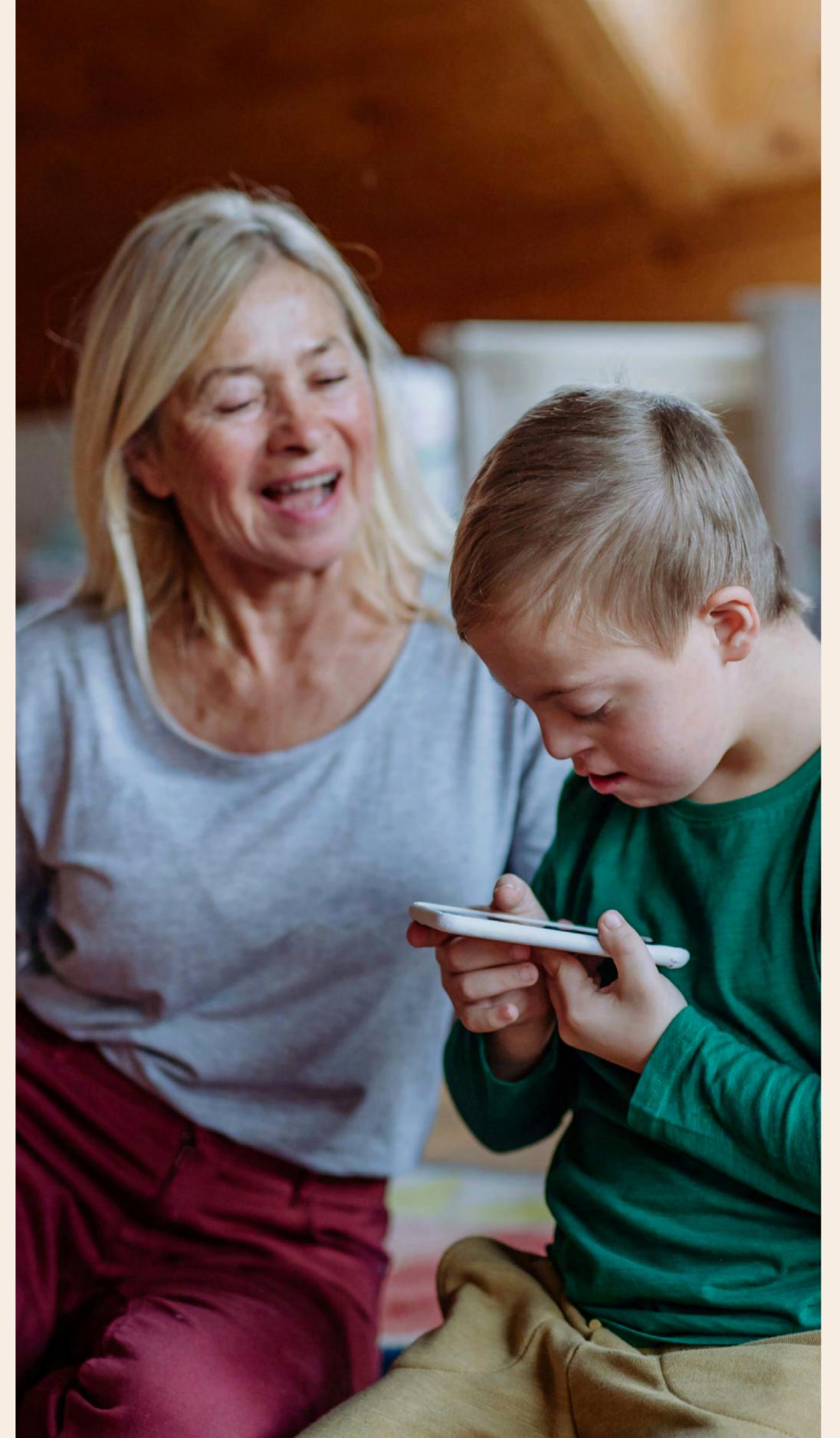


# I want to go there now!

Universal design insights on Citiverse and digital twin technologies. For more inclusive and accessible city and event experiences.



