmental and social benefits for Vienna's citizens, as highlighted above.

**Additional economic/financial co-benefits of the KT:** A successful and widespread project KT would increase the number of public transportation users. Therefore, an additional financial benefit would accrue to the public transport system if the KT fosters a shift from private to public transport use.

**Measuring economic/financial benefits:** Overall, the costs of the KT program should be compared to other policy options for reducing CO<sub>2</sub> in Vienna. In quantitative economic terms, the marginal costs of 1 kg of CO<sub>2</sub> abatement in the transport sector in Vienna can be compared to the cost of the CO<sub>2</sub> abatement due to the KT. There are several studies that estimate CO<sub>2</sub> abatement in Austria, for example (Schwarz et al., 2013). In qualitative economic terms, the KT can be compared to other policies designed to reduce greenhouse gasses in Austria, for example discussed in (Kammerlander et al., 2018). The data needed to do so is not yet available.

In financial management terms, the goals and benefits can be measured by comparing the planned budgets to the final budgets to ensure that the project's milestones are met on time and in budget.

#### **4. Addressing Stakeholder Needs Creates Value**

What essential needs of the ecosystem actors is the KT aiming to satisfy or could possibly hinder? How is value co-created and destroyed?

The goals listed above are developed in response to distinct stakeholder needs. Meeting these “fundamental” needs creates value (Upward & Jones, 2016). The strongly sustainable ontology, which is the basis of this report, envisions value not only in monetary terms, but also along “aesthetic, psychological, physiological, utilitarian” dimensions. These reflect the fundamental needs. While fundamental needs are universal and do not change, the way they are met are multiple and context dependent, i.e. through need “satisfiers” (Max-Neef et al., 1991). The activities and processes of the KT are the satisfiers chosen by the project KT team.

In practice, fundamental needs emerge from different sets of actors at different levels. Figure 12's description of the KT flourishing social systems model highlights the needs and values (benefits of the KT that meet these needs). The KT's actors range from the city government, to Vienna's inhabitants, to the individual app user. This report distinguishes between the fundamental needs of individuals and of institutions because the value creation and destruction generated by the KT differ for the individual and institutions involved.

##### **4.1. Value co-creation for institutions in the exosystem**

For the Viennese institutions, the primary need is to fulfill the public governance role and mandate given by the citizens and to react to their concerns. The OECD defines public governance as the “formal and informal arrangements that determine how public decisions

are made and how public actions are carried out, from the perspective of maintaining a country's constitutional values when facing changing problems and environments. The principal elements of good governance refer to accountability, transparency, efficiency, effectiveness, responsiveness and rule of law. There are clear links between good public governance, investment, and development. The greatest current challenge is to adapt public governance to social change in the global economy. Thus, the evolving role of the State needs a flexible approach in the design and implementation of public governance"<sup>10</sup>. The KT's overarching value to the institutions is to contribute to good public governance as follows.

KT contributes to good public governance by innovatively implementing public policy that addresses citizens' concerns. First, the environmental objective of CO<sub>2</sub> reduction falls within the STEP 2025 targets set by the city (Magistrate of the City of Vienna, 2019). Second, incentivizing the low-carbon mobility behavior of Viennese inhabitants. The CO<sub>2</sub> reduction goal responds to the inhabitants' concern about climate change. The Eurobarometer Public Opinion study reported this to be the main concern for Austrian respondents (27% of them) in 2019, while general concern over the environment emerged as the third most frequent concern<sup>11</sup>. Third, as indicated in the city's Smart City Strategy 2019-2050, various organizations have an "institutional responsibility" to contribute to high quality and inclusive education and low-threshold access (Magistrate of the City of Vienna, 2019). Amongst these are cultural institutions. These three goals define the institutional need for good governance, to which the KT contributes.

The KT's good governance method is a voluntary and reward-based approach, complementing other existing regulation-based approaches (Strauch, 2019). The explicit intent of the project KT is to reject sanctioning of undesired behavior, as is for instance done with social scorecards (Strauch, 2019). In contrast, the KT is characterized by "opt-in" and incentives which are a "positive manipulation", aiming to influence behavior. Further, the KT implements good governance by adhering to EU and Austrian privacy and data protection regulations. With the KT, "the public administration creates networked services that benefit the population" (Lutz & Strauch, 2020).

#### **4.2. Value co-creation for individuals in the mesosystem and microsystem**

For the individual Max-Neef et al. (1991) identified these needs as "Being, Having, Doing and Interacting, Subsistence, Protection, Affection, Understanding, Participation, Idleness, Creation, Identity, and Freedom" (Max-Neef et al., 1991). At the individual user level, the KT focuses in particular on encouraging active mobility for a healthy lifestyle and environment. At the same time the KT addresses the citizens' needs for arts and culture, which contribute to emotional and intellectual well-being (Magistrate of the City of Vienna, 2019). Further, the KT responds to the inhabitants' need to participate and to feel engaged in first-person in sustainable actions (Max-Neef et al., 1991). Integration and equality are needs of all inhabitants (mesosystem) and individual KT users (microsystem) facilitated by creating access to cultural institutions (Max-Neef et al., 1991).

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<sup>10</sup><http://www.oecd.org/investment/toolkit/policyareas/publicgovernance/>(Accessed on July 15, 2020)

<sup>11</sup><https://ec.europa.eu/commfrontoffice/publicopinion/index.cfm/survey/getsurveydetail/instruments/standard/surveyky/2255>(Accessed on July 15, 2020)

**Summary of value co-creations:** In summary, the KT creates value at many levels of the social system for the institutions that created the project KT and for the KT app's users. These values are good public governance and meeting the individual's fundamental needs to act in a sustainable and socially enriching way.

#### **4.3. Value co-destructions**

The FBC methodology includes identifying the value co-destructions caused by the enterprise. Value co-destructions are effects that hinder or disadvantage any ecosystem actors now and/or in the future. The authors have identified four potential value co-destructions of the KT as follows.

- Do the cultural institutions involved in the KT lose a significant revenue stream? For example, as the KT grows, will the lost price of admissions tickets negatively affect the operating budgets of the institutions? For example, will the institutions lose annual ticket customers because they choose to earn and spend KTs for individual tickets instead of purchasing an annual ticket?
- Will ticket purchasers' perception of the market price for the cultural offerings change as more free tickets become available through KT?
- Is there an opportunity cost loss? Perhaps the funding for the project KT could be better spent on other CO<sub>2</sub> abatement policies from transportation or other mobility behavioral change strategies.
- Is there a potential risk of value co-destruction from a leak of private data caused by a programming or other kind of error or due to hacking and security infringement? As private data of citizens is collected and analyzed, there is a potential risk of leaks or security errors.

