PUBLIC SAFETY IN SMART CITIES – A (TRANSACTIONAL) RESILIENCE PERSPECTIVE

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IMPETUS

Intelligent Management of Processes,
Ethics and Technology for Urban Safety

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Outline

- The complexity of the Smart City: impossible to foresee all potential situations that may arise
  - The operators at the Security Operations Centers (SOC) must also be prepared to operate at the boundaries of even the best conceivable operational concept
- Resilience Engineering (RE): addresses the abilities needed to handle the variations, disturbances and unexpected situations in a complex system
  - Recover from threats and stresses : perform as needed under a variety of conditions : respond appropriately to disturbances - and opportunities
- RE is relevant for Smart Cities related to (i) the formulation of an initial operational model, (ii) the transition towards the model, and (iii) for the continuous evolvement of the operational model
  - The basic fallback capacity is the SOC operators' skills, knowledge and experience
- RE is not the only reasonable approach for taking advantage of resilience concepts
  - The RE contribution will be contextualized through a NE**X**US model approach,
  - framing and bridging an (eclectic) set of resilience approaches (a form of *polycentric* resilience) .
- Accordingly, "smart city resilience" (SCR) is a result of different efforts for resilience, from different contexts
- A training-by-gaming approach (TORC) may be used for development of SCR
  - also addressing situations at the boundaries of what is possible through preparedness efforts

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Theories on the origins of resilient performance

- **Theory A**: An intrinsic part of the function (curve) on which the effect of resilient performance is projected.
  - In the SCR case, it can also be a coordinated plan for redundancy related to material resources and personnel.
  - May be ingrained in:
- **Theory B**: A repository of organized, supportive resources designated to uphold a specific curve through phase-oriented contingencies.
  - Risk management, emergency preparedness, business continuity, ++
- **Theory C**: Underlying principles and conditions for sustained resilient capabilities - drawing on a finite base of resources, dealing with complexity, emergence, and brittleness.
  - Being poised to adapt - without a blueprint
  - *Actual adaptations are less interesting than the underlying adaptive capacity*
  - (~ Resilience Engineering)

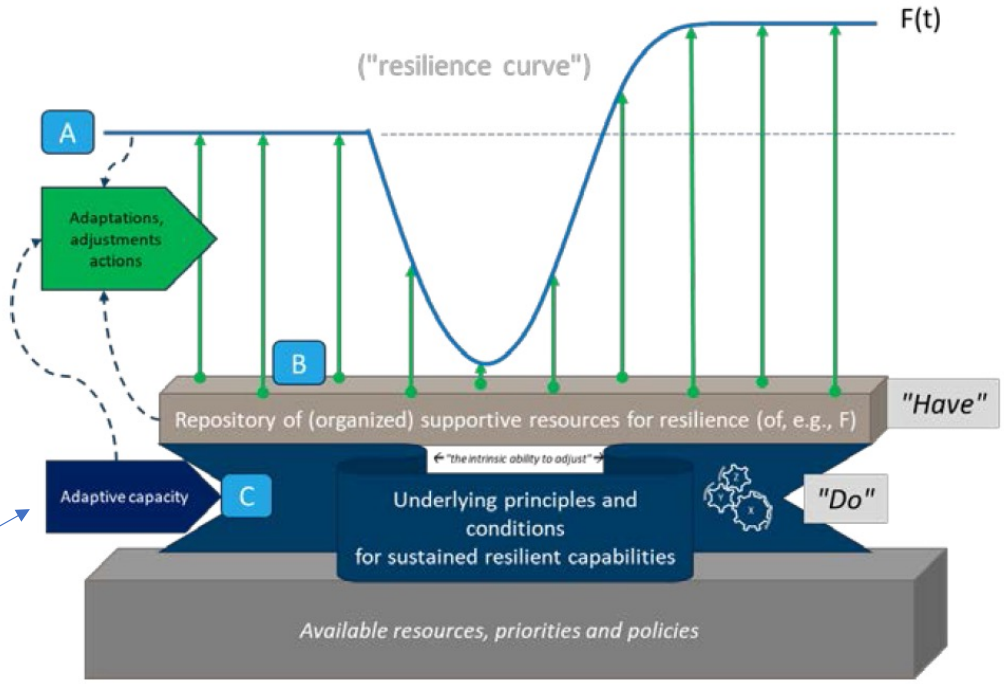

Figure 1 Theory A, B and C. Adapted from Grøtan, Antonsen and Haavik (2021)

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(Polycentric) Resilience: the NEXUS model

- Risk and crisis management processes aiming for **Enhanced Preparedness** at large (towards anticipated disruptions)
- Sociotechnical systems implementing **Sustained Adaptive Capacities**

- Individuals and communities focusing on Collective Survival and Growth
- Managerial interventions and decision processes during crises.
  - Prioritization and allocation of joint resources
  - "Drift management" - carefully noting and adjusting managed resources to changing circumstances.
  - Professional "meaning management" - suggesting ways to see a brighter future through adversity