Families of children with disabilities / a broad diversity of abilities, face hidden thresholds every day – sensory overload, complex planning, and barriers to equal participation.

In our community, we hear these stories all the time. With deep insights from families and networks with diverse needs, we saw a real opportunity to make a difference.

*What if new technology could help lower these thresholds – and contribute to a society where everyone can take part, on equal terms?*

***“I saw potential in how digital twin and Citiverse technology could support families who today face barriers and exclusion in accessing city life activities.”***

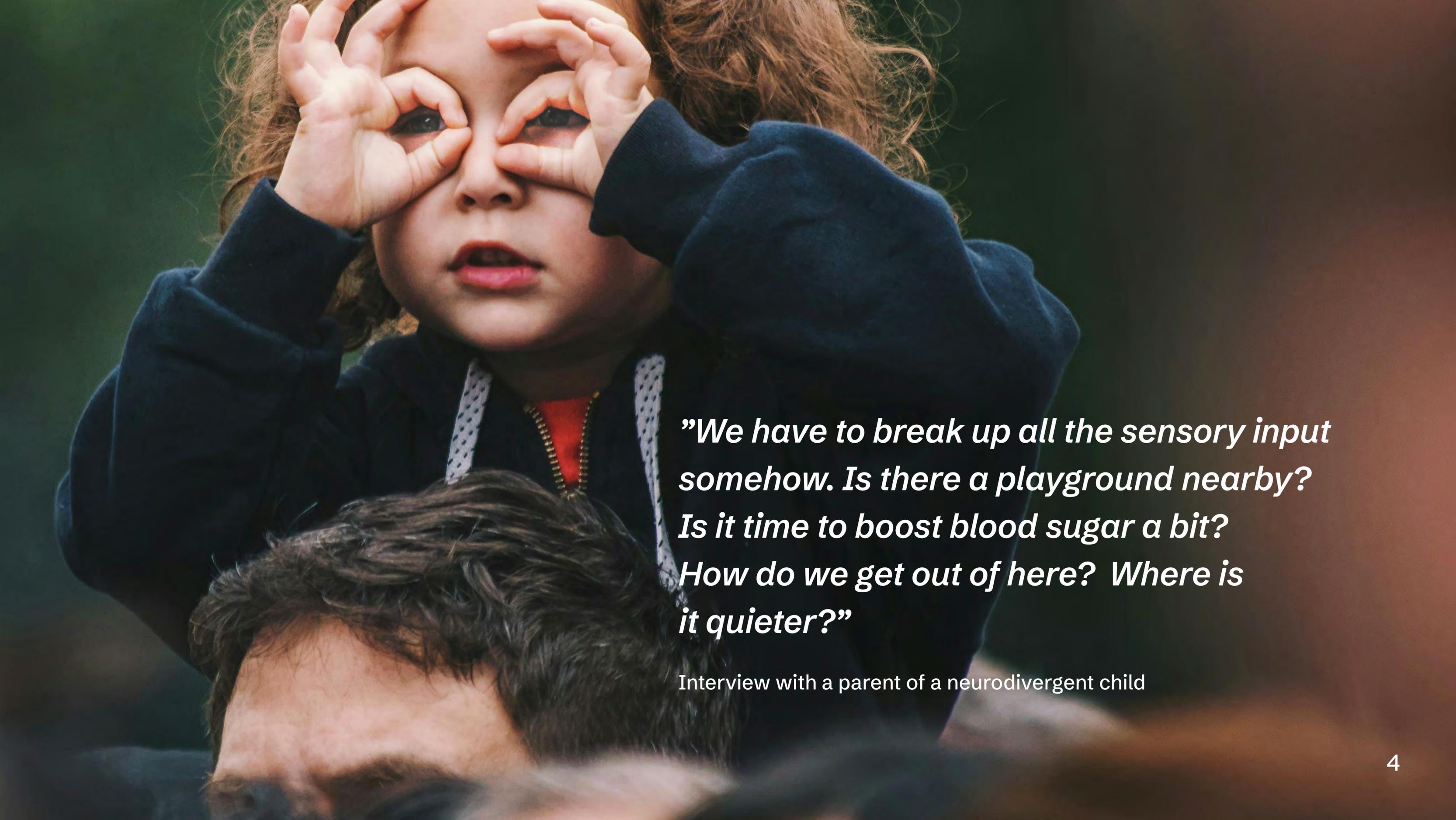
**Jenny Lindström Beijar**

Founder Our Normal Association – a non-profit supporting inclusive innovation for children with disabilities and their families.

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A young child with curly hair is sitting on a man's shoulders. The child is covering their eyes with their hands, looking distressed. The man's head is visible in the foreground, looking down at the child. The background is a blurred outdoor setting.

***“We have to break up all the sensory input somehow. Is there a playground nearby? Is it time to boost blood sugar a bit? How do we get out of here? Where is it quieter?”***

Interview with a parent of a neurodivergent child