These possible value co-destructions cannot be fully explored at this time because the data is not yet available. However, these are appropriate research questions during the operation of the KT.



## 5. People and Process

“To describe how the “right” things are to be “done right” now and in the future requires understanding how the organization acts to create the value, described by its business processes.” (Upward & Jones, 2016) Hence, this section delineates the activities of the KT, the resources and partnerships necessary to perform these, as well as the governance structures that underlie and shape the project.

### 5.1. Stakeholders and partners

How are different ecosystem actors involved in the project KT? Which stakeholders are formal and informal partners of the KT? What roles and tasks do these partners undertake?

Actors of the wider ecosystem, within which the KT takes place, play various roles in the project. They either benefit from the KT app, or are necessary for its development and implementation, or are impacted or influenced by the project KT in various ways. The stakeholders of the KT can be broadly categorized as formal and informal partners of the project. Stakeholders hence hold various degree of involvement and decision-making, based on their roles and resources. An overview of the key stakeholders, and thus partners, involved in the project, as well as their respective responsibilities, tasks and roles is provided in Table 1. Figure 14 portrays the timeline of the project, showing the stages in which each stakeholder is involved.

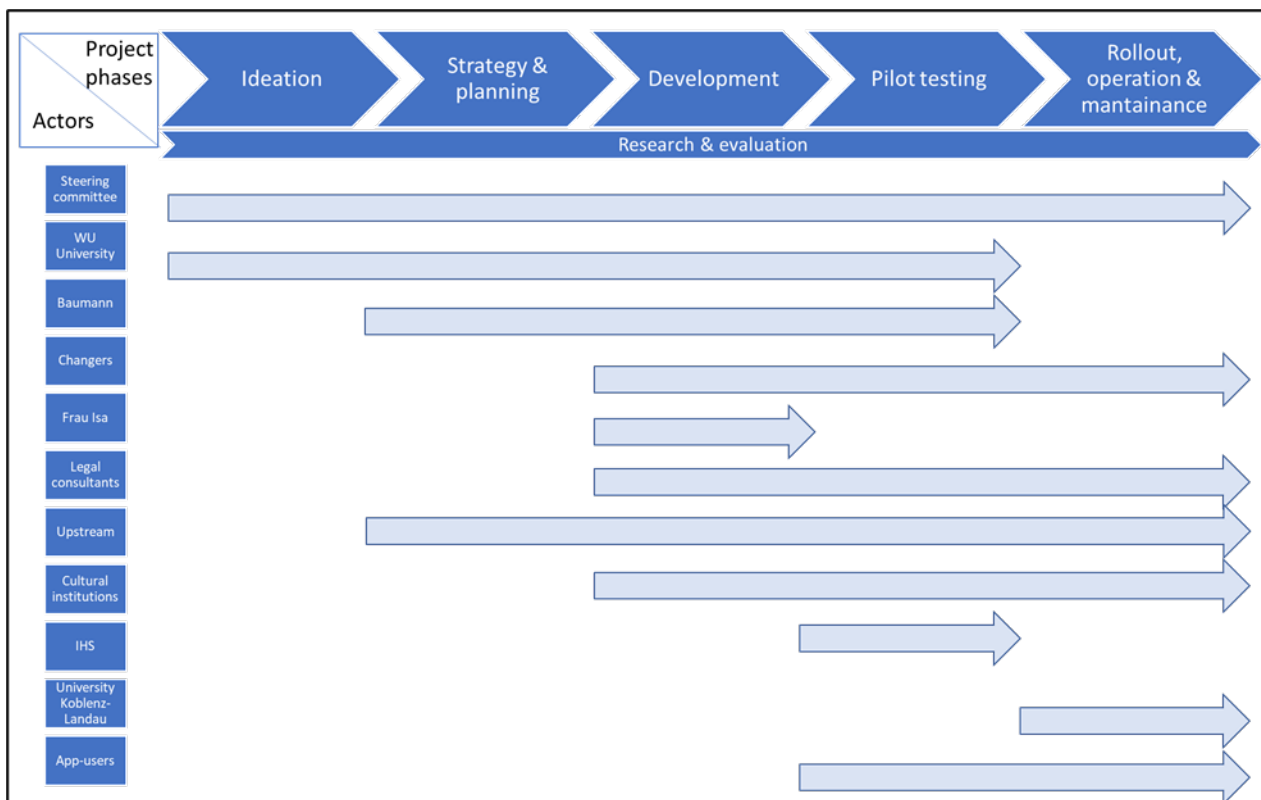


Fig. 14. Timeline of project stages and stakeholder involvement

### 5.1.1. Formal partners

The formal partners of the project team are the steering committee, the project manager, and various actors. They have legal agreements or other types of official agreements establishing their participation in the design and implementation of the KT. The steering committee is at the core of the formal partners. This group is outlined in Figure 16. It oversees the planning and project management and has the main responsibilities for decision-making. Hence, it advances the project design and oversees progress and development. Its members are actors of both the City of Vienna and the Vienna University of Economics and Business (Research Institute for Cryptoeconomics). Three organizational units of the city administration represented by: the Office of the Chief Information Officer of Vienna (CIO) as project sponsor; the Municipal Authority (MA) responsible for Information Technology, MA01 – Vienna Digital; and OCAS as project initiator.

