

An interdisciplinary collaboration  
*or*  
the case of the “Sustainability means inclusivity:  
Engaging citizens in early stage smart city  
development” project

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# Where it all began



**REliable, Resilient and  
secUre IoT for sMart city  
applications (2013-'16)**

2 IoT-Enabled Pilot trials:

- Smart Home
- **Smart Transportation**

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## Traffic Estimation Visualization



Desktop version



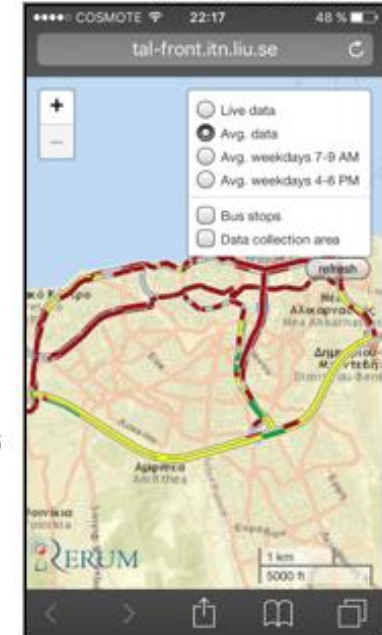
### Traffic estimation:

- "Live"
- Total avg.
- Avg. weekdays 7-9 AM
- Avg. weekdays 4-6 PM

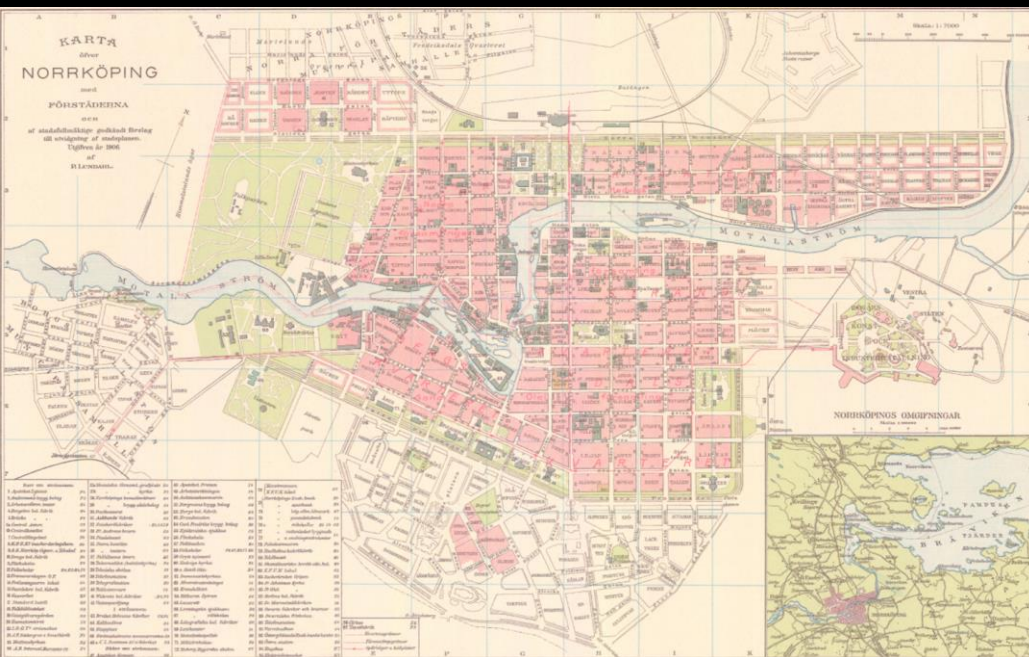
### For reference:

- Location of bus stops
- Geofencing area

Mobile version



# Fast Fwd: 2019 – An urban IoT testbed in Sweden



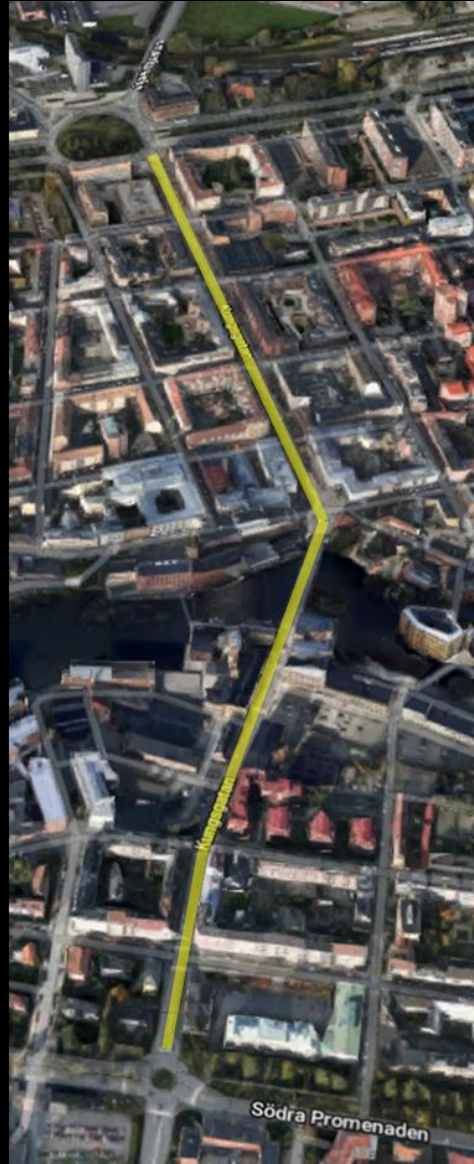


# Fast Fwd: 2019 – An urban IoT testbed in Sweden



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- 1.3 km stretch
- North part: 30 m wide - 2 lanes & wide sidewalks
- Southern part: Narrow
- 2 roundabouts
- 1 square
- 1 bridge (~100m)
- 7 sets of traffic lights



- N: Police - - Train Station
- Parking garage
- LiU - Campus Norrköping
- Visualization Centre - C
- 2 Schools
- Parking garage
- Shops / Coffee shops / Restaurants
- S: Fire station / SOS Alarm - - bus stop

# the Testbed & Ambition

- IoT – Inspired
- Situational awareness through sensing and data fusion
  - Real time sensing
  - Historical data
- Models & Prediction mechanisms
- *Digital twin:*
  - *Mobility on Kungsgatan → Kungsgatan*

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- Situational awareness through sensing and data fusion
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- *Digital twin:*
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- Openly connect (any) sensing/actuating device
- Semantically annotate data to allow flexible & open service composition
- •Computation at the edge!
- –Saves resources
- –Maintains privacy
- Our RERUM lesson:  
Engage the users of Kungsgatan in the solutions' design



# The grand challenge

- The challenge of how cities can be designed and developed in an inclusive and sustainable direction is monumental.
- Smart city technologies currently offer the most promising solution for long-term sustainability.
- This solution involves integration of digital technologies into the urban environment to capture data about daily life.

BUT...

- smart city projects have been criticised for ignoring diverse needs of the local population and increasing social divides.

# Inclusivity and sustainability hand-in-hand

- A sustainable urban environment depends as much on creating an inclusive space that is safe, accessible and comfortable for a diverse group of citizens as it does on deploying “smart” technologies for energy efficiency or environmental protection.
- This is because citizens will be more likely to adopt technologies promoting sustainability if they are well-aligned with their lived needs and experiences.

# “Sustainability means inclusivity”: an interdisciplinary project

- 2020-2022, funded by Swedish Research Council FORMAS
- Focus on a smart city test site in Norrköping, Sweden
- Bringing local residents and government representatives into dialogue with technical developers by adopting a “meet-in-the-middle” approach [10].



# Methods

Complementary methods to explore the testbed and engage with its potential users:

- First, we engage in an in-depth, STS-inspired ethnographic process that asks: what assumptions do technical developers and other “top down” stakeholders have about smartification of the urban space?
- Second, we conduct a Living Lab (LL) participatory design process that works closely with a range of citizens to explore how their needs can be best served by the test site
- In parallel, technical development, involved the design & development of a simple IoT back-end system, and sensor platforms / boxes



# Cycles of engagement and development

- Pilot workshop in September 2019
- Cultural probe in Spring 2020
- Kick-off meeting for Living Lab in September 2020
- Fall 2020 Living Lab
- Spring 2021 Prototype development
- Fall 2021 2<sup>nd</sup> round citizen engagement at Kulturnatten
- June 2022: Closing festival and app testing

Do you want to help create a safe environment on Kungsgatan in Norrköping? Then please join us for a public meeting on September 10, 2019, to discuss your needs and ideas for creating a street that is safe and accessible for us all.

