A Multi-period Tradable Credit Scheme to Manage Traffic Network Demand

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Introduction

Tradable Credit Schemes (TCS)

- A **flexible market-based** mechanism used in transportation, with the aim of **manage congestion and emissions** via tradable mobility rights, as it is potentially **more equitable** than conventional pricing.

Single-Period Tradable Credit Scheme (TCS)

- It contains **one-time credit allocation** with **constant supply**, **demand**, and **charging rules,** which is more suitable for short-term demand regulation due to its higher volatility risk.

Multi-Period Tradable Credit Scheme (TCS)

- In this method, Credits are allocated **across multiple periods** to **updating policies** per periods toward **sustainability** and **price stability**, considering **long-term goals** such as **congestion** and **emissions reduction** as well as **equity enhancement.**

Crowdfunding in Transportation

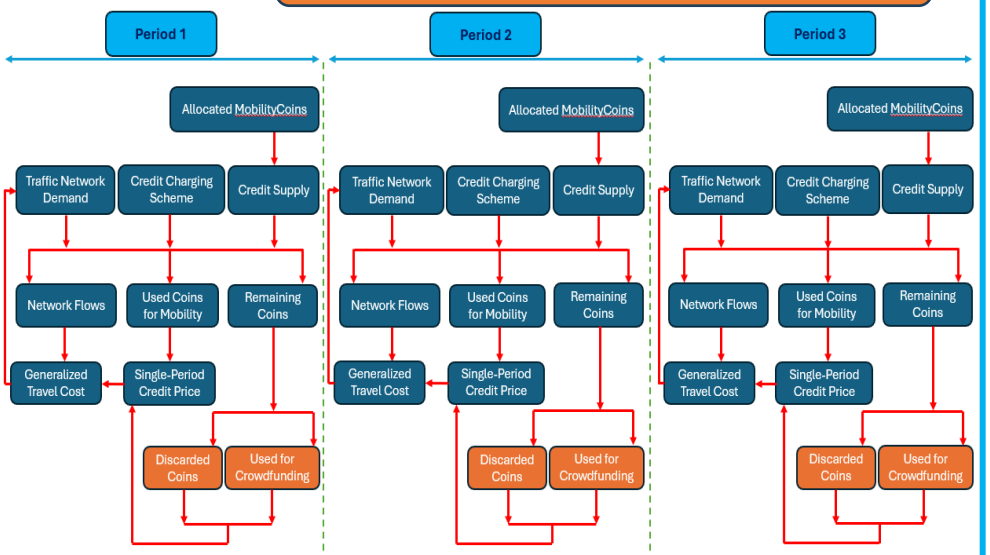
- It is a **decentralized**, **online-based**, **democratic** funding method, which enhances **public engagement** and **acceptance** in **green mobility** and bridges **funding gaps** in sustainable transport.

MobilityCoin Framework

- **MobilityCoin** is an emerging framework to integrate **demand**, **sustainability**, and **financing** through a **full-trip pricing,** reflecting **mode**, **distance**, **congestion** and **emissions**. It promotes **equity** which enhances **public participation** and **aligns** mobility behaviors with **market stability** and **sustainability goals**.

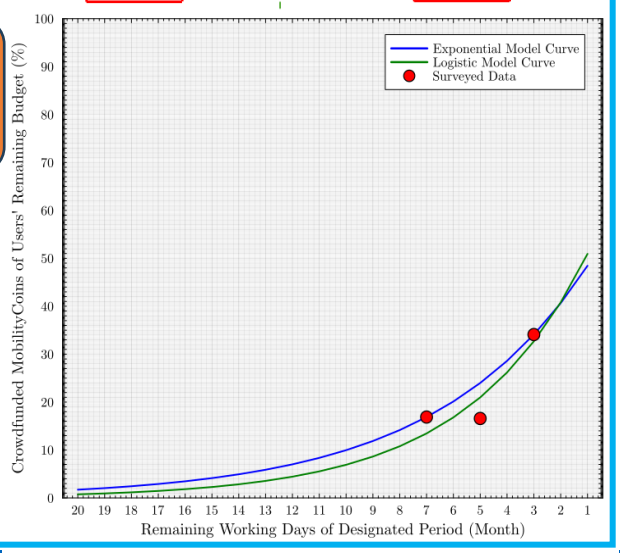
Methodology

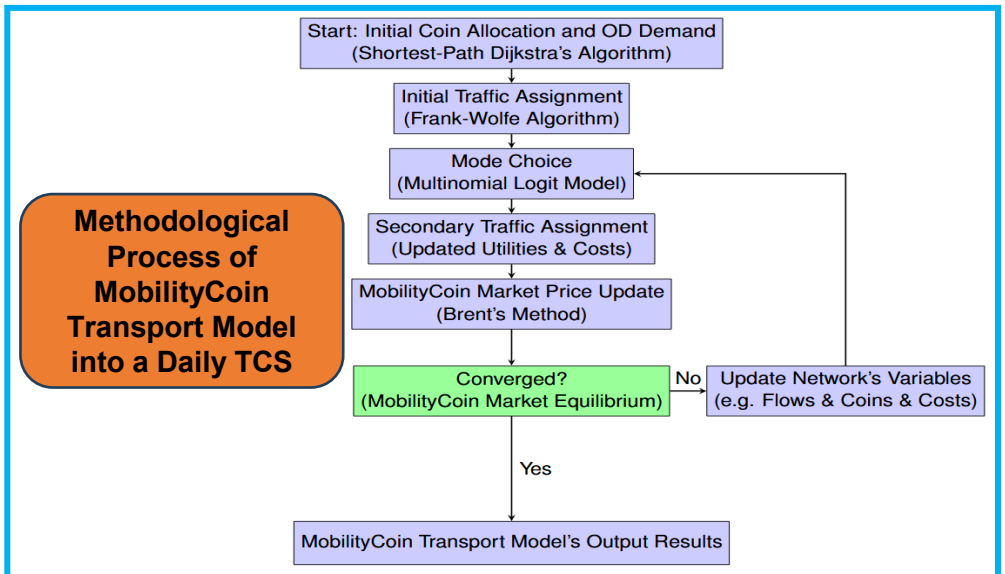
Multi Single-Period TCS with Crowdfunding considered as Coin Allocation method



