Episode 2: queuing diagrams, the quadratic assignment problem, and applications in supply chain management

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a mini teaching dialogue with Dr. Xuesong (Simon) Zhou at Arizona State University

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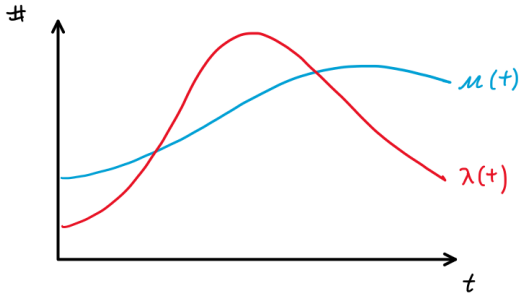
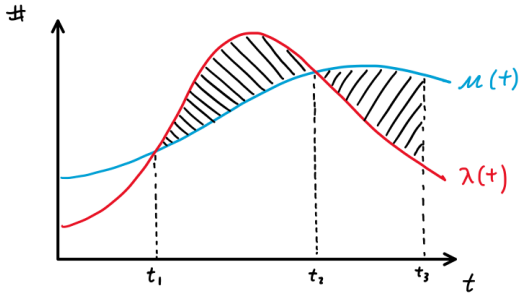
Applications

Modeling with Inflow and Outflow Rates





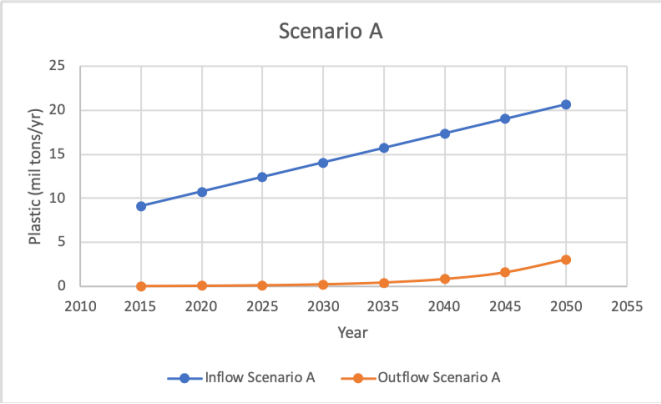
Queue Congestion and Dissipation

$$Q(t) = \int_{t_1}^{t} [\lambda(t) - \mu(t)]\, dt, \quad t \in [t_1, t_3] \tag{1}$$

$$\int_{t_1}^{t_3} [\lambda(t) - \mu(t)]\, dt = 0 \tag{2}$$

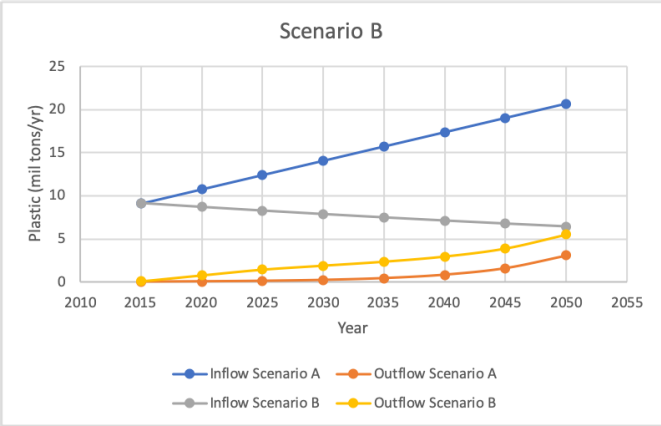
$$\int_{t_1}^{t_2} [\lambda(t) - \mu(t)]\, dt = -\int_{t_2}^{t_3} [\lambda(t) - \mu(t)]\, dt \tag{3}$$