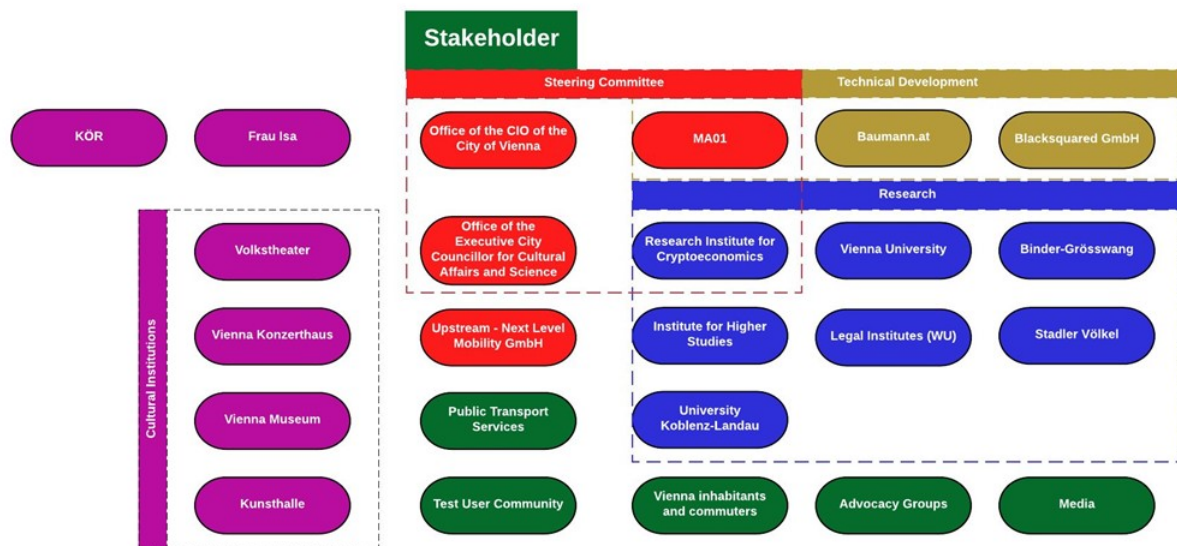
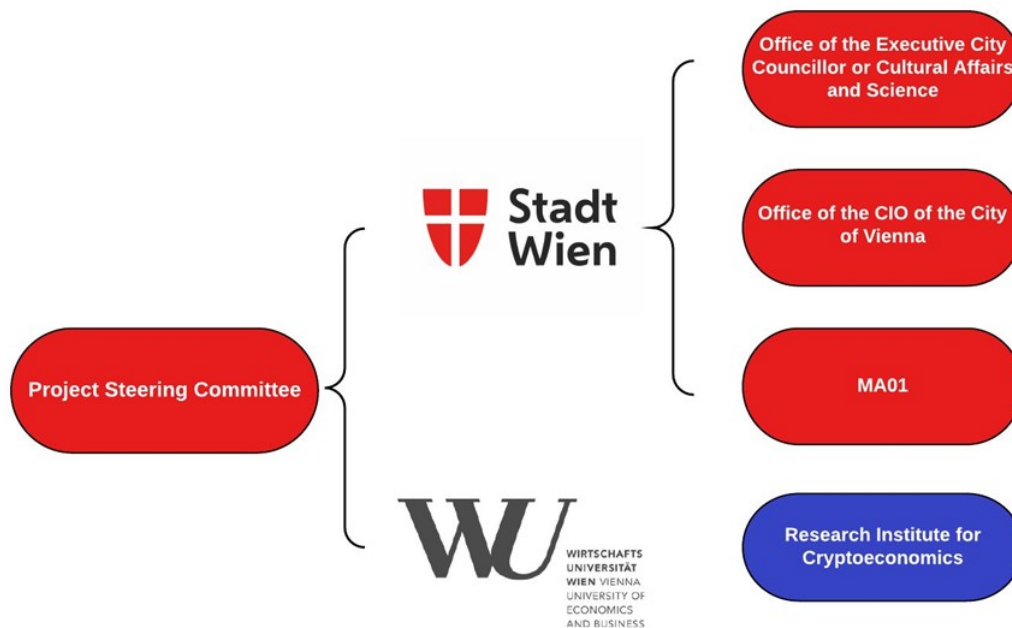


Fig. 15. Stakeholders of the project KT. Source: internal documents.

Upstream - next level Mobility GmbH, is a subsidiary of Vienna Public Utilities and Vienna Public Transport and is responsible for project management. Thus, it closely collaborates with the steering committee and is involved in decision-making.

More formal partners contribute to the project, without being involved in the comprehensive planning and decision-making. Together they form the project team. They have authority over their own work packages and/or have been involved in workshops with the steering committee. These further formal partners are software developers, Changers, (with its parent company Blacksquared GmbH), who developed the original app, and Baumann.at (under Dr. Christian Baumann, supported by capacity.at). External evaluators, IHS Insight Austria and the University of Koblenz-Landau, take another formal role. Additionally, the project envisages formal collaborations with art-focused actors: the KÖR and Frau Isa. For the legal aspects, several legal partners were consulted, particularly the studio Binder Grösswang GmbH.



**Fig. 16. The project KT Steering committee. Source: internal documents.**

Finally, cultural institutions play a part in the realization of the project KT, thus are formal partners, but are not involved in project management. As of May 2020, four cultural institutions, Volkstheater, Wiener Konzerthaus, Kunsthalle, and Wien Museum, are involved. They both contribute to the realization of the project as well as benefit from the KT in terms of promotion, visibility and innovation of their offers.

#### Choice of formal partners

The selection of formal partners did not occur through national nor international tenders in order to use and develop the expertise of the City of Vienna, with the exception of Baumann.at, who was chosen through a tender. Changer's selection was a result of market research. Changers' existing app was easily and rapidly adaptable for the city's objectives and needs.

The four cultural institutions involved in the pilot are chosen because they each have a different artistic focus. For example, music at the Konzerthaus, visual arts at Kunsthalle, theater at Volkstheater and local interest museum installations of the Wien Museum (which has the benefit of 19 locations all over the city). In the long term, when rolling out the KT app on a larger scale, a larger number of cultural partners would be involved, and they would potentially take over more responsibilities. So far, several Viennese cultural institutions have signaled a high interest in the project.

All the formal partners have different responsibilities and tasks through which they contribute to the project, since they can rely on specific expertise and resources. Table 1 summarizes the formal partners with their respective roles and responsibilities, as well as resources.

### **5.1.2. Informal partners**

Informal partners benefit and contribute indirectly or are impacted to a certain degree by the development of the KT. Primarily informal partners are explicitly considered in the project KT, but are not engaged in the planning nor decisions making, neither do they hold any specific responsibility in the project. For the pilot phase, individuals volunteered to join the testing. Thus, they are likely people that are already interested in culture and comfortable with apps. The range of app users might diversify in the future rollout phase of the project, if for instance the KT is combined with other applications for public services or once the KT app becomes more known and popular. Related informal actors are all Viennese and commuters. The air quality and environmental dimensions as well as the cultural and mobility environments impact them.

Further, informal partners are the actors working together with the individuals and organizations formally involved in the KT. At the city level for instance, the Council Member for culture (Kulturstadtraetin), the Mayor, and other political actors who are continually informed and who helped realizing the project, mobilizing the necessary funds and support. Similarly, the legislative context that allows the development of the project KT plays a role. Media and advocacy groups are involved in the communication of the project to other actors, hence in its promotion and support, as well as by potentially influencing the future rollout of the project through the feedback they provide. At the same time, the project KT relies on the possibility for app users to use Vienna's public transport (Wiener Linien). This partner was involved through informal conversations and consulting.

Several partners do not receive direct compensation for their participation in the project. For example, the cultural institutions as well as several legal institutions. Cultural institutions funding is through other means (including taxes). Combining this with free-tickets through tokens is a cultural-policy measure independent of their funding. Legal institutions provided free legal consulting during the pilot phase.