# What is a Citiverse?

**A Citiverse is a digital version of a city that combines real-time data, 3D models and interactive technology. You can think of it as a virtual layer on top of the physical city.**

In a Citiverse, buildings, streets, traffic, services and people's movements are represented digitally. Sensors and data from the real city update the virtual one in real time. This allows people and organizations to explore, simulate, and test ideas safely – before experiencing places in real life.

A Citiverse can be used for planning, safety, energy use, and citizen engagement. It makes it easier to understand how a city works – and how it could work better for everyone.

While new technologies increasingly support physical accessibility – like smart traffic lights for people with visual impairments or crowdsourced wheelchair accessibility data – many areas remain to be explored.

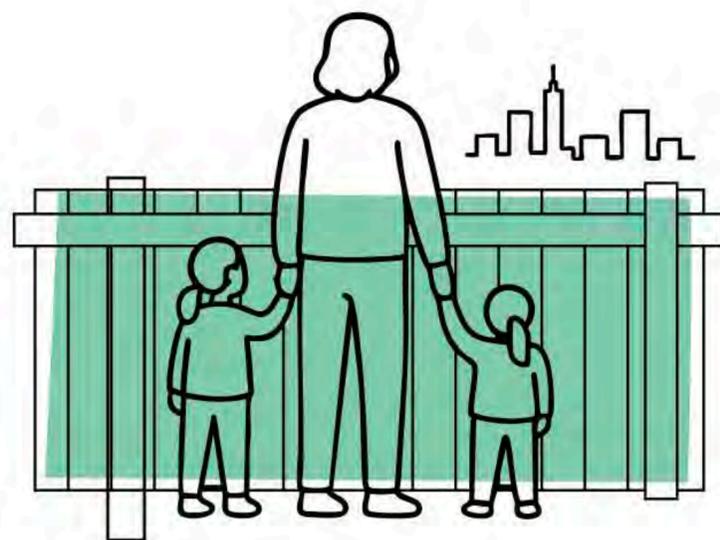
## **For example:**

*Can these technologies also reduce barriers for people with cognitive disabilities? Could simulations support more inclusive wayfinding? Can public access to virtual environments increase independence and engagement for all citizens?*