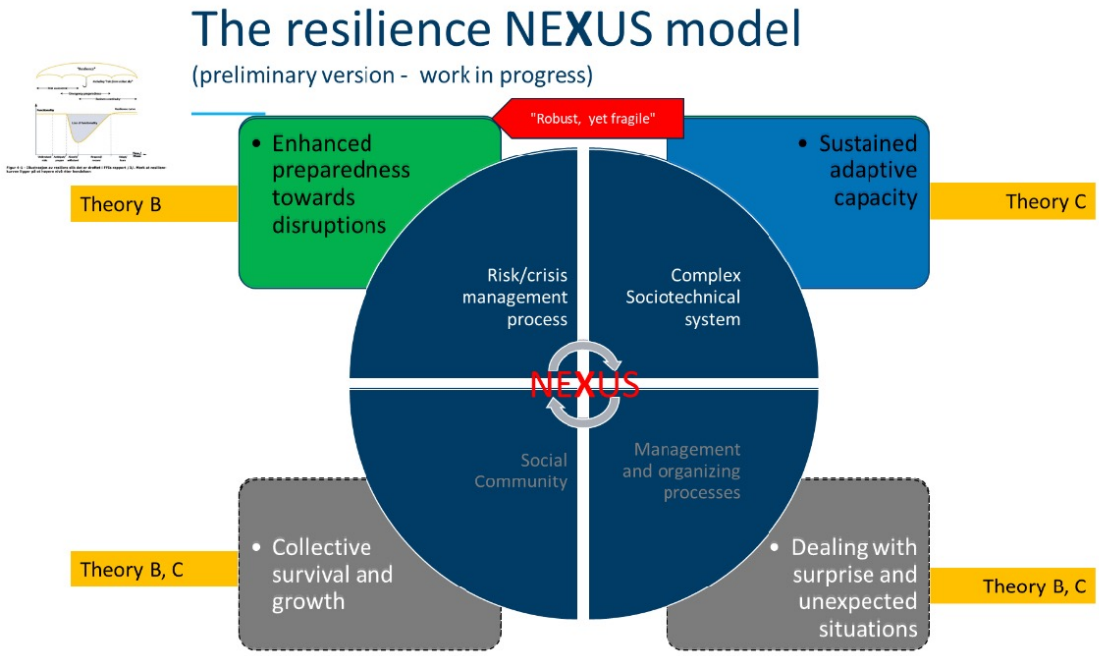

Figure 2 The Smart City NEXUS

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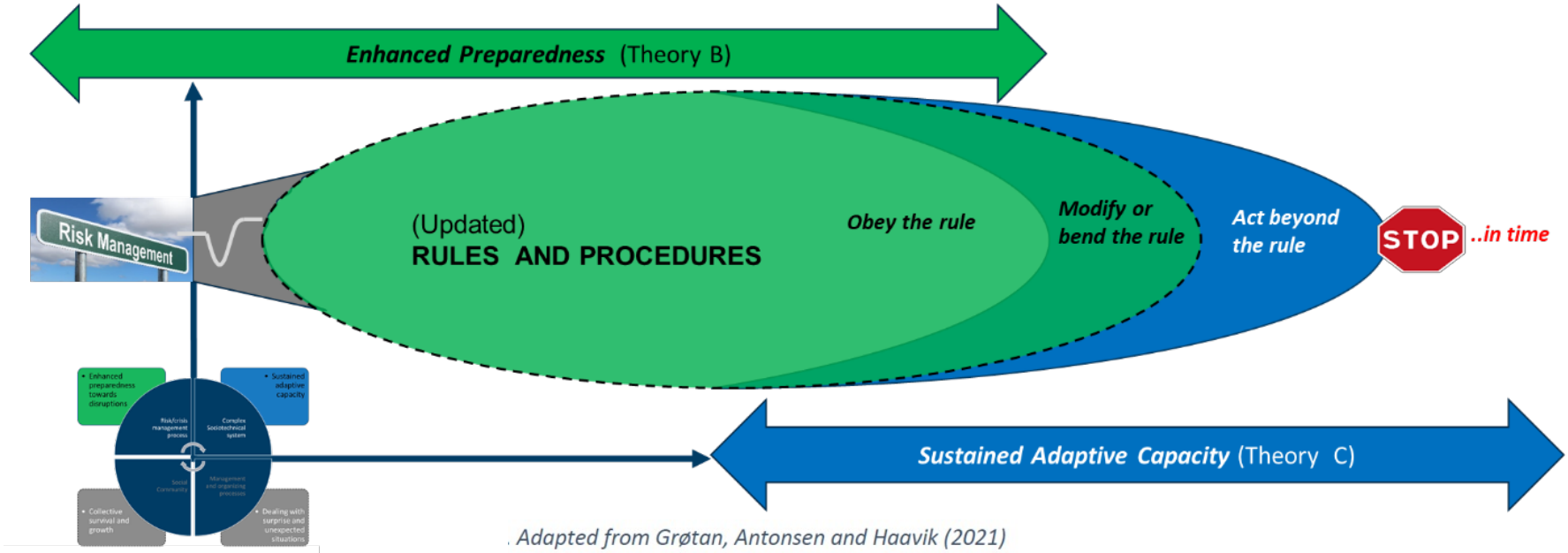
Bridging Enhanced Preparedness and Adaptive Capacity