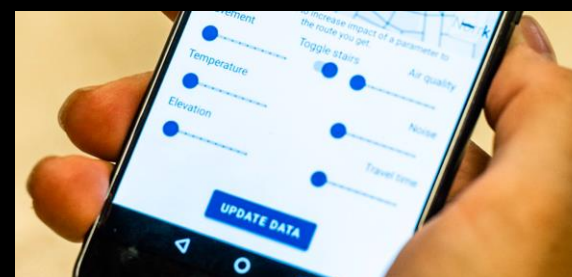
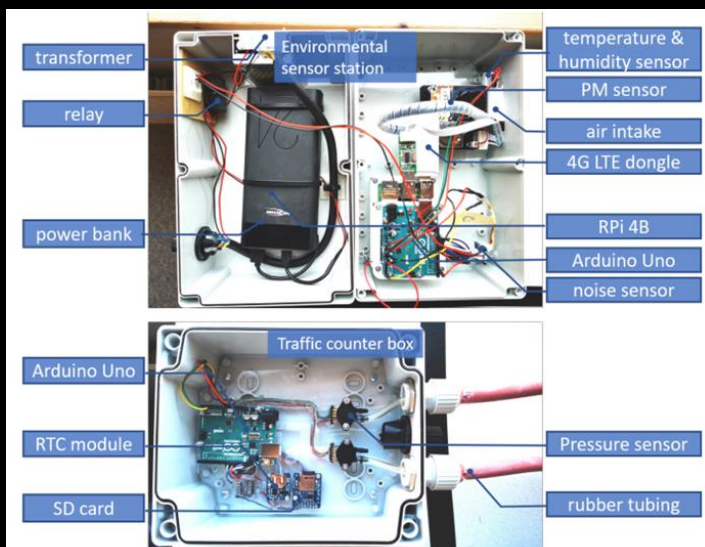
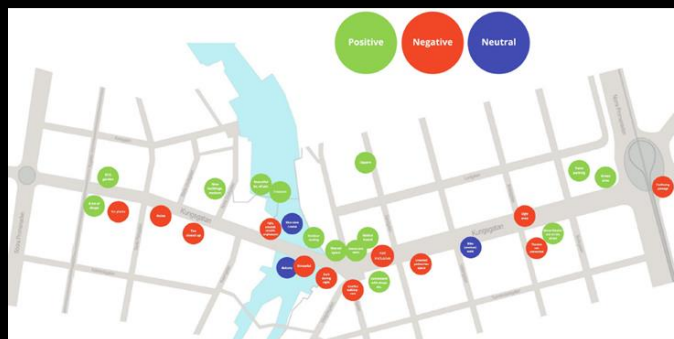
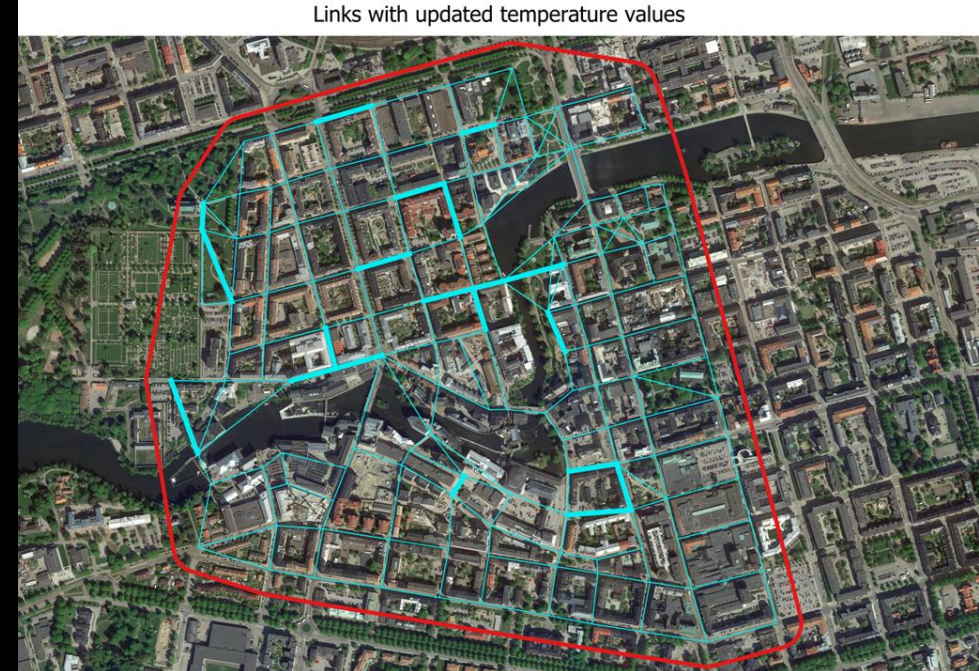