Role	Responsibilities	Tasks	Stakeholder
Project steering committee		Final decisions Planning and directing the project Oversees progress and results Solves interdependent problems	City Council of Vienna: OFFICE OF THE CIO, MA01, OCAS, Research Institute for Cryptoeconomics (WU)
Project sponsor	Media and communication Securing resources	Chooses the project leader and required competencies Responsible for securing the resources and budget for the project Assigns the project Accepts the milestones and project results Chair of the project board Final decision maker Coordinates cultural institutions	CIO & OCAS
Project manager	Project management	Project initiation, controlling, marketing Overviews the progress Coordinates the project team Reports Plans milestones Risk management	Upstream – next level Mobility GmbH
Part of steering committee AND Scientific consulting & evaluation		Coordination Project organization Support project management Content consulting Scientific evaluation and research Marketing	Research Institute for Cryptoeconomics (WU)
Project manager	Coordination of data governance and protection	Coordination of data governance Coordination of meetings, contracts	Executive Office - Information & Security Office of the CIO
Project team member	Technical overview Work package development	Budget control Oversees concept and technical execution Oversees and contributes to the implementation	Magistrate Office MA01 - Wien Digital
Project team member	Node-operator	In the pilot: MA01 operates all 3 nodes Later roll-out: each node operated by a different actor Responsible for the operation of the blockchain	MA01 and later additional actors
Project team member Contractor	Technical service provider	Evaluates the mobility data Developed the original app; then adapted it for the KT Technology Providing and maintaining the app's infrastructure Technical feedback to users	Changers
Project team member Contractor	Technical service provider	Develops and implements the blockchain system	Baumann.at
Project team member	Legal consulting	Legal advice and evaluation Coordination of other legal consultants	Law firm Binder Grösswang Rechtsanwälte GmbH and other legal consultants of WU, City of Vienna, Danube University Krems, Vienna University and law firm Stadler Völkel
Stakeholder	External evaluation	Behavioral research (field study) - IHS Investigation on user's feelings, ethical concerns (Koblenz-Landau)	IHS Insight University of Koblenz-Landau
Stakeholder	Cultural partner (institution)	Pilot phase: Accepts one token as one voucher for a ticket Later roll-out (planned, but not final): Generates voucher-tokens and defines conditions for the emission of voucher-tokens	Volkstheater, Wiener Konzerthaus, Kunsthalle, Wien Museum; potential new cultural institutions
Stakeholder	Graphic Design Artistic Direction	Sponsors Frau Isa Supports communication and marketing	Institution "KÖR Kunst im öffentlichen Raum" (Public Art Vienna)
Project team member	Graphic Design Artistic Direction	Graphic design and art director	Street artist Frau Isa
Stakeholder	App User	Uses the app, to get KT's because of her mobility data and then accesses cultural offers	Viennese citizens and commuters

**Table 1. Partner Roles**

## **5.2. Governance**

Which stakeholders can make decisions, for example about the goals of the project? What is the formal governance structure?

The KT is a project with Viennese and German actors. The city government owns and runs the KT without a profit-motive. As indicated above, government actors are involved, i.e. MA01, OCAS, Office of the CIO and cultural institutions who aim to achieve societal goals. At the same time there is a for profit semi-public actor, Upstream – next level Mobility GmbH, which is owned by the City. In addition, private sector actors include Changers and Baumann.at. The sections below describe the roles of the public and private actors who worked together to develop the KT.

This section explores decision-making for the project KT. Mainly, the steering committee makes the formal decisions. This includes the OCAS, MA01, MD- OS and the Research Institute for Cryptoeconomics at WU. From each of these organizations or units of the city, one to two people are primarily involved in the KT. In addition, Upstream – next level Mobility GmbH is involved in the decision-making, because of its project management role. On a broader level, decisions are discussed within the project team, including the software developer, the legal consultants, and the graphic designer. Eventually, the city, particularly its units OCAS and OFFICE OF THE CIO, are responsible for final decisions, since the city is both project owner and sponsor. Ultimately, the CIO and the Mayor have the last word on decisions as well as influence the direction and plan of the KT indirectly through other projects and strategies, such as the STEP 2025, as described in chapter 3.

OCAS accepted the proposal and project idea. Subsequently, the project team defined the goals, value propositions and project processes. Each work package, i.e. project phase and area, such as implementation, research, communications, is assigned a work lead in charge of supervising the work in line with project goals and processes.

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## **5.3. Relationships:**

Through which channels do the relationships between the different stakeholders develop? What relationships between the different stakeholders are necessary to develop and implement the project KT? What is the function of each relationship in each value co-creation or value co-destruction relevant for each stakeholder?

### **5.3.1. Channels**

The relationships between partners and stakeholders are developed and maintained in various ways. The project team originally met via phone calls, discussing for 10 to 30

minutes, weekly to bi-weekly. In addition, in-person meetings organized once a month, with more structured workshops at crucial project stages, for instance before finalizing a concept or before introducing new work packages. The meetings of the steering committee aimed to verify the status of the project, assign, and divide tasks and develop ideas.

Concerning informal partners, such as cultural institutions and media, they are in contact with individual members of the project team, who are responsible for the respective area. Exchanges also occur by inviting the community of actors to events, for instance press conferences.

The acquisition and communication with app users was handled differently. Potential app users were recruited under the coordination of the researchers at the Vienna University of Economics and Business. The recruitment was carried out with all partners (CIO, official City of Vienna, MA01 and OCAS, and Universities) reaching out on their social media and communication channels to advertise the pilot. This resulted in 4000 applications. One thousand applications were randomly selected according to scientific standards with the statistical program SPSS. The randomly selected applicants were invited to participate in the pilot.

### **5.3.2. Characteristics of the relationships**

Each project partner has different resources, core competencies and knowledge. These complementarities allow for synergies. To realize the KT, relationships between these partners had to be established and maintained, as well as cultivated along several dimensions.

Collaboration, teamwork and cross-institutional exchange are a source of value for such a cross-sectorial project. Collaboration is characterized by the shared goal of realizing the KT and structured work within a timeframe. The relationship between formal partners of the KT is of collaborative nature. To facilitate this type of exchange, and particularly to develop discussions, inform stakeholders and finalize decisions, the project team held workshops and regular meetings among formal project partners, as pointed out in the previous section. The collaboration between private partners, with in-depth knowledge and experience in blockchain and app solutions, and public partners, who have a “legal and administrative specialization culture” (Achard, 2019) and a relationship with the citizens, allows a type of value creation unique to public-private partnerships, such as the KT. At the same time, collaboration characterizes also the relationships between public actors. Indeed, Veronica Kaup-Hasler, Executive City Councilor for Cultural Affairs, pointed out the “positive, enjoyable collaboration for an innovative, forward-looking city” with the city’s Digital Innovation unit (Lutz & Strauch, 2020). Hence, the KT collaborations build on horizontal complementarities driven by the scope and specialization of partners, as well as on vertical relationships defined by the governance structure, outlined in section 4.2 (Achard, 2019).

