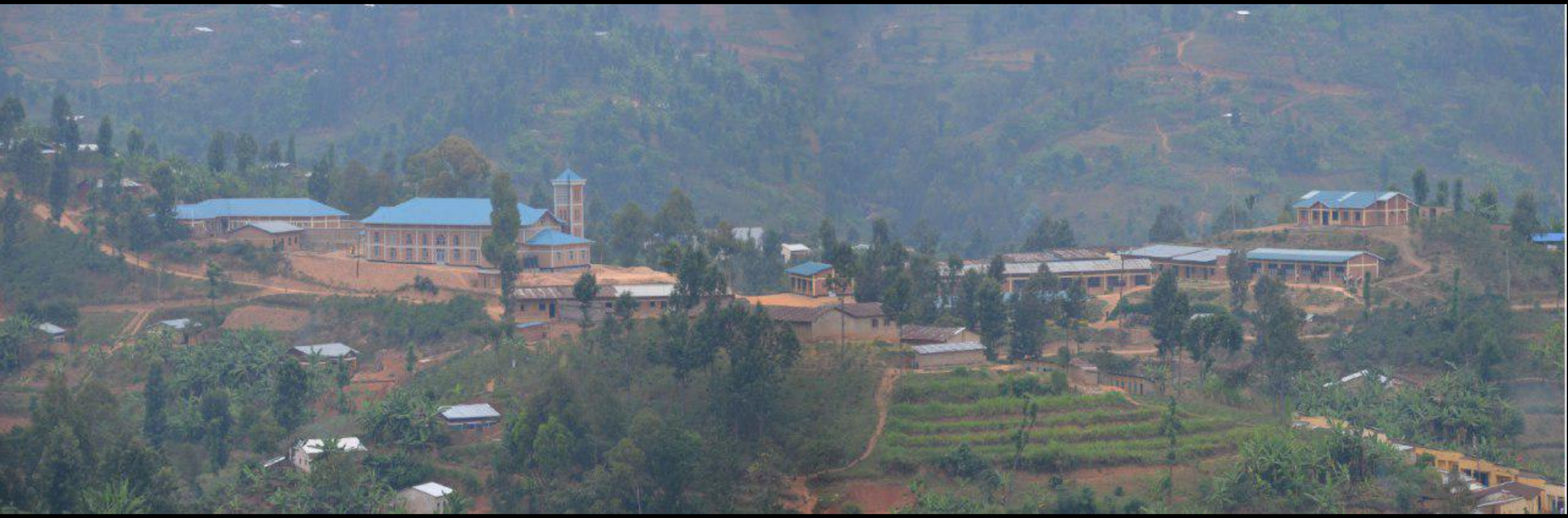
MULTI-PHYSICS APPROACHES FOR MODELING CIVIL SYSTEMS

# MODELING SOCIAL ASPECTS FOR A WATER SUPPLY SYSTEM

ROBERT EGEL | ASSIGNMENT 3

# THE ENVIRONMENT: NYAMASHEKE - RWANDA



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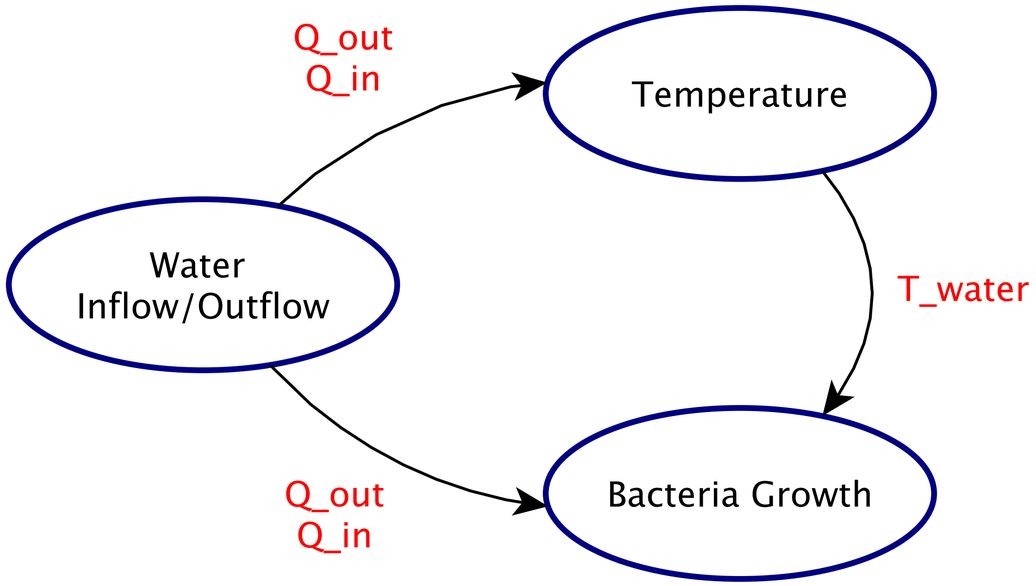
# THE SYSTEM




