Project **MoSAic**: Tetrahedral **mo**del to comprehend and enhance **s**ocial **a**cceptance of **c**ircular **e**conomy

Nature, by itself, functions in closed loops. For instance, discards act as sources for others in water or nutrient cycles. Humans, however, have been mainly following a linear consumption model: to make, use and dispose of. We reside on the 'Spaceship Earth', with finite resources, and nature can replenish these resources at its own pace. The growing population and the need for raw materials to fulfill the demand for necessities and the lifestyle have put a substantial strain on natural resources, as we consume faster than the planet Earth can replenish. Moreover, the problem of waste collection and disposal is also one that has reached a critical level. One of the most prominent examples of this is the problem of plastic waste. It is estimated that one-third of the global plastic waste is either not collected or managed, causing it to end up in the oceans and other natural ecosystems and disrupting them. Researchers and policymakers have indicated an incomprehensible sustainability crisis at the brink of threatening the existence of human civilization on Earth! However alarming this may sound, there is hope, and workable solutions such as Circular Economy (CE) are available. The origins of this term can be traced back to 1966 when Kenneth Boulding, although not explicitly, referred to this concept in his essay, 'The Economies of the Coming Spaceship Earth". CE consists of three main principles: designing out the pollution and waste, keeping the goods and materials in use repeatedly, and revitalizing the natural cycles. Transitioning from the linear model of the economy to a circular closed-loop economy would mean decreasing stress on natural resources, as the goods at the end of their lifecycle would be introduced back into the economy as resources for other goods. The waste management sector has a significant role to play in this. Optimal collection and processing of waste to ensure that the discarded goods have increased chances to serve as raw material for other goods is the desired goal. In the municipal waste management sector, initiatives such as waste segregation were a step in the right direction. However, more interventions are required.

CE has been widely studied, and the positives that CE has to offer have been highlighted prominently in the literature. Despite the urgency and benefits CE offers, the concept has yet to gain momentum due to several barriers. Change is always met with resistance, and it becomes even more challenging to implement when it clashes with the existing business philosophies. An in-depth look at the literature regarding barriers highlights four major categories: (i) Cultural barriers: lack of awareness/willingness to engage, (ii) Regulatory barriers: lack of supporting policies and regulations that can direct the transition, (iii) Market barriers: lack of economic viability, and (iv) Technological barriers: lack of proven technologies for implementation. Each of these barriers is significantly interrelated and has yet to be studied together for CE in general and particularly for CE in municipal waste management. These four barriers correspond to the nodes within the social acceptance model conceptualized by Wuestenhagen et al. (2007) and further elaborated by Upham et al. (2015). Through this project, we aim to apply it and investigate the socio-economic, psychological, technological, and macroeconomic factors that can lead to the successful transition of the Polish municipal waste management sector towards the CE model. In particular, **the main objectives of this project are**: (i) to create a tetrahedral model for social acceptance of CE, which would explain the interlinks between the barriers of transitioning to CE, based on empirical pieces of evidence from Poland; and (ii) to develop a set of recommendations for increasing social acceptance of CE aiding in the transition to CE.

To achieve the objectives, we would first explore the factors affecting the social acceptance of CE and deduce the linkages between them based on empirical evidence from Poland. In particular, we will conduct longitudinal surveys among all the stakeholders, consumers, businesses, policymakers, and managers at municipal waste management plants. After that, we would integrate the identified elements to develop a tetrahedral model, which can be used to comprehend the level of social acceptance using Agent-Based Modeling. Finally, we will use the model to build a set of recommendations for the Polish municipal waste management sector in particular and central Europe in general.

From the point of view of basic research, the project contributes to: (1) The development of the research field in behavioral economics by introducing a model that could be adopted by researchers, policymakers, and industries for examining the social acceptance of CE and measure how to improve the process of transition; (2) The development of the research field in diffusion & social acceptance of innovation, by elaborating the involved variables concerning all key players of social acceptance and examining relations between micro level of social interactions and macro level of economic variables (i.e., price, subsidy, tax).

From the point of view of economic and societal impact, this project contributes to: (1) Shedding light on the heterogeneity in consumer motivations, including values and lifestyle engagement, which can improve understanding of the motivations behind the consumer's role in transitioning towards CE; (2) Developing tools and policies that can be useful in designing future marketing campaigns enhancing acceptance of innovations. Finally, the proposed project creates an opportunity for a young researcher (the project's principal investigator) to develop his academic career.