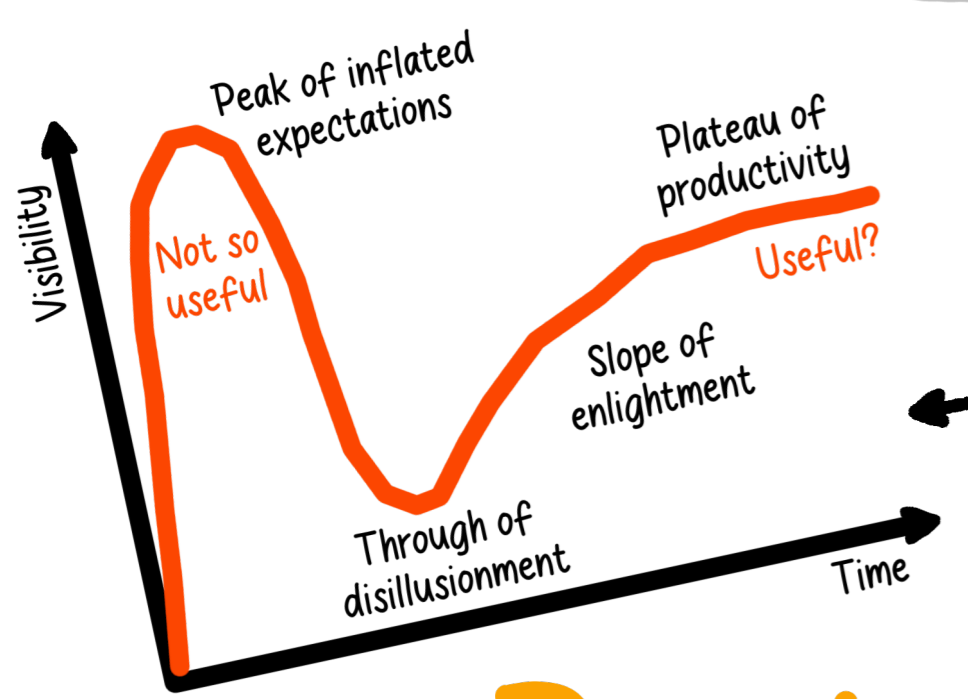# Digital twins of human-centric cities

Digital twins are virtual representations of physical systems. They originated as a way to anticipate rocket engine failure. Nowadays, they have become popular in urban planning as a way to model our cities, and futuristic promises are made about how they will reshape our lives. But cities are not rocket engines. They are complex systems made out of people, in which a myriad of social and economical processes are taking place, bringing along diversity, chaos, and unpredictability. These are characteristics of cities that bring them to life, rather than unwanted noise complicating our models. However, when hype technologies move forward, and we begin to be honest about their limitations, they can turn into a tool of practical use. On this poster, we explain how.

Gartner Hype Cycle
How hype technologies can develop into something useful

Peak of inflated expectations
Not so useful
Plateau of productivity
Useful?
Slope of enlightment
Through of disillusionment
Visibility
Time

Requirements
- Variety of input data, quantitative and qualitative
- Explainable models, reducing black boxes
- Focus on demand instead of supply
- Human-centric instead of techno-centric model evaluation
- No "one-fits-all" solution, embracing local characteristics
- Human involvement in all stages of the feedback loop

"What questions do we have that need an answer?" instead of "How can we find a use-case for all these fancy data, tools, and algorithms?"

"How does this affect people's wellbeing?" instead of "How does this optimize efficiency?"

