DUTCH
SAFETY BOARD

# Using STAMP to Remedy Unsafety

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# Our topic today

Once we understand why a system is unsafe,
how can we use STAMP to explore remedial strategies?

# Introducing the Dutch Safety Board

- Independent government agency
- Aimed at learning from incidents
- Far-reaching powers of investigation
- All industries, and then some
- ~45 investigators, various backgrounds
- DSB's view on accident causation:
  most accidents can be traced back to system imperfections

# DSB & STAMP

- DSB's view on accident causation favours use of systems theory
- STAMP is current model of preference
  - Elegant
  - Versatile
  - Visually appealing
  - But also very hard to apply…
- Used in ~10 major investigations so far, in various industries

# DSB's mission

- Explain why incident occurred
- Contribute to avoiding recurrence
  - By facilitating learning
  - By making recommendations
- Control structure improvement as a measure of DSB success

# What do we use STAMP for?

- Map out system as designed (‘STPA’)
  - Parties involved
  - Controls available
  - Controls conceivable
  - Feedback mechanisms

- Map out system during accident (‘CAST’)
  - Control inadequacies
  - Process model flaws
  - External disturbances / context factors

# STAMP and the art of problem-solving

- CAST/STPA has proven useful to identify control inadequacies
- Knowledge of problems does not suffice to solve them
- In order to solve a control inadequacy, we need to understand how it came into being
- Can system dynamics be of use?

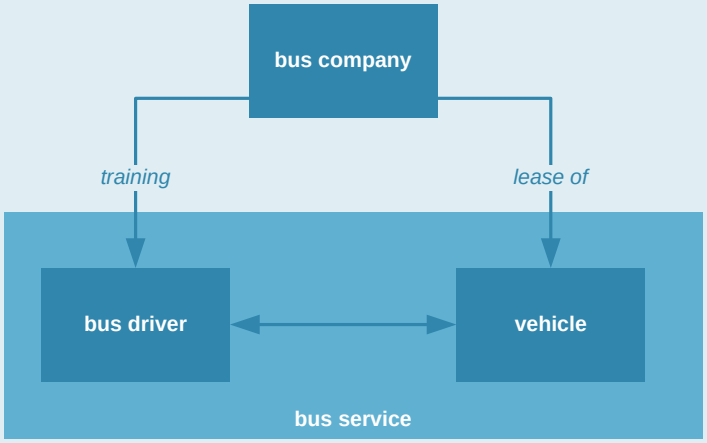
# Case: CNG-propelled public transport



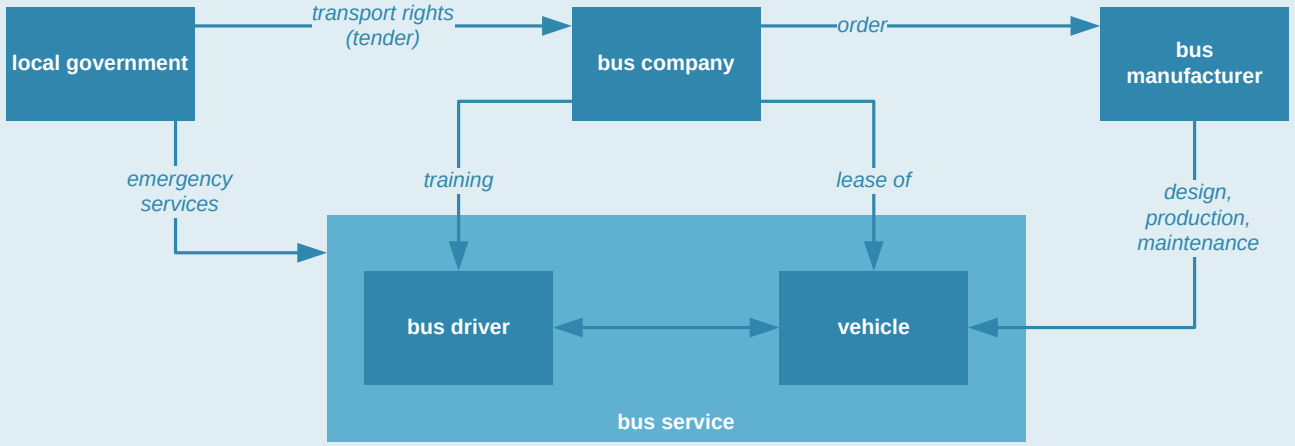
# Incident

- Fire in vehicle
- CNG vents automatically to avoid explosion
- Flash, ~15-20 mts in length
- No injuries
- Everything and everyone performed as expected

