

研究成果報告書

Research topic: Research on a method to assess and predict circular consumption patterns and their sustainability effects / 研究題目: 循環消費パターンとサステナビリティ効果の評価手法に関する研究

Research period / 研究期間: 2023/10/01 - 2025/04/30

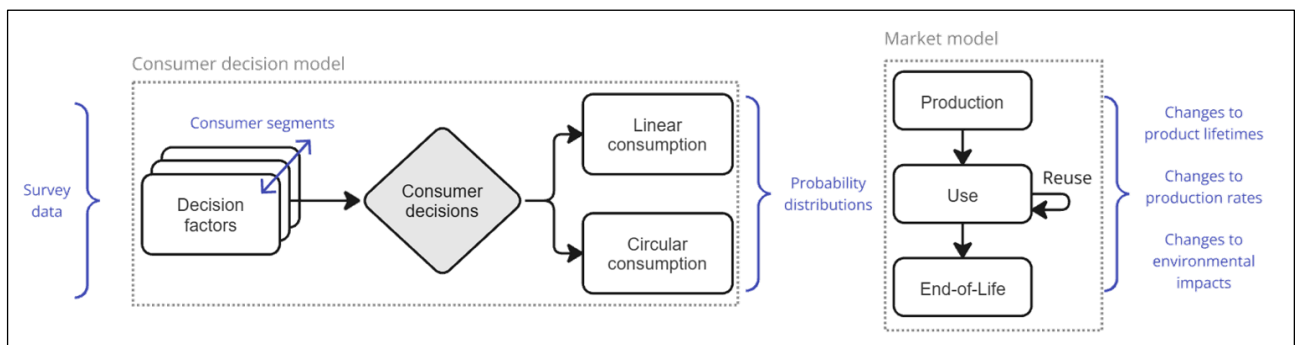
Brief progress report

Reuse, as a means of extending the lifespan of products, promises to decrease the environmental impacts of consumption and is one of the pillars of the circular economy concept, in which the consumption of resources is decelerated, and their circulation is maximized. Attempts have been made to quantify the environmental benefits of second-hand consumption, however, previous studies have typically focused on individual consumption impacts rather than market-level effects. This study further develops a market-level stock and flow product consumption model to analyze the cumulative effects of product reuse on life-cycle environmental impacts, while considering diverse consumer behavior, and testing measures aimed at incentivizing circular consumption. While simulating the effects of potential business or policy interventions, such as the provision of longer warranties for pre-owned products, the market model captures the flow of products between their production and end-of-life (EoL), based on empirical data on product lifespans and consumer propensity to reuse second-hand items. Due to their pervasiveness and relatively quick obsolescence, smartphones are considered as a case study.

An overview of the modeling framework developed within this project is depicted in figure 1. Consumer interaction with market-available consumption options determines the circularity of a product group in a market. When procuring a product, consumers decide whether to purchase a new or a used (pre-owned) unit. Further, at the time of the end-of-use of the product, consumers decide whether to dispose of it, make it available for reuse, or store it at home (hibernation). The cumulative outcome of those consumer decisions over time determines the flow of products within a market, including their overall lifetime, the reuse rate, and the production rate of new products. The production rate directly correlates with the environmental impacts of the product group in the market.

The next step in this project is to define relevant interventions to test consumer behavioral change and to distribute an online questionnaire survey to collect empirical data on consumer behavior, after which the models can be implemented to calculate results. Preliminary findings will be presented at the EcoBalance 2024 conference in Sendai, Japan, in November 2024.

Figure 1: High-level overview of the modeling framework



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