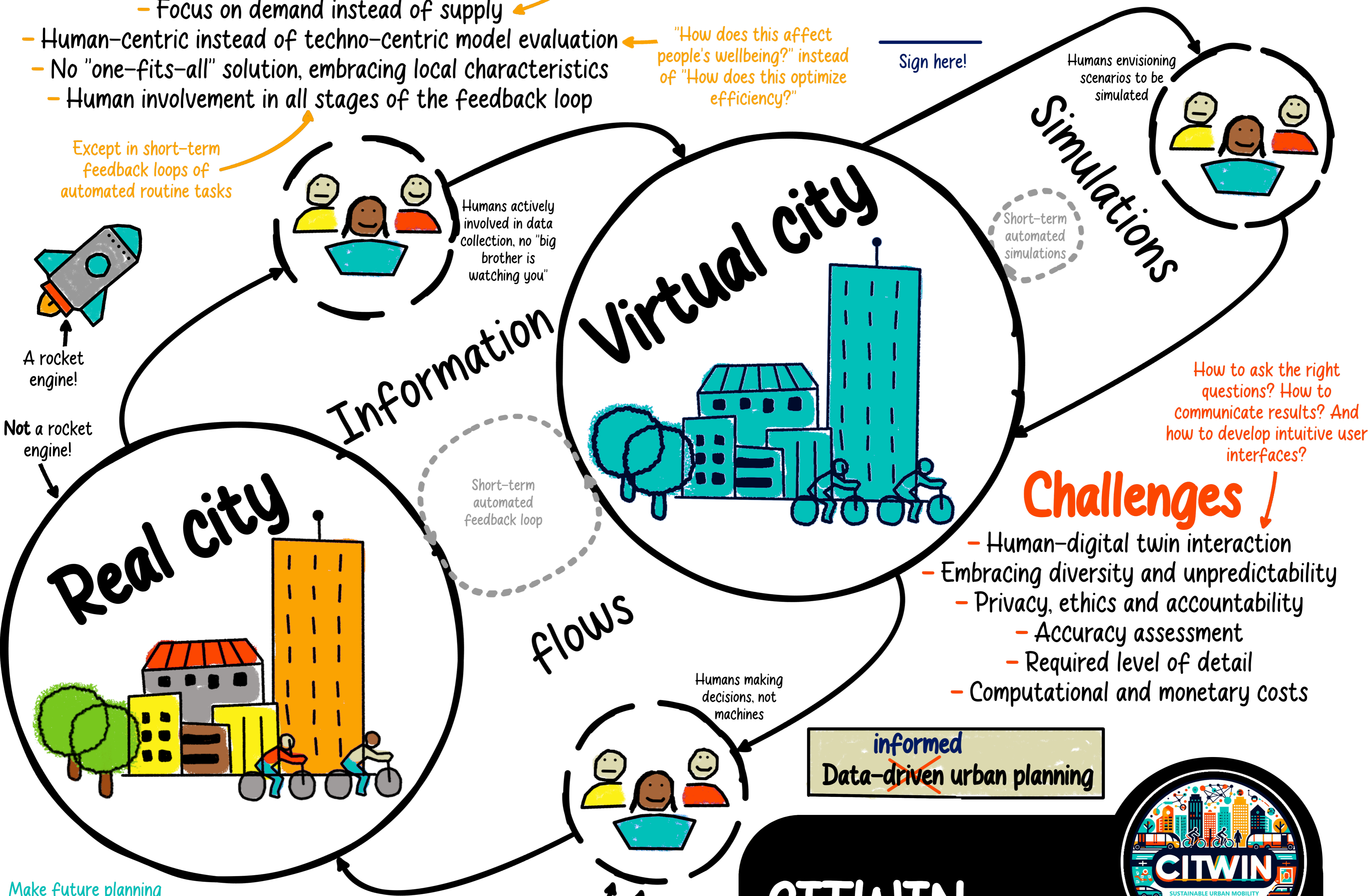Except in short-term feedback loops of automated routine tasks

Terms of use
- I will remember the digital twin is not the real world, and the real world does not satisfy my equations
- I will remember the digital twin is only one of many tools in an urban planning process
- I will not give people false comfort about the accuracy of the digital twin, but be open about the limitations
- I understand the digital twin can influence the real world, in ways that may be beyond my comprehension

Sign here!

Real city
Not a rocket engine!

A rocket engine!

Virtual city

Information

flows

Simulations
Humans envisioning scenarios to be simulated

Short-term automated simulations

Humans actively involved in data collection, no "big brother is watching you"