Q_in = Inflow rate
Q_out = Outflow rate

Image reference: ingenieure-ohne-grenzen.org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# SOCIAL ASPECTS

- EVERY PERSON IS RANDOMLY ASSIGNED A BOTTLE AND DRINKING HABIT
- FILL LEVEL OF EACH BOTTLE IS MONITORED CONTINUALLY
- IF FILL LEVEL FALLS BELOW THRESHOLD, PEOPLE LINE UP TO GET NEW WATER
- IF FILL LEVEL REACHES ZERO, PEOPLE GET UNSATISFIED WITH SYSTEM
- SOCIAL NORMS (EGOISM VS. ALTRUISM)

Image reference: https://www.monitor.co.ug/artsculture/Reviews/long-queues-water/691232-2625436-2429gqz/index.html

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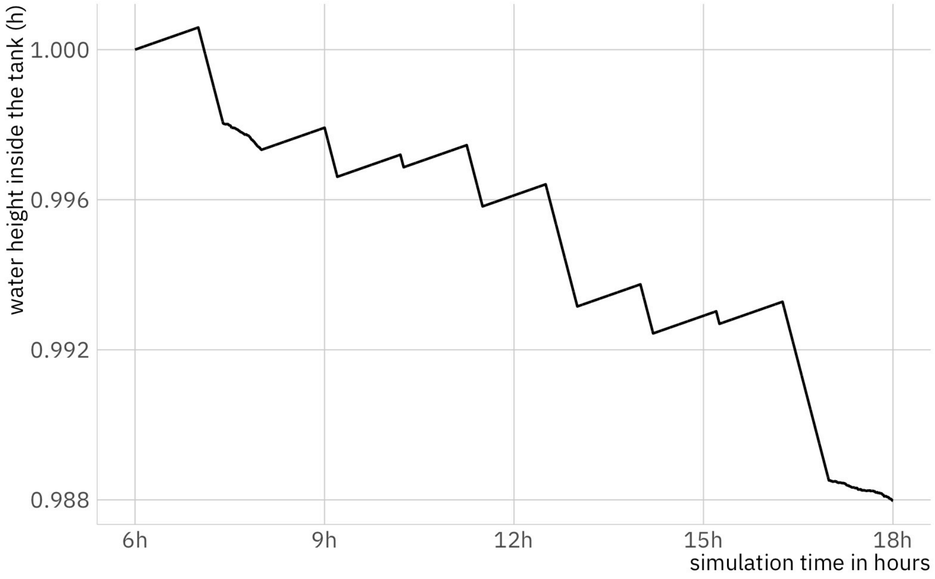
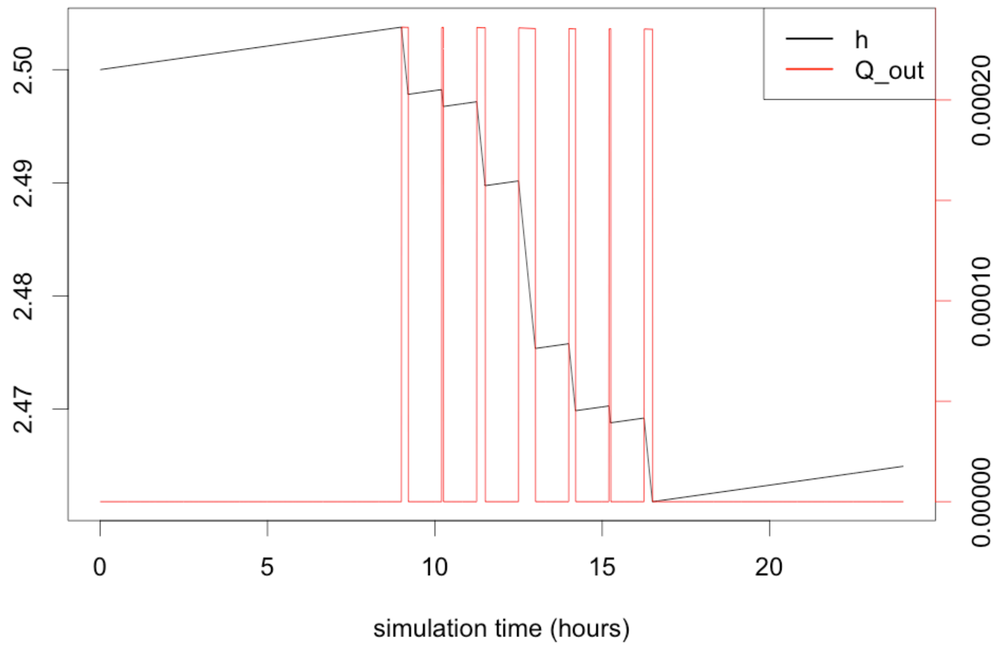
# HIGH PERFORMANCE CRITERIA