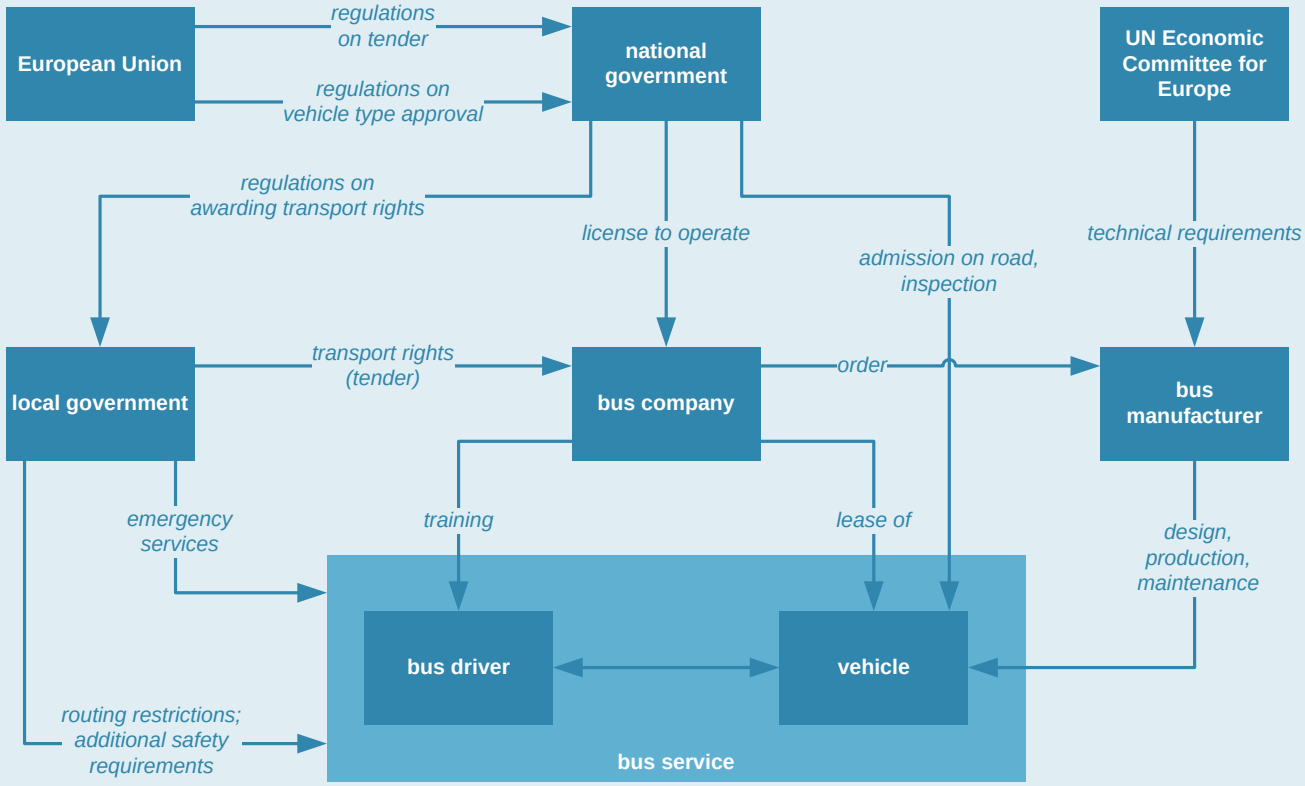
# Control structure (1/3)