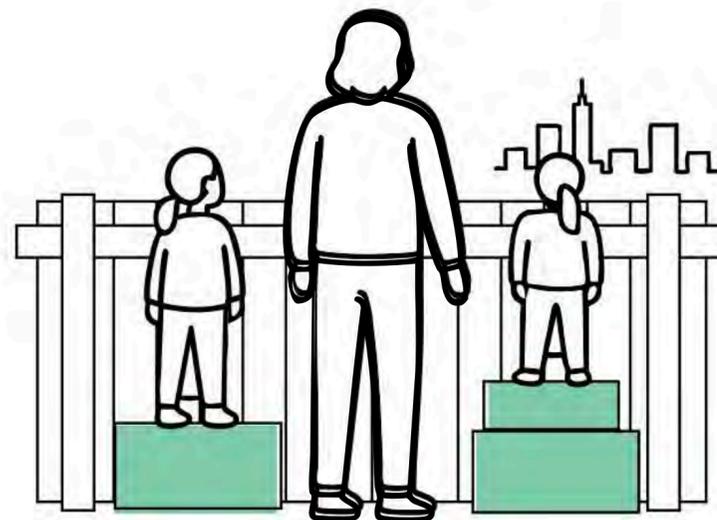


# What is Universal design?

Universal design is a design approach that aims to create environments, products and services that work well for as many people as possible from the outset. It is based on the understanding that people have different needs and abilities and that these should be considered early in the design process - not as an afterthought. By removing barriers and designing for diversity from the beginning, universal design contributes to greater accessibility, usability and inclusion for all. It also leads to more sustainable and efficient solutions, benefiting both individuals and society.



**Inaccessible**



**Accessible**



**Equal / Universal design**

# European Citiverses Uniting for Inclusiveness

European Citiverses Uniting for Inclusiveness is a collaborative innovation project co-funded by the European Union.\* The project brings together 12 partners from across Europe, working towards cities that are smarter, more inclusive and more human-centred.

**Project partners:** City of Gothenburg, Göteborg & Co, GATE, Kokokaka, Lindholmen Science Park, Iceberg+, Our Normal Association, RISE, The Point Labs, University of Twente, Virtuall Design and Younite.

To support inclusive and universal design from the outset, the project began with a user needs analysis aimed at grounding the work in real lived experiences. This report summarises the key insights from that initial research phase.

The research design and analysis were led primarily by Our Normal Association and RISE, with contributions from project partners.

## Research Approach (summary)

Insights in this report are based on a triangulated research approach combining quantitative and qualitative methods:

- Survey analysis: analysed 200+ responses from families with children with disabilities, capturing experiences from site visits and public events.
- Empathy-driven research: interviews with 20 families, including 10 families with children with disabilities, representing diverse disability profiles and the use of assistive technologies.
- Real-world validation: dialogue input from 10 young adults and on-site visitor journey mapping at major public events in Gothenburg (Sweden).
- Literature review: thematic proxy review on inclusive tourism, accessibility and assistive technology in smart city contexts.

\*In Sweden the project is also co-funded by Vinnova.

# Barriers to Equal Access & Inclusion

Families of children with disabilities / broad diversity of abilities - face a range of barriers and sources of stress when navigating city life. These include physical obstacles, sensory overload, social expectations, and uncertainty about whether a place can meet individual needs.

We have grouped the barriers we identified into four main categories:

**Attitudinal Barriers** - related to social norms, expectations, and how people are met and treated.

**Physical Barriers** - obstacles in the built environment that limit access and mobility.

**Distressing Sensory Stimuli** - environments with high sensory input that may cause discomfort, anxiety or overload.

**Lack of Accessible Information** - insufficient or unclear information that makes it hard to plan, prepare or participate on equal terms.



Barrier no. 1

## Attitudinal Barriers

Attitudinal barriers relate to social norms, expectations of behaviour, and attitudes in public spaces. They occur when visitors, staff or systems misunderstand, judge or fail to accommodate people with disabilities and diverse needs.

Such attitudes can create significant stress for families, particularly parents, and this stress is often transferred to the child. The impact is not limited to a single moment, but can arise before, during and after a visit.

For children, new experiences are essential for development and participation in society. However, for families of children with disabilities these experiences often involve increased risk, uncertainty and emotional effort. As a result many families limit their participation and rely on familiar environments, which can lead to social isolation despite a strong desire to engage in everyday city life.