| Objective | Key indicator | Unit | Extent |
|---|---|---|---|
| provide enough water for each individual within school time | satisfaction rate | 1 | $\geq 90\%$ |
| provide healthy water | bacteria concentration | num/$m^3$ | $< 25 * 10^{-4}$ |
| provide a pleasant drinking temperature | temperature | °C | < 17 |

# COMPARISON TO ASSIGNMENT 1

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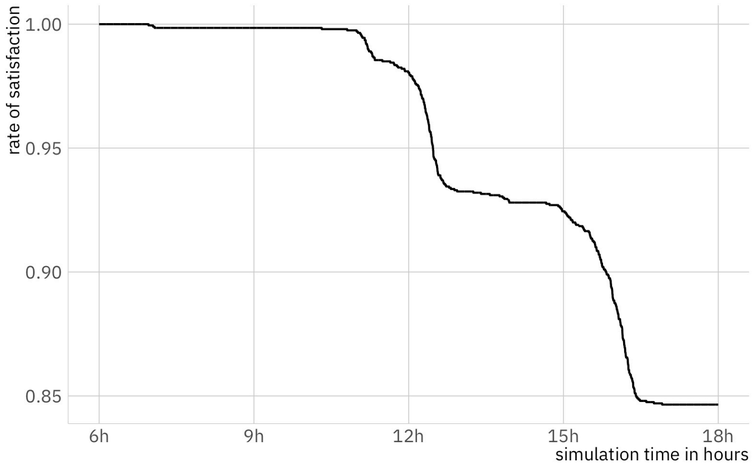
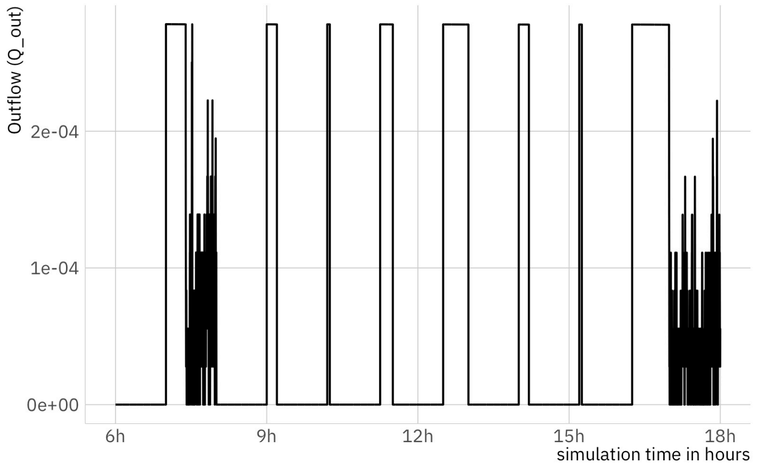
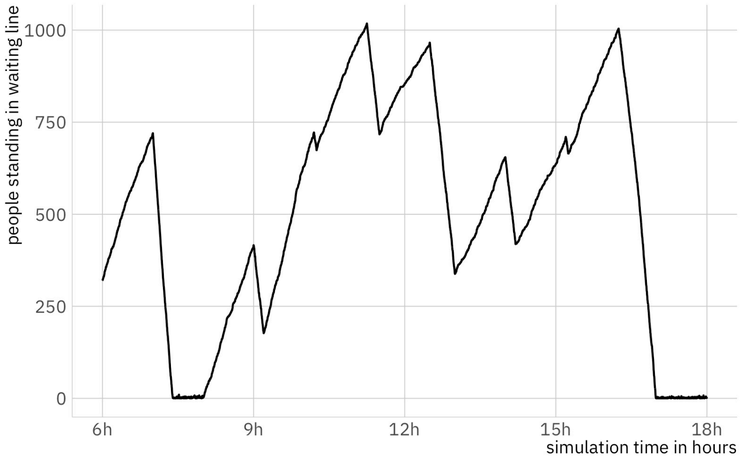
# SYSTEM BEHAVIOR