As the project KT was planned, new partners were included to draw on their expertise and

resources, due to the rapid implementation plan. Thus the MA01 has the responsibility for the technical implementation and has contracted Changers (app) and Baumann.at (blockchain and check out).

Instead, the relationship between project members and informal partners is cooperative, with free information sharing and less structure. For instance, the app users and citizens are involved in the design of the project to a limited extent. They can provide feedback via e-mails and the specific function in the app, as well as the survey at the beginning and end of the project. Further, articles and user's comments were considered by the project KT team.

A second dimension is trust, which has been particularly relevant to the relationship between city government and app users. Transparency and implementing validating nodes can foster this as they complicate the manipulation of the app for illegitimate goals. Trustful relationships are fundamental in relation to data protection since the KTs are assigned based on the mobility data. Concerning privacy, the KT only evaluates anonymized data, in two systems. The location data connected to the app-infrastructure is anonymized before it is shared with the research team. The two companies operating the mobility tracking, i.e. Changers and its subcontractor MotionTag GmbH, both based in Germany, are bound by data protection contracts (KT – Digitales Wien, n.d.) and all data transmission is encrypted (Changers, n.d.). Due to their location, German authorities oversee that the two companies ensure data security and protection.

The City of Vienna receives only aggregated results, the same way that KT users would see them. Thus, the city has neither direct anonymized data points nor access to the database linking the pseudonym IDs to the users' e-mails and number of Tokens generated through mobility behavior. This is preferable from a legal point of view. Further, due to privacy considerations, the city aims to take on full data governance as soon as possible. Crucial in terms of trust is the voluntary nature to join the project KT, as well as the anonymity of data of the app users.

Finally, the research team at the Vienna University of Economics and Business obtains user data, such as e-mail addresses and aggregated mobility data (only distance data per means of transport, CO<sub>2</sub> savings/emissions, per user) and pseudo named user IDs, associated to the respective e-mail (used, for instance, for demographic controls in behavioral analysis). It does not have access to location data (KT – Digitales Wien, n.d.). Similarly, for research purposes, the University Koblenz-Landau has access to user e-mails to conduct surveys and interviews. Blockchain system data is saved by the City of Vienna for 7 years, due to financial accounting requirements. In any case, users have the possibility to delete their data anytime and to contact the city via the website.

A further relationship distinctive of the KT is the peer relationship among app users. Hackel and Grosch analyze behavioral changes in the research accompanying this project (Hackel & Grosch, forthcoming). They hypothesize that social incentives might spur competition among peers, as well as conversations and debates on mobility behavior. These could foster consciousness for environmentally-responsible mobility behavior" (Hackel & Grosch, forthcoming).



Moreover, the app could also create new and foster existing relationships, particularly between app users and cultural institutions, where they can exchange their tokens. Overall, to realize the goals of the KT in the short and long-term the relationship between the city, the project team and the citizens as well as app users is crucial. Therefore, maintaining a relationship characterized by transparency, trust and collaboration with the app users and wider community of citizens will eventually grow the number of users. Chapter 6 develops the recommendations for the project.

#### **5.4. Resources**

What tangible (physical materials from biophysical stocks, such as fixed assets, raw materials and human beings) and intangible resources (energy, relationship equity, brand, tacit and explicit knowledge, intellectual property, money – working capital, cash, loans, etc.) are required by the KT's activities to achieve its goals?

The implementation of the KT requires both capabilities and resources to create value (Upward & Jones, 2016). Resources are both tangible and intangible. The tangible resources relate to the digital, mobility and cultural elements of the project KT. Related to the digital element are resources such as blockchain technology, servers, and mobile devices necessary to develop, set up the app, and to allow its utilization by the users. In turn, these devices require raw materials and energy for their manufacturing, as well as for their usage (Suckling & Lee, 2015; Williams, 2004; Yu et al., 2010). Instead, the mobility dimension of the KT implies the involvement of transport providers, both public, such as busses and trams, and private, ranging from cars to bicycles and scooters. Publicly funded infrastructure, such as car lanes and bicycle lanes are tangible resources. The number of private cars in Vienna was 881.596 at the end of 2018, in an increasing trend since 2002. The city's spending on public transport and infrastructure was about 500 Million Euros in 2017, which corresponds to about 40% of the public transport costs. The remaining 60% is covered by Wiener Linien. Public transport was used by about 965.9 Million passengers for trips in Vienna in 2018 (Wiener Linien, 2019). Finally, the cultural aspect of the KT is based on the existence and maintenance of physical assets like the buildings hosting cultural institutions and resources used for the creation of artistic and cultural products. Fixed assets so far are the buildings of the four cultural institutions involved. In addition, the entire project KT also relies on funding, mainly through Vienna's digital innovation budget and KÖR's sponsoring.

Intangible resources comprise the knowledge on the digital, environmental, cultural and behavioral dimensions. Thus, for instance the research and information on blockchain technology. The KT also builds on tacit knowledge (van Nunen et al., 2011) such as practical know-how of the devices on which the KT app operates. Another intangible asset is the intellectual property of the app, first developed and then adapted for the KT by Changers. Closely linked, is the intangible asset of the legal agreements between the partners involved as well as the legal framework conditions for the KT operationalization. Binder Grösswang Rechtsanwälte GmbH developed this latter aspect through a legal analysis of the project (Binder Grösswang, 2020).

Moreover, the KT relies on the marketing and communication campaigns to involve Vienna's inhabitants in the use of the app. Similarly, the city's "brand name", i.e. the

local administration's reputation, the credibility about its commitment to STEP 2025 and Smart City Strategy, overarching goals of the KT, are intangible resources that influence the participation into the project and the support of the KT by the inhabitants, since the project is publicly funded. Indeed, several of these intangible resources determine the relationship equity, i.e. the trust app users have in the KT's partners and the quality of their relationship. An in-depth discussion appears in section 4.2.2.

## **5.5. Activities**

What value adding work, organized into business processes, is required to design, deliver, and maintain the organization's value co-creations and value co-destructions to achieve the project's goals?