Applications: Plastic Pollution in the Ocean



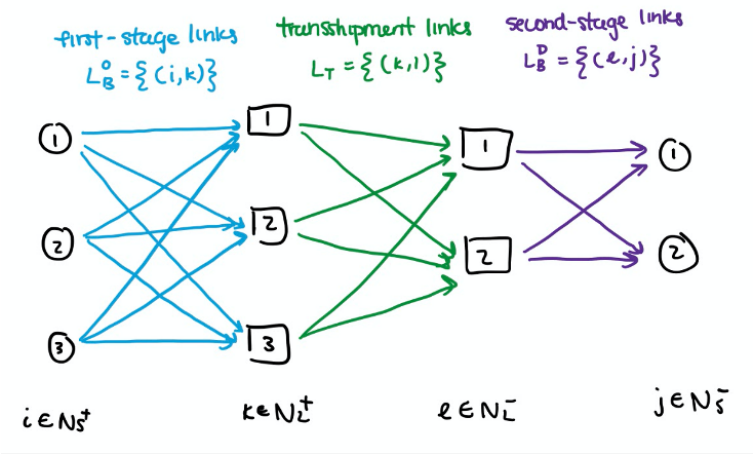
124.9270 million tons

Applications: Plastic Pollution in the Ocean

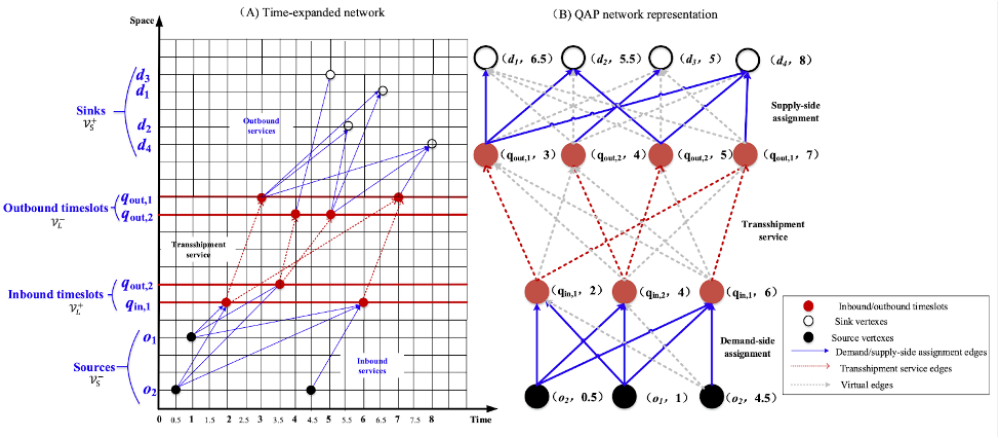


42.1987 years

Defining the Basic Network



Time-Expanded Network



Source: Xin Wu, Jiawei Lu, Shengnan Wu, Xuesong Zhou, unpublished paper

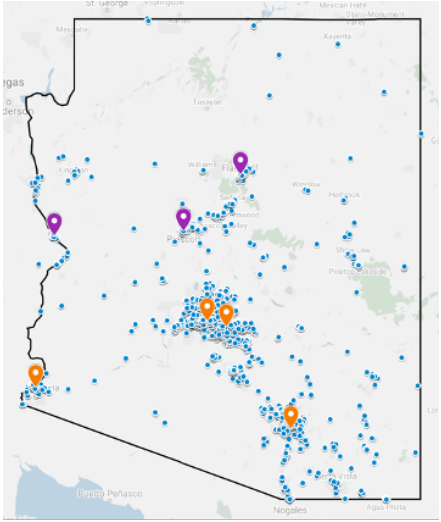
Applications: COVID-19 Vaccine

Source: World Health Organization, 2020
(www.who.int/immunization/programmes_systems/supply_chain/en/)

My Current Project

- 31% of the food supply chain is lost as waste, of which 68% is potentially edible.
- 37 million Americans struggle with hunger

My Current Project



Applications of Supply Chain Management

- planning shuttle times for passengers in NY
- tracking inventory through a warehouse
- information transfer over blockchain