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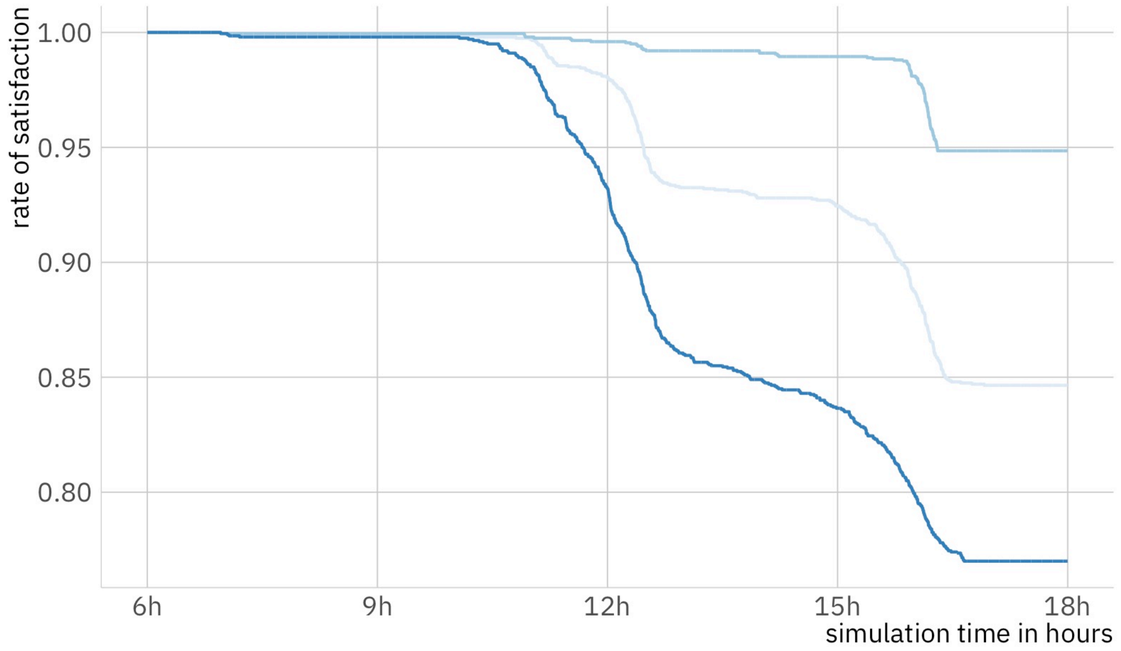