To ensure meaningful and dignified participation, access to the city must be seen as a human right – and ensuring that access is a shared responsibility.

***“Our daughter doesn’t want us to tell others about her diagnoses – but everyone around will notice anyway. It’s just that you can’t see her diagnose. So we often get stares and comments.”***

Quote from interview with a parent of a neurodivergent child.

A young boy with Down syndrome is sitting in a wheelchair outdoors. He is wearing a white t-shirt under a black zip-up hoodie and grey shorts. He has a thoughtful expression on his face. In the background, a person in a blue jacket is pushing the wheelchair. The setting appears to be a paved area with trees and a building in the distance.

*“At a playground, there was a truck for kids to play on. It had wheelchair-accessible entry to the cab but once you were inside you couldn’t reach the steering wheel. It’s completely wrong. It shows how society values individuals differently. Like my daughter would think, ‘Oh, at least I still got to watch my siblings play.’”*

Interview with a parent of a child using a wheelchair

## Physical Barriers

Despite accessibility regulations and standards, many venues still contain a range of physical obstacles that limit participation. These include stairs, curbs, narrow passageways and high or fixed seating that make it difficult to navigate with mobility aids or when supporting multiple needs.

In addition to the main venue area, side facilities such as restrooms, changing rooms and food areas are often overlooked in terms of accessibility. Even everyday activities like dining out can require negotiation or assistance, rather than offering equal access. Furthermore interactive elements at venues such as museums or theme parks are frequently not designed with diverse users in mind.

Physical barriers not only prevent access to certain areas or activities – they also create friction, demand extra planning and add stress to experiences that should be enjoyable and inclusive.

*”Access to toilets and changing facilities is a huge challenge for us. It’s difficult to spend extended time in the city because there’s no easy way to change on our daughter. With a height adjustable changing table, one person could handle it alone. But those are almost non-existent - even in hospitals. There is only one that I know of in Gothenburg.”*

Interview with a parent of a child using a wheelchair.



*“In urban environments, there are so many steps and curbs. Simple physical barriers are extremely common - even in newly built areas. With a 4-year-old in one hand, a wheelchair in the other, and a 9-year-old asking, ‘What’s the name of this statue?’ - that curb becomes a really big deal.”*

Interview with a parent of a child using a wheelchair

## Sensory Barriers

Beyond physical accessibility, many environments present less visible but equally significant challenges. Unpredictability and disrupted routines can create stress, especially when combined with high sensory stimuli such as noise, smells and visual impressions in chaotic and complex settings.

Social interaction with unfamiliar people, fear of separation from family members and limited food and beverage options that do not meet a child's needs can further increase discomfort.

Constrained freedom of movement – waiting in lines, remaining seated for long periods or navigating dense crowds – adds additional pressure. Even experiences designed to be enjoyable can become overwhelming, where excitement and stress become entangled and “too much of a good thing” turns into a barrier to participation.

*“My daughter is so enthusiastic about many things. She often says it’s the best day ever. But then it often becomes too much and she crashes even before we leave home. Especially when it’s something new – the excitement just gets overwhelming.”*

Interview with a parent of a neurodivergent child.

A photograph of a crowded public transit vehicle, likely a subway or train. The focus is on the lower half of several people standing. In the foreground, a person wears dark trousers and a black backpack. Next to them, a person wears a white t-shirt and blue denim jeans with a large tear on the back pocket. To the right, another person wears blue denim shorts with a similar tear. The background is filled with other passengers, some holding onto poles, creating a sense of a busy, packed environment.

***“The biggest challenge for us is large crowds. We don’t have a car and always rely on public transport. It’s exhausting and takes a lot of energy. Moving around in urban environments or shopping centers is almost unthinkable.”***

Interview with a parent of a neurodivergent child

## Information Barriers

Beyond on-site challenges, unclear or unreliable information can create barriers before a visit even begins. When details are vague or inconsistent, families struggle to assess whether a place will meet their needs.