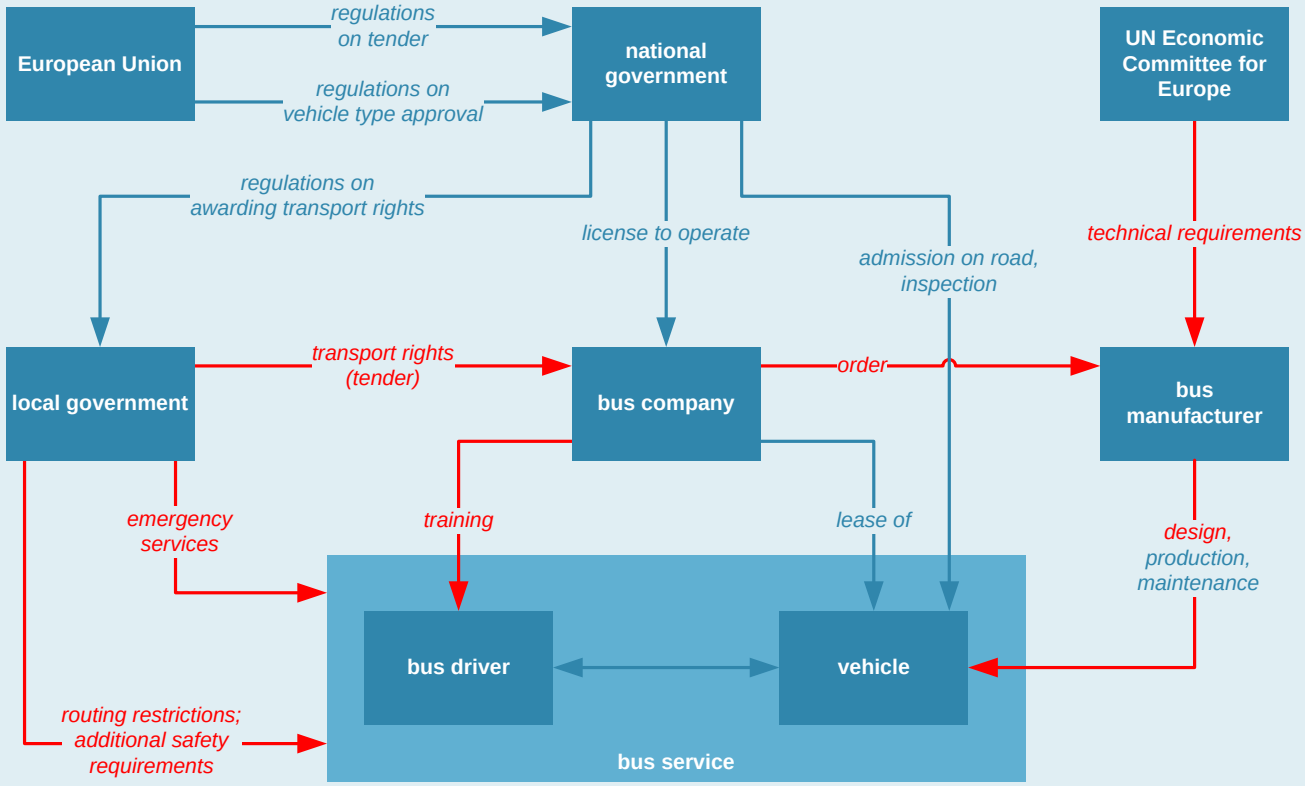
# Control structure (2/3)