Fitted Model for Travelers' Crowdfunding Behavior Estimation

Logistic curve captures **end-of-cycle surpluses** and **generosity,** which is **better** fit for **bounded**, **real-world crowdfunding** behavior.

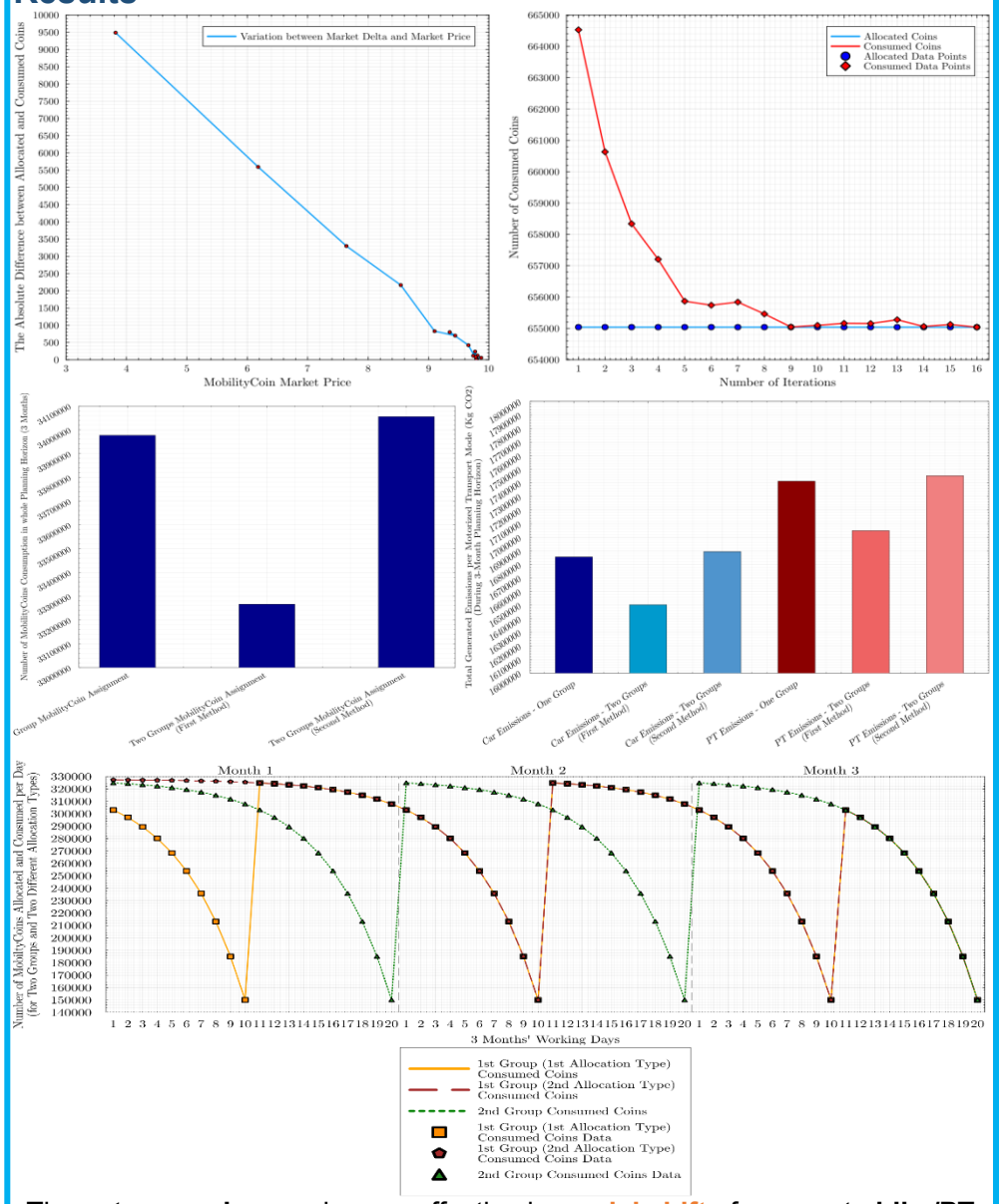




Methodological Process of MobilityCoin Transport Model into a Daily TCS

This processing method is used for comparing **3 considered scenarios** of **MobilityCoin allocation methods** over **3-month** horizon; **Uniform allocation**, **Two-Group allocation type 1**, and **Two-Group allocation type 2**. It assesses their impacts on **credit usage patterns**, **emissions**, **crowdfunding**, and **modal shifts**.

Results



These **temporal** scenarios are effective in **modal shifts** from **car** to **bike/PT** and thus **equity** and **sustainability goals** , which the **best scenario is First group-wise** scheme with **lowest emissions and highest adaptation.**