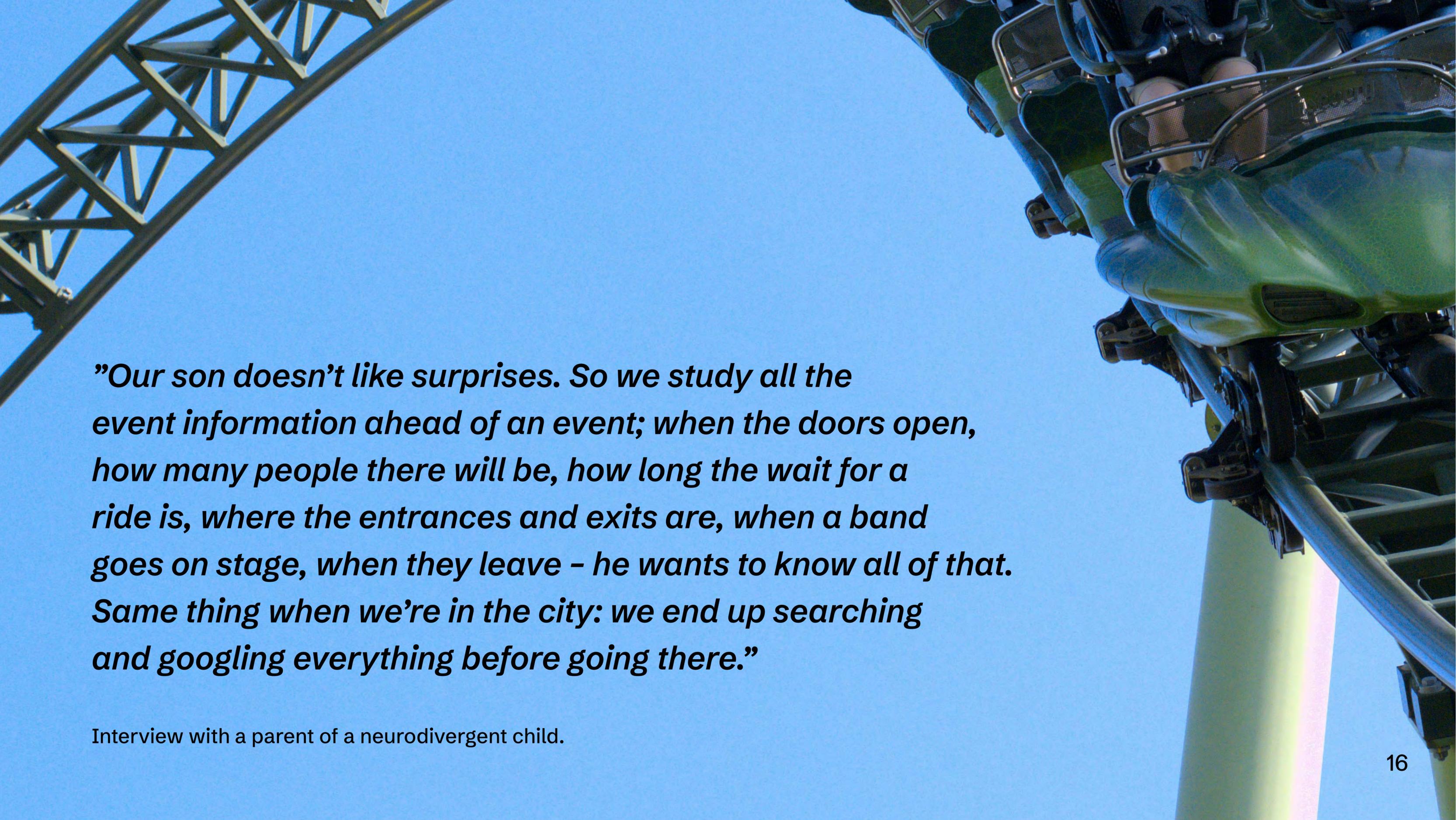
Accessibility terms such as “quiet areas” or “wheelchair-friendly” are often undefined, and promotional descriptions may not match the actual experience, reducing trust and increasing uncertainty.