# From ideas...





...to tangibles





# Closing Festival – interdisciplinary & interactive

Prof. Theo Tryfonas (U. Of Bristol) on "Sense (and) the City: From grassroots IoT sensors and city-fostered Open Data to Urban Observatories"

Prof. Ramon Ribera Fumaz (U.of Catalunya) on "The smart city is dead. Long live to the right to the city!"

Prof. Lauren F. Klein (Emory U.) on "What is Data Feminism?"

Modan Akbarnazim (Arhitect, Malmö) on "Who is participating in whose process?"



## The sustainable city. The inclusive city.

June 13-14, Campus Norrköping

How should our cities develop?  
Who is involved in urban development?  
And what is the role of smart city technologies?

Join us for two days of conversations,  
inspiration and food for thought  
on the futures of sustainable and inclusive cities!



Free of charge,  
please register by May 31.

[bit.ly/sumin2022](https://bit.ly/sumin2022)



# Reflections

- Taking careful account of the diversity of human needs has the benefit not only of making urban spaces comfortable and safe for more people, but also of improving chances of new technologies being adopted by the whole community...
- It's a good theory, but hard to achieve in practice.
- Diversity work is difficult and interdisciplinary collaboration takes extra time.

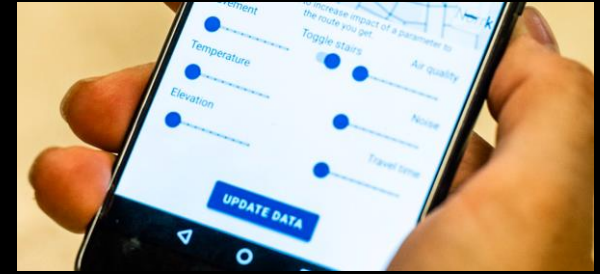
# Mind the gaps!

- Street observation as a "reality check" on inclusivity
- Why the disparity between "real" user group and the citizens we managed to engage with? (Harrison, K., Börütecene, A., Löwgren, J., Enlund, D., Ringdahl, R., & Angelakis, V. (2021). Sustainability Means Inclusivity: Engaging Citizens in Early-Stage Smart City Development. IEEE Technology and Society Magazine, 40(3), 60-65.)
- Gap between technology and lived reality persists: Sensors are meant to capture an accurate 'map' of the street and what is going on along it, but our interdisciplinary conversations around the sensors revealed the heterogeneity both of smart city planning and spatial formulations of the city (Enlund, D., Harrison, K., Ringdahl, R., Börütecene, A., Löwgren, J., & Angelakis, V. (2022). The role of sensors in the production of smart city spaces. Big Data & Society, 9(2), 20539517221110218.)

# Bringing gender expertise into conversation with technical innovation

- Gap not just between academia and society but between disciplines
- Building a conversation takes time
- Qual & quant methods
- Learning seminars

# Going forward



- LiU Innovation office --> preference-based mobility app in market research
- 2 LiU granted EU Horizon projects



- ECIU Pilot Project on air quality
- 2 Applications LiU/FORTH (SILVERLINE & GreenIn Cities)
- The Wallenberg AI, Autonomous Systems and Software Program – Humanities and Society (WASP-HS) "Operationalising Ethics for AI": explainability in smart cities



# Thankyou and questions