Various activities are required to create value and thus generate the output of the KT, which consists of incentivized sustainable mobility and facilitated access to cultural events. The activities and tasks of each project partner are outlined in Table 1.

### **5.5.1. Operational**

These activities are at the core of the value creation and in the case of the KT are majorly of technical nature. They are based on the KT app, an individualized adaptation of the Changers app for the City of Vienna. On the user side, core activities are everyday mobility and then the use of KTs to access cultural institutions. On the side of the KT, the core activities are mobility tracking, token generation and token redemption, where the last two rely on the blockchain system.

#### **- Mobility tracking:**

As outlined in Section 1.2 the mobility of the app user is tracked through GPS, through the smartphone on which the user has downloaded the KT app. MotionTag GmbH, an enterprise based in Germany, manages and supervises the tracking and the evaluation of the mobility data, as a contractor of Changers. This evaluation allows the estimation of the amount of CO<sub>2</sub> saved (compared to covering the same distance by car), based on the route travelled, start-stop patterns and other data.

#### **- Tokens and blockchain:**

The collected mobility data is then "gamified using blockchain technology in a purely administrative process" (Lutz & Strauch, 2020). The blockchain system is set up and managed by Baumann.at. The gamification is a distinctive modality of generating value, which engages the app user in a new way.

This gamification happens first through the generation of tokens. Two types of tokens are generated, each with a different function. One type are KTs, that in the first phase only exist outside of the blockchain system and are obtained by the app user when she saves 20 kg of CO<sub>2</sub>. On average, this amount is saved after two weeks, considering average Viennese mobility patterns. The second type of voucher tokens are created on the

blockchain and represent vouchers for free tickets to cultural events. These are generated manually by the City of Vienna during the first phase of the project. Their generation can happen at the last-minute, for instance to offer left-over tickets to specific events (Baumann, 2019). A QR code is associated with each token.

On a “market place”, KT’s can be exchanged for voucher tokens. Tokens gained through mobility converted into free tickets (Binder Grösswang, 2020). Furthermore, for each KT converted into a voucher and then spent, a tree is planned to be planted in the garden of the young Viennese (Garten der jungen WienerInnen), during the annual reforestation event for families. Figure 17 displays the various **technical components** required for the functioning of the project KT. The Changers backend gathers and analyzes the data, so that it is ready for the front-end (i.e. the app) upon request. At the same time, the web3 communication component allows the backend to communicate with the blockchain.

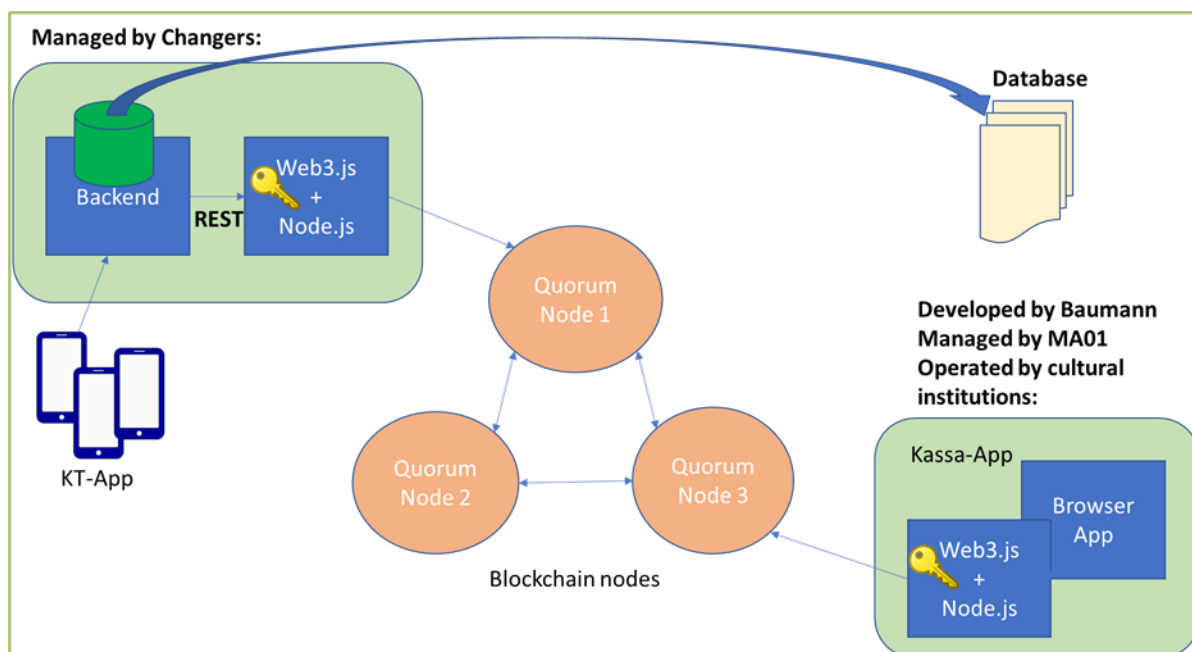
The blockchain required the installation of three nodes in the city’s data center MA 01 servers for the pilot (at the center of Figure 17). In a later phase, further node operators will be easy to include thanks to the “docker” blockchain nodes. These further nodes will be established at trusted institutions, such as the WU, or the Technical University of Vienna or the Austrian Federal Computing Center. The blockchain allows “solidity” contracts, i.e. it is based on “Ethereum” and is of the “proof-of-authority” type. Each node decides whether the transaction requested is legal and valid, and each node knows the “authority”, i.e. the identity of the other nodes. If the majority of nodes agree, the transaction is validated.

The time between the selection of the contract and the results of the transaction is within 5 seconds. This period is a feasible upper limit for the “Kassa” (checkout) app and reasonably constrains the “blocking time”, i.e. the consensus-algorithm. A further step was the realization of the mobile checkout app based on Android (in the bottom-right corner of Figure 17). This app allows cultural institutions to verify tickets shown by visitors on the KT app. By scanning the QR code on the KT-app, the web3 communications part allows the Kassa app to request verification of the token’s validity by the three nodes of the blockchain. Once redeemed, the token cannot be used a second time. The Kassa app is currently available on 10 mobile devices, which will be increased to 30 in the future. At a specific “Kassa” only a certain type of token is accepted, based on the character string associated to the QR code. However, the tokens are not bound to a specific person.

### 5.5.2. Supporting activities

These include ongoing activities such as budget management, communication with external stakeholders and press, and the evaluation of the pilot as well as planning the potential extension of the app on a larger scale.