# Control structure (3/3)



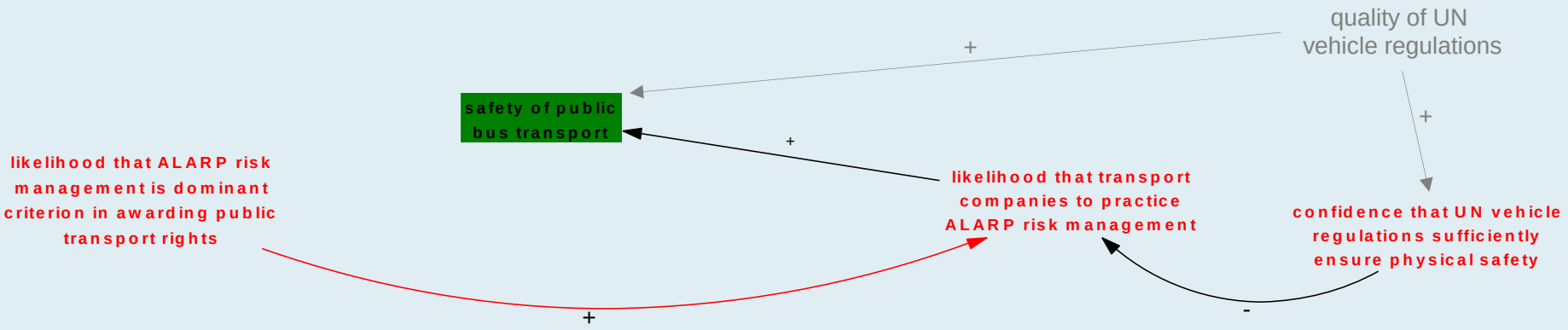
# Control inadequacies



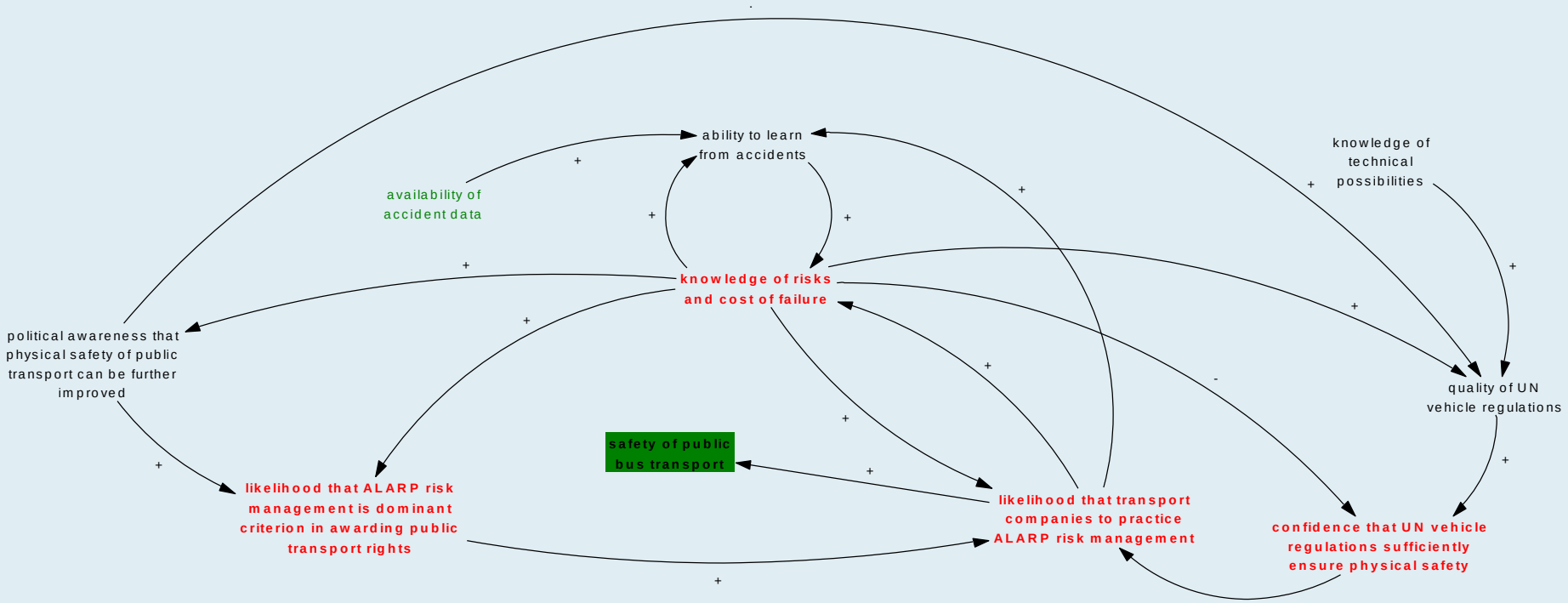
# Our diagnosis

- All parties involved rely on compliance with vehicle regulations as a sufficient means of meeting system safety requirements
- Bus companies don’t reduce risks any further than regulations require
- Local governments can set additional requirements in request for tender, but don’t