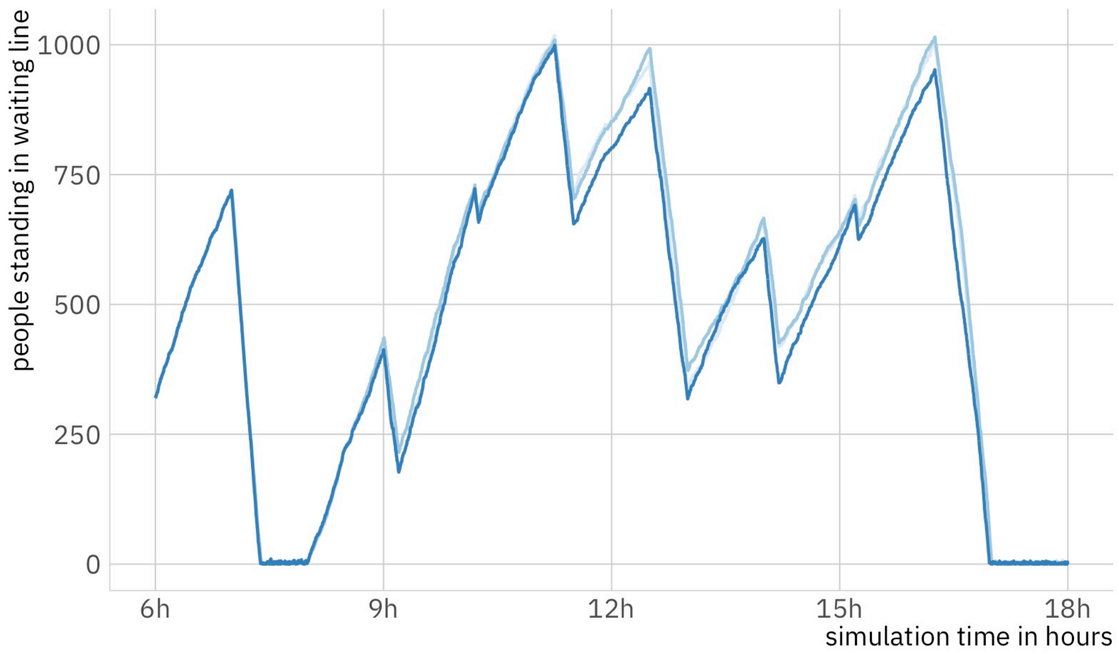


socialNorm — default — altruistic — egoistic

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