

Master's Thesis

## Modeling food security on a regional scale against big disruptions

## Background

Global food supply chains are complex systems, composed of numerous actors and processes across countries that add value at every stage of the supply chain to deliver food to the end customer. From farm to table, the food industry is responsible for **10% of the world's GDP**, employing ca.**1.5 billion** people. Due to the global inhomogeneity of land resources driving import and export, growing human population and urbanization, and the dependence of primary production on climate change, food supply chains are vulnerable infrastructures. This was demonstrated by the food insecurity caused by the last global pandemic COVID-19. The goal of this project is to use mathematical modelling for constructing synthetic food supply chain networks to evaluate their resilience based on scenario analysis of big disruptions, especially pandemics, cyber-attacks, and climate change disturbances.

The goal of the thesis is to model the food security for a specific country/region by modelling the underlying supply chain networks. After depicting the network, the resilience is tested for big disturbances (pandemics, natural catastrophes, or cyber-attacks) and metrics are derived for conclusions.

We search for students with following profile:

- Interest in modeling of real food supply chains
- Interest in doing a systematic literature research (25% of the thesis work)
- Desired knowledge in basics of mathematical linear programming
- Independent and organized working style
- English proficiency in reading and writing
- Desired experience with Python
- Interest in data visualization with Python



Figure 1: Maps of food flow networks for all spatial domains (Konar.2018)

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