Issuing tokens required legal evaluation as stated by Binder Grösswang, and subsequently confirmed by the Austrian financial market authority (FMA), the KT, as defined in the city’s project, is neither e-money, nor a payment instrument or means, nor a virtual



**Fig. 17. Technical components of the KT. Source: internal documents.**

currency (Binder Grösswang, 2020). These conclusions rely on the current project configuration, which prohibits the trade with and conversion of the Tokens. The FMA also does not consider the activity inherent in the KT as a service for which registration is required.

## 6. Recommendations and Conclusions

The KT Sustainable Business Model set forth herein is a case study of the first project worldwide to create tokens for access to cultural institutions and events based on reducing carbon emissions. Therefore, the KT Sustainable Business Model report is unique in the literature. It intends to go beyond the narrow market-based profit-seeking business models to capture the broad range of characteristics and challenges of a not-for-profit government run entity developed with multiple public and private partners.

This business model is an academic research product. The analysis and findings documented herein preserve the history of the actors who are involved in the development, operation and maintenance phases of the KT. The authors compose and structure the varied goals, benefits, costs, and values generated by the KT from the dataset of public and non-public documents read and analyzed, using a comprehensive business modelling method, the Flourishing Business Canvas.

In addition, the KT Sustainable Business Model serves as an evaluation and strategy tool for current and future project KT stakeholders. However, the current analysis is restricted at the current early stage of the project. Measuring impact will be possible when the pilot is completed, the project rolled out to the general public, and new statistical data is collected.

Even without the statistical data, the dataset of documents used for this analysis proved to be a treasure trove of rich qualitative data for this case study. Based on the findings of the Flourishing Business Canvas analysis presented in Chapters 3 to 5, the authors offer the following eight recommendations to the project's steering committee, project team leader, and project managers.

- **The KT has the potential to be a true participatory governance strategy. The project KT should build on this potential by hosting a stakeholder workshop to validate the KT Sustainable Business Model.** KT directly engages citizens in reaching societal climate change mitigation goals. Citizen input could be encouraged in the planning stages as well. For example, the FBC is designed for use in a workshop with stakeholders. We recommend that the City of Vienna uses this report as the entry point for a public participation workshop. The workshop could be explicit about the target users and consider which users may be inadvertently excluded. For example, diverse socioeconomic groups or people with disabilities limiting their mobility choices. The workshop would be an opportunity for the project KT to seek input for and validate the current KT Sustainable Business Model.
- **The goals and benefits, particularly the non-financial benefits, noted in the KT Sustainable Business Model should be used to evaluate the pilot and the operations phases.** As the overarching goals of the KT are not financial gain, the project managers should not rely exclusively on traditional financial indicators but seek to measure and evaluate the indicators discussed herein that correspond to existing policy goals, i.e., increases in the share of walking and cycling in modal split.
- **The KT needs to formulate a business plan with a long-term perspective.** To date, a traditional business plan that states how many users sought, the scope of institutions desired, how marketing will work, etc. is missing. The KT Sustainable Business Model value discussion should be used to frame business planning discussions that set long-term strategy of the KT.
- **The KT has the potential to complement or combine with other sustainability apps.** For example, other low-carbon mobility initiatives in the city could be linked with the KT such as using the City Bike sharing stations. Further, apps that are not mobility focused but encourage low-carbon and sustainable lifestyles could be linked to the KT. For example, the Viennese app enabling consumers to reduce food waste called “Too Good to Go” could earn KTs. Complementing or combining KT with other apps could reduce the cost of attracting KT users and leverage the existing architecture to achieve greater results. As pointed out herein, the voluntary nature of the app is crucial for trust and good governance.
- **Access to the KT and cultural experiences throughout all districts of the city is an important goal that should be targeted for expansion.** Currently, the majority of the cultural institutions involved in the KT are located in the city center. To expand access to culture, more cultural institutions in all districts should be targeted as the KT grows.

- **The vibrant mosaic of Vienna’s cultural scene should be reflected in the KT.** Currently, the majority of the participating cultural institutions are well established and traditional. However, the cultural scene in Vienna is also vibrant, modern, and non-traditional. As the KT expands, it should also expand the types of culture it offers by including different types of cultural venues and events, including the many cultural festivals that Vienna hosts each year for which tickets are required (i.e., Internationale Akkordeon Festival Wien, Afrika Tage Wien, or ImPulsTanz Wien). Offering a wide range of cultural events would make the KT app and low-carbon mobility appeal to a wider array of citizens.
- **Explore whether the app could be carbon neutral.** The KT’s largest environmental concern is increased electricity use to run the app itself. Once the energy consumption of the app is reliably estimated, then the KT should explore carbon neutrality by offsets or the use of renewable energy at its servers.
- **To focus on changing mobility behaviors, the KT could be limited to residents of the districts with the highest car use.** For example, the KT would not be available to residents in districts where the majority of people already use public transport for commuting. Targeting the KT to districts with high car use would reduce actual car use and CO<sub>2</sub> emissions, rather than theoretical CO<sub>2</sub> emissions from people who already use public transport.
- **Given the Corona virus crises of 2020, the KT could offer digital cultural experiences in addition to in-person visits.** Several cultural institutions offer digital tours online as well as exploring 3D virtual reality models of historic buildings, and online concerts. In addition, due to the corona virus pandemic, people may become more reluctant to use public transportation. They could be incentivized to continue to use public transport with additional KTs.
- **Data protection, data security, and privacy concerns could be more transparently managed if the KT app and backend were hosted in the city’s own data center.** This suggested change to the current architecture is in line with the “Digital Agenda Vienna” as “personalised evaluations, allowing citizens to review the use of their data in the ICT System” would be available.

In conclusion, the Flourishing Business Canvas analysis conducted for the KT shows that it appears to be a viable policy tool for Vienna and other municipalities in Austria. The KT is still in its early stages. The authors conclude that it is a promising strategy of good public governance to achieve low-carbon mobility through encouraging new low-carbon mobility behavior. It creates significant value for its actors, fulfilling several institutional and individual needs whilst generating relatively few negative value co-destructions. This first iteration of the KT Sustainable Business Model will assist the current and future project KT managers to innovate and improve the program over time. In addition, academics and city managers interested in a case study of a digital sustainability behavioral change app may use it.

**Contact Information:**

For further information, please contact:

**Prof. Dr. Alfred Taudes**

Department of Information Systems and Operations, Institute for Production Management, Vienna University of Economics and Business

Tel: +43 1 31336 5611

E-Mail: [alfred.taudes@wu.ac.at](mailto:alfred.taudes@wu.ac.at)

**MSc Jakob Hackel**

Research Institute for Cryptoeconomics, Vienna University of Economics and Business

Tel: +43 1 31336 6142

E-Mail: [jakob.hackel@wu.ac.at](mailto:jakob.hackel@wu.ac.at)

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## Appendix 1

The 16 guiding questions of (Elkington Upward, 2016) for the Flourishing Business Canvas Analysis:

“(1) Goals: What are the goals of this business that its stakeholders have agreed? What is this business’s definition of success: environmentally, socially and economically?