- Wildavsky (1988): *resilience as an intellectual and instrumental counterweight to "an obsession with prediction*"
- Weick and Sutcliffe (2007): *the ability to cope with the unexpected requires a different mindset than to anticipate its occurrence*.
- By carefully keeping the premises of distinctions alive, it is also possible to conceive a fruitful interaction



Adapted from Grøtan, Antonsen and Haavik (2021)

- And extend the bridge later on

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Using (digital) TORC for bridging and dedicated trainging

- Worst-case scenarios are the scenarios cities need to be more acquainted with because they will challenge cities in many areas. Scenarios with low probability and high consequences entails high uncertainty in the chain of consequences, both for management and as societal consequences.
- Operational concepts can be challenged in a systematic way by training on worst-case scenarios again and again to ensure that the operational concepts are - at all times - in line with societal risk.
- Training of worst-case risk scenarios is essential for gaining a deeper understanding on how the chain of propagating consequences could affect cities. With the results from these training scenarios, it would be possible to identify which part and which type of resilience is relevant in the consequence chain, and the NE**X**US approach can bind these together.
- By combining this type of training with regular rehearsal on high-probability, low consequence scenarios, the various types of resilience capabilities can be better integrated across operational contexts, and together they will strengthen the sustainability of risk management.

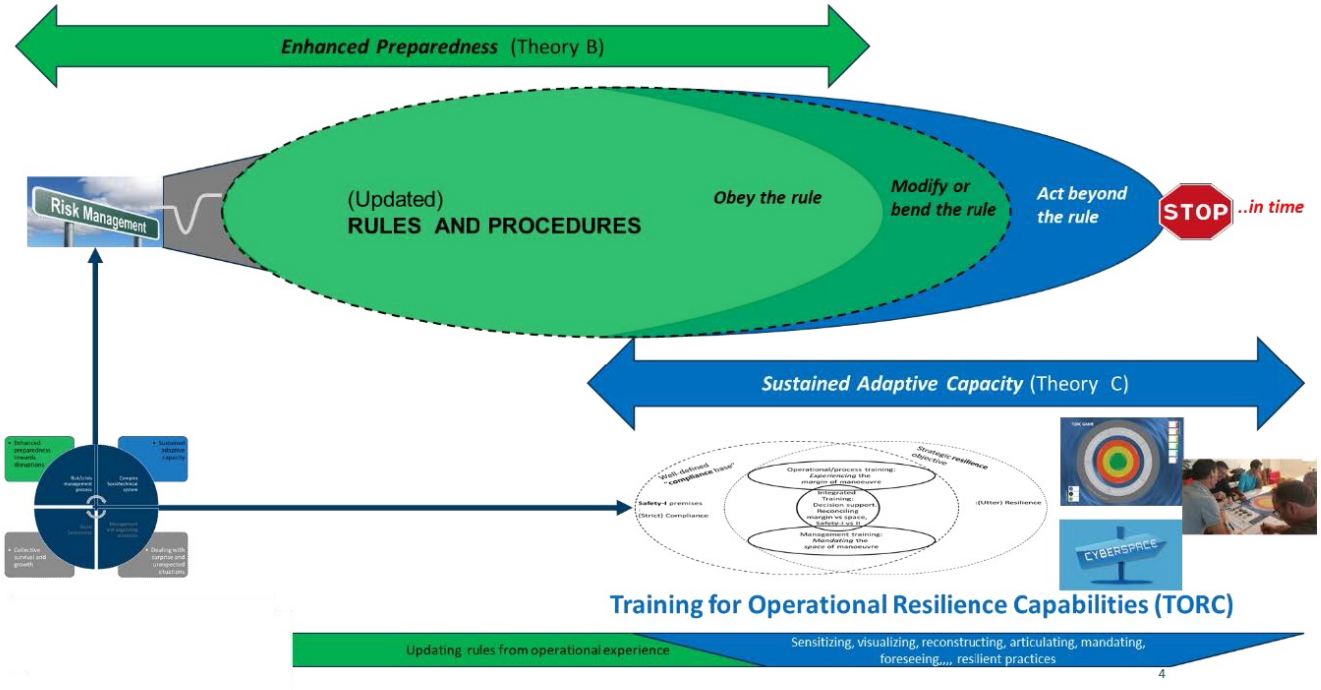

Figure 5 Bridging Enhanced Preparedness and Adaptive Capacity through TORC training. Based on Grøtan, Antonsen and Haavik, 2021

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Conclusion

- The NEXUS approach seems to be a useful vehicle for integrating resilience thinking, including Resilience Engineering, in the IMPETUS context.
- The implications are primarily on the work process side, but as the perspective applied in this discussion is a sociotechnical one, there are also implications on the technological side.
- The TORC training approach seems to be a useful device for integrating the various resilience contributions into a functional whole.
- Important concepts for development of Operational framework

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