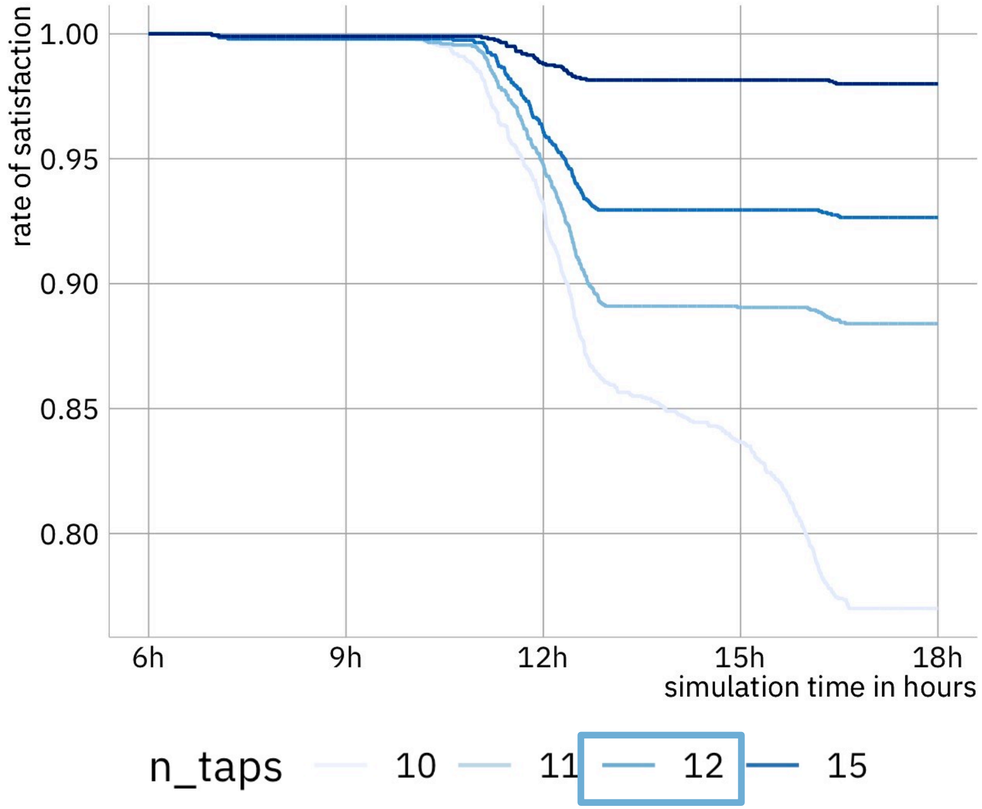
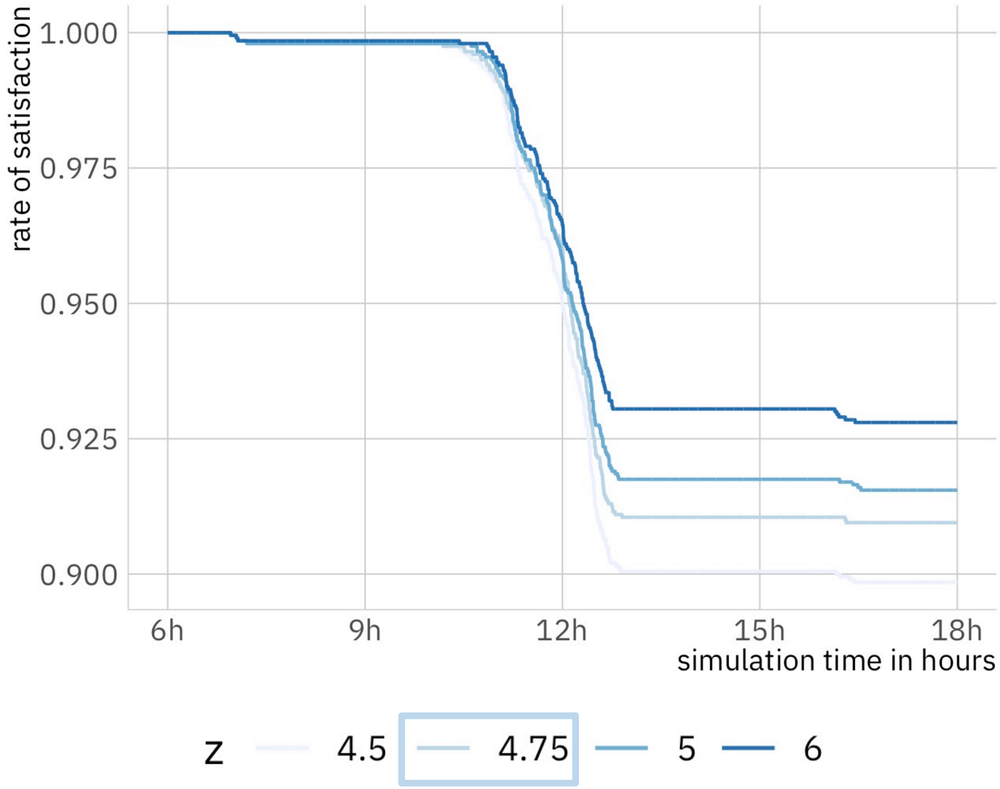
# PARAMETER OPTIMIZATION (OFAT)

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