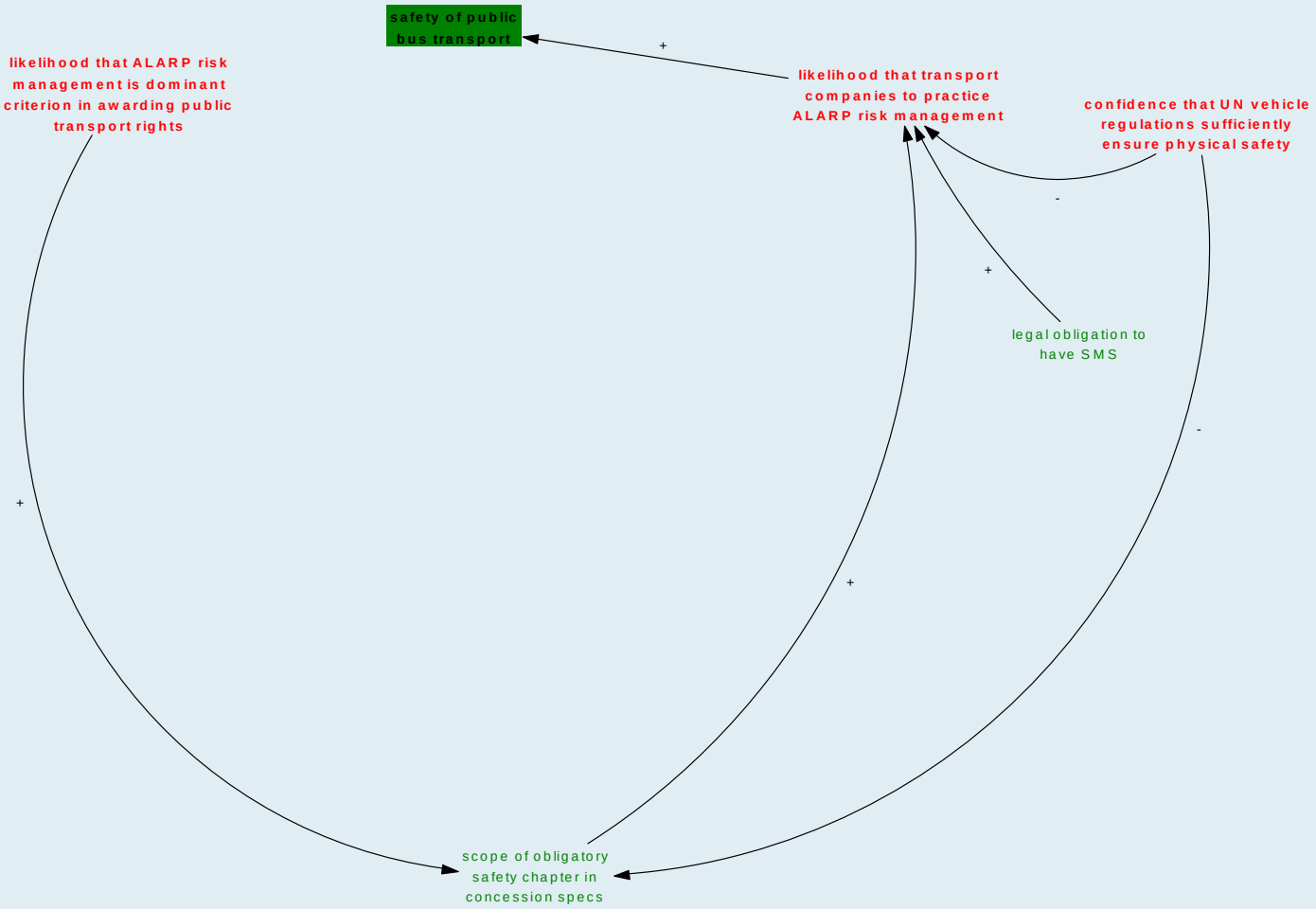
# Modelling system dynamics 1/5



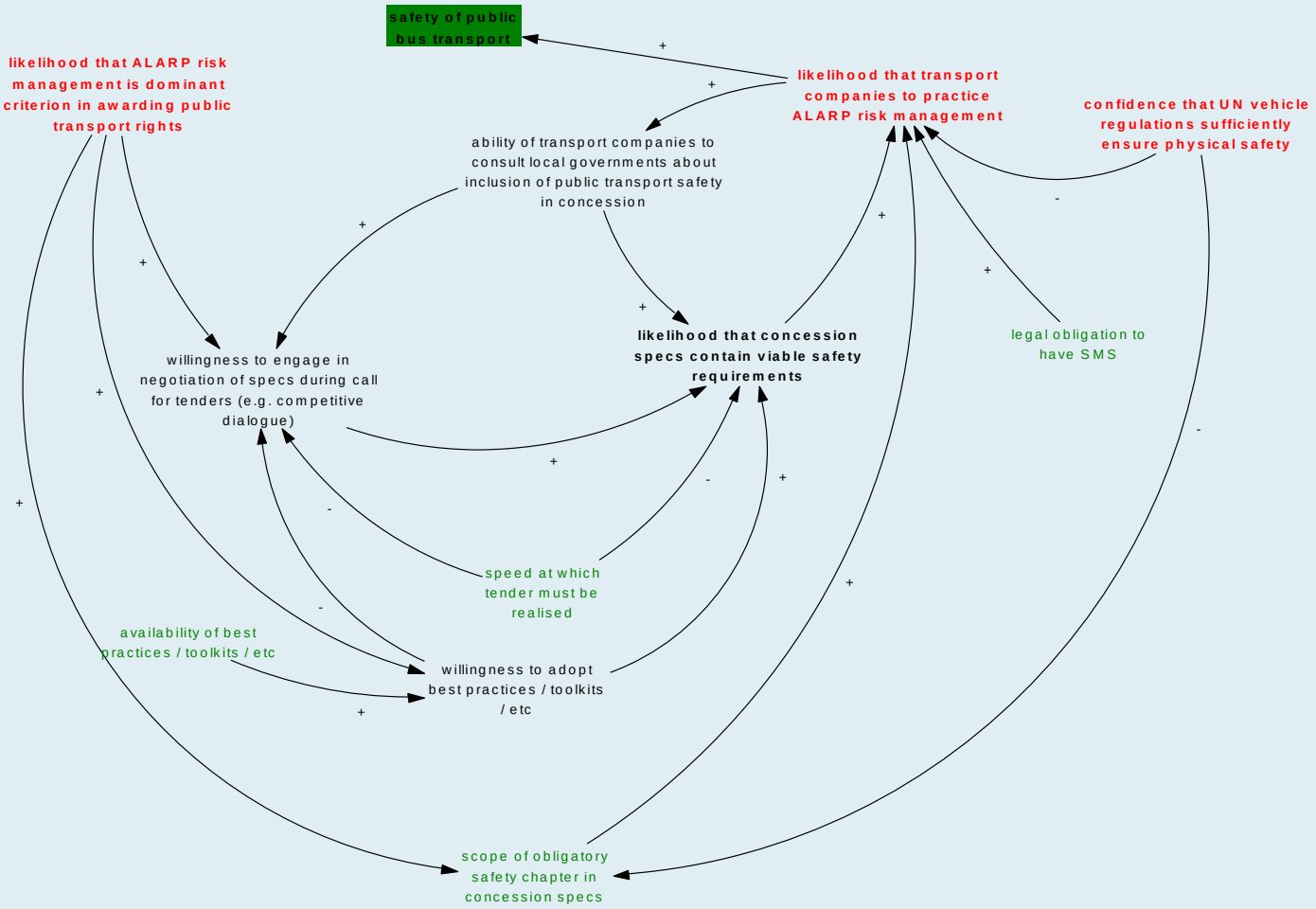
# Modelling system dynamics 2/5



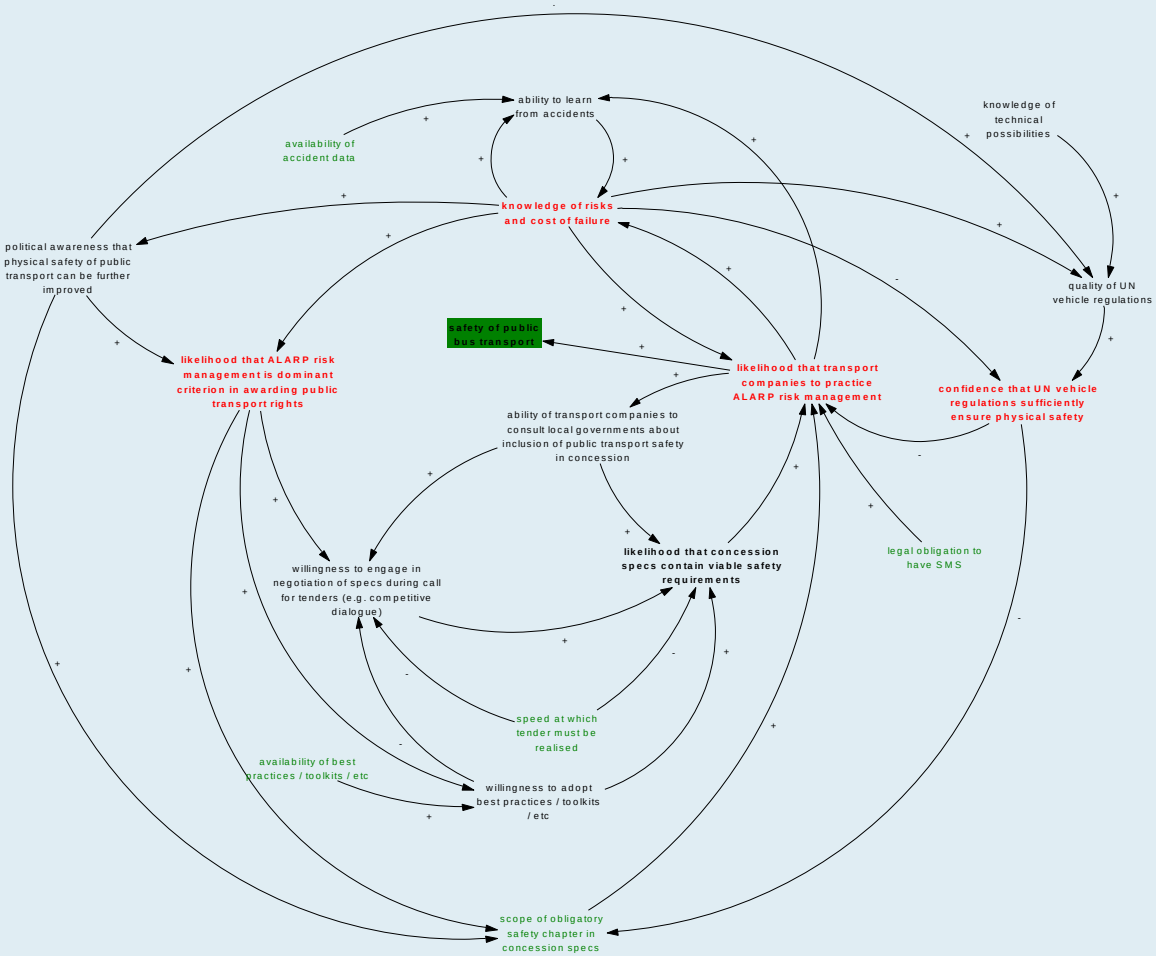
# Modelling system dynamics 3/5



# Modelling system dynamics 4/5



# Modelling system dynamics 5/5



# So…?

- System dynamics provides a framework for exploring remedial strategies
- Participants are prompted to think beyond ‘simple solutions’
  - Solutions which are ‘inverse problems’
  - Solutions which require a far-reaching institutional changes
- No unified societal view needed; system dynamics can accommodate multiple perspectives at once
  - ‘Traditional’: government should impose stricter rules
  - ‘Neoliberal’: market conditions should be manipulated

# Problems & pitfalls

- System dynamics is REALLY difficult to model
  - Level of detail
  - Variables: ‘positive’, or ‘negative’?
  - Perspective: as is, or as could be?
- Flexibility of SD introduces risk of bias
- Daunting complexity
- Modelling what you find (description), or finding as you model (investigation)?

# Future outlooks

- Develop standards for using SD to generate solutions
  - With investigators
  - With parties involved
- Improve integration in STPA / CAST
- Develop user manual / road map
- Expand use of SD to
  - Prioritize solutions according to cost/benefit
  - Strategize how solutions can best be proposed

# We could use your help!

- Personal experiences in using system dynamics?
- Reflections on how to use SD with groups?
- Thoughts on whether/how to involve external parties?
- Ideas on using SD for communication purposes?

Come talk to us during the poster session!

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