(2) Benefits: How does this business choose to measure the benefits that result from its business model (environmentally, socially, economically), each in relevant units?

(3) Costs: How does this business choose to measure the costs incurred by its business model (environmentally, socially, economically) each in relevant units?

(4) Ecosystem actors: Who and what may have an interest in the fact that this business exists? Which ecosystem actors may represent the needs of other humans, groups, organizations and non-humans?

(5) Needs: What fundamental needs of the ecosystem actors is this business intending to satisfy or may hinder? See Max-Neef (Max-Neef et al., 1991) for an introduction to “fundamental human needs” and their “satisfiers”.

(6) Stakeholders: How is each ecosystem actor involved in this business? What roles does each ecosystem actor take? Examples: customer, employee, investor, owner, supplier, community and regulator.

(7) Relationships: What relationships with each stakeholder must be established, cultivated and maintained by this business via its channels? What is the function of each relationship in each value co-creation or value co-destruction relevant for each stakeholder?

(8) Channels: What channels will be used by this firm to communicate and develop relationships with each stakeholder (and vice versa)? Examples: retail, face-to-face, Internet, phone, e-mail, mail, transport.

(9) Value co-creations: What are the (positive) value propositions of this business? What value is co-created with each stakeholder, satisfying the needs of the associated ecosystem actor, from their perspective (world-view), now and/or in the future?

(10) Value co-destructions: What are the (negative) value propositions of this business? What value is co-destroyed for each stakeholder, hindering the satisfaction of the needs of the associated ecosystem actor, from their perspective (world-view), now and/or in the future?

(11) Governance: Which stakeholders get to make decisions about: who is a legitimate stakeholder, the goals of this business, its value propositions and its processes?

(12) Partnerships: Which stakeholders are formal partners of this business? To which resources do these partners enable this business to gain preferred access? Which activities

do these partners undertake for this business?

(13) Resources: What tangible (physical materials from one or more biophysical stocks, including fixed assets, raw materials and human beings) and intangible resources (energy, relationship equity, brand, tacit and explicit knowledge, intellectual property, money – working capital, cash, loans, etc.) are required by this business's activities to achieve its goals?

(14) Biophysical stocks: From what ultimate stocks are the tangible resources that are moved, flow and /or transformed by this business's activities to achieve its goals? As per laws of conservation of matter, all tangible resources remain biophysical stocks somewhere on our single shared planet irrespective of this business's activities (past, present and anticipated future).

(15) Activities: What value adding work, organized into business processes, is required to design, deliver and maintain the organization's value co-creations and value co-destructions to achieve this business's goals?

(16) Ecosystem services: Ecosystem services are processes powered by the sun that use biophysical stocks to create flows of benefits humans need: clean water, fresh air, vibrant soil, plant and animal growth, etc. Which flows of these benefits are required by, harmed or improved by this business's activities? For an introduction, see World Business Council for Sustainable Development (WBCSD)'s Corporate Ecosystem Service Review v2.0 (Hanson et al., 2012)." (Elkington and Upward, 2016)

## Appendix 2

The following is the verbatim text of Figure 11, the Flourishing Business Canvas Version 2.0, for academic projects. It is reproduced here as the figure may not be legible to all readers. The original graphic may be found at <http://www.flourishingbusiness.org/>. Downloaded June 15, 2020.

**“BIOPHYSICAL STOCKS** What tangible materials are moved, flow, and / or transformed during the Activities that achieve this business’s Goals? Guidance: All materials remain biophysical stocks somewhere on our single shared planet irrespective of this business’s Activities.

### ECOSYSTEM SERVICES

Eco-system services are processes powered by the sun that use Biophysical Stocks to create flows of benefits humans need: clean water, fresh air, vibrant soil, plant and animal growth etc.

Which flows of these benefits are required by, harmed or improved by this business’s Activities?

Example: See World Business Council for Sustainable Development (WBCSD)’s Corporate Eco-System Service Review v2.0.

### NEEDS

What fundamental Needs of the Eco-System Actors is this business intending to satisfy or may hinder?

Guidance: For inspiration on possible Needs review Maslow’s Hierarchy of Needs or Max-Neef’s Fundamental Human Needs (preferred).

### RESOURCES

What tangible and intangible resources are required in order to execute this business’s Activities and so achieve its Goals?

### PARTNERSHIPS

Which Stakeholders are formal partners of this business? To which Resources do these partners enable this business to gain preferred access?

Which Activities do these partners undertake for this business?

### GOVERNANCE

Which Stakeholders get to make decisions about: who is a legitimate Stakeholder, the Goals of this business, its value propositions and its Processes?

What are the Governance arrangements for this business?

## ACTIVITIES

What value adding work, organized into business processes, is required to achieve this business's Goals?

## VALUE CO-CREATIONS

What are the (positive) value propositions of this business?

What value is co-created with each Stakeholder, satisfying the Needs of the associated Eco-System Actor, from their perspective (world-view), now and / or in the future?

## VALUE CO-DESTRUCTIONS

What are the (negative) value propositions of this business? What value is co-destroyed for each Stakeholder, hindering the satisfaction of the Needs of the associated Eco-System Actor, from their perspective (world-view), now and / or in the future?

## RELATIONSHIPS

What Relationships with each Stakeholder must be established, cultivated and maintained by this business via its Channels?

What is the function of each Relationship in each Value co-Creation or Value Co-destruction relevant for each Stakeholder?

## STAKEHOLDERS

How is each Eco-System Actor involved in this business? What roles does each eco-system actor take?

## ECOSYSTEM ACTORS

Who and what may have an interest in the fact that this business exists?

Examples: Humans, NGOs, Government, Media, other life (usually represented by an NGO) etc.

## CHANNELS

What Channels will be used by this firm to communicate and develop Relationships with each Stakeholder (and vice versa)?

Examples: Retail, Face-to-Face, Internet, Phone, Mail, Transport

## COSTS

How does this business choose to measure the Costs incurred by its business model (Environmentally, Socially, Economically)?

## GOALS

What are the Goals of this business that its Stakeholders have agreed?

What is this business's definition of success: environmentally, socially and economically?

## BENEFITS

How does this business choose to measure the Benefits that result from its business model (Environmentally, Socially, Economically)?" <http://www.flourishingbusiness.org>