Short-term automated feedback loop

Humans making decisions, not machines

Many other information sources in the planning process

How to ask the right questions? How to communicate results? And how to develop intuitive user interfaces?
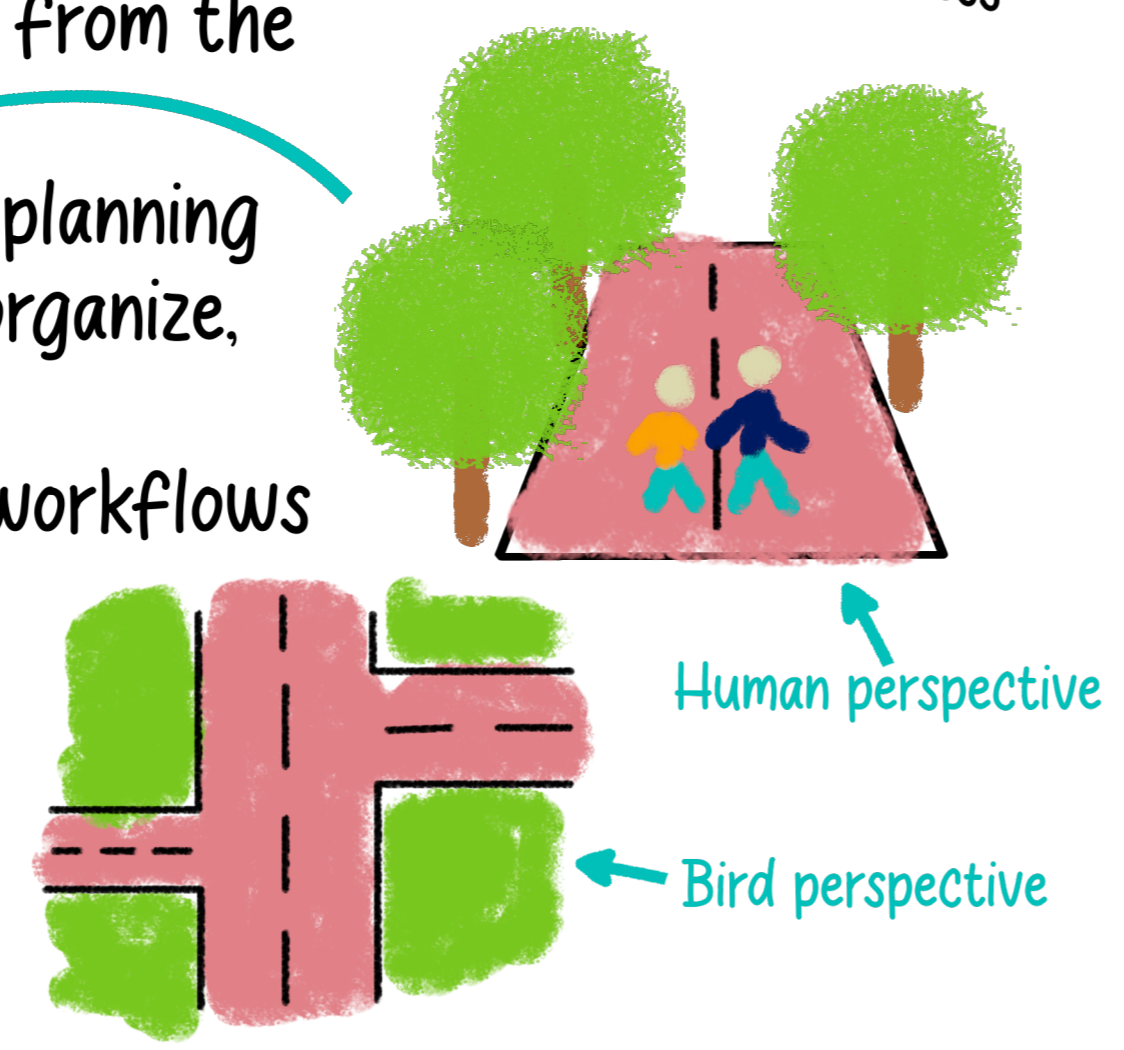
Challenges
- Human-digital twin interaction
- Embracing diversity and unpredictability
- Privacy, ethics and accountability
- Accuracy assessment
- Required level of detail
- Computational and monetary costs
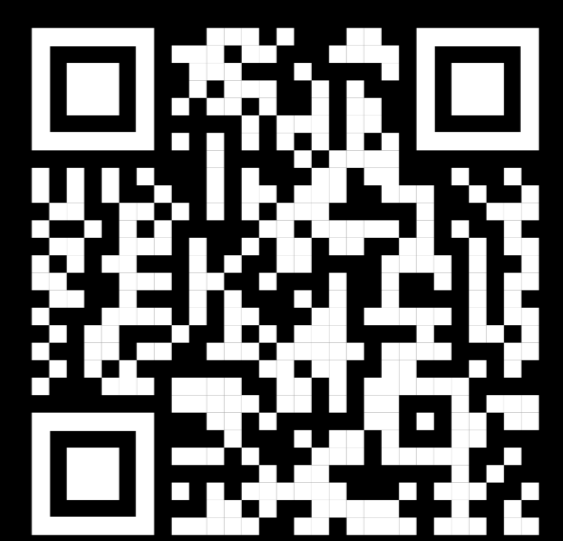
informed
~~Data-driven~~ urban planning

Potential
- Enable four dimensional modeling from the human perspective
- Enable interactive participatory planning
- One platform to collect, store, organize, visualize and analyze data
- A platform to integrate analysis workflows from different disciplines

Make future planning scenarios imaginable

3D space and time

Human perspective

Bird perspective

CITWIN

CITWIN is an applied research project funded by the Driving Urban Transitions (DUT) partnership of the European commission. It involves multiple European universities, municipalities, companies and NGOs throughout all project phases. CITWIN aims to explore the potential and challenges of digital twin technology in 15-minute cities, with a particular focus on the urban transport system and human-centric planning practices.

Scan me for more information!

CITWIN
SUSTAINABLE URBAN MOBILITY

Lucas van der Meer
University of Salzburg
lucas.vandermeer@plus.ac.at