Time-related factors – waiting, crowds, breaks and sensory exposure – also require planning, but this is difficult without clear, tailored information.

Pre-visit information shapes expectations; when it falls short or is inaccessible, it can lead to stress or risk. The burden of finding and verifying details often falls on families, discouraging participation.

*”We don´t always want to stand out too much. We don´t request ‘special needs’ when we travel either, because then we just get their standardized package, which still isn´t individually adapted..”*

Interview of parent of a child with visual impairment.

A low-angle shot of a roller coaster car at the peak of a track. The car is green and blue, with safety harnesses visible. The track is a complex metal lattice structure. The background is a clear, bright blue sky. The text is overlaid on the lower left portion of the image.

***“Our son doesn’t like surprises. So we study all the event information ahead of an event; when the doors open, how many people there will be, how long the wait for a ride is, where the entrances and exits are, when a band goes on stage, when they leave - he wants to know all of that. Same thing when we’re in the city: we end up searching and googling everything before going there.”***

Interview with a parent of a neurodivergent child.

# Citiverses and digital twin technology

Several Citiverse projects are currently being developed across Europe. These initiatives explore how digital twin technologies – using real-time data, 3D visualisation, and AI – can support cities in planning, climate adaptation, traffic management, energy efficiency and citizen participation.

Some focus on technical infrastructure while others explore how digital twins can be used in everyday life – for example to simulate climate impact, understand energy flows or co-design public spaces with citizens.

Together, these projects aim to make digital city environments more accessible, useful and inclusive – not only for planners and professionals, but also for the people who live in, and move through, cities every day.

# Solutions for Everyday Barriers

We have identified five opportunity spaces where Citiverse and digital twin technologies can meet families' needs in meaningful and inclusive ways. These areas reflect different stages of a family's journey – before, during and after a visit – and show how data-driven and interactive tools can reduce uncertainty, support autonomy and improve the overall experience.

On the following pages, each opportunity space is described in more detail, with examples of how technology can make participation easier, safer and more engaging.

## Quick summary of the five opportunity spaces:

### 1. Preparation and Planning

Using simulations and digital previews to support confident visits.  
Technologies: digital twins, 3D models, VR, interactive schedules.

### 2. Wayfinding and Navigation

Using AI, real-time maps and AR guidance to reduce stress.  
Technologies: AI, AR, IoT sensors, real-time crowd data, indoor positioning.

### 3. Communication and Information Access

Making information accessible through adaptive interfaces and assistive tech.  
Technologies: accessible interfaces, plain language, sign language support, AI-powered information tools.

### 4. Engagement and Inclusion

Creating motivating and shared experiences through gamification and interaction.  
Technologies: gamified content, interactive screens, XR environments, inclusive event design.

### 5. Adaptability and Real-Time Responsiveness

Using AI and smart systems to respond to changing needs on the go.  
Technologies: AI agents, personalized settings, dynamic adjustments, real-time updates.

Opportunity space No. 1

## Preparation and Planning

Building confidence through digital previews and structured preparation.

For many families, uncertainty is one of the biggest barriers to participation. Preparing for a visit – especially in unfamiliar environments – often requires detailed knowledge of routes, accessibility, sensory conditions and timing. Having the chance to explore a space virtually and understand what to expect can greatly reduce stress and make new experiences feel more manageable.

### How Citiverse can help:

Digital twins of cities and venues can provide immersive previews, showing entrances, facilities, seating, lighting or crowd levels. Families can rehearse key moments such as arrival, navigation, or taking breaks at their own pace.

Event simulations can model crowd flows or safety procedures, helping families choose when and how to visit. VR experiences also allow children to become familiar with a place in a safe, controlled way.

These simulations can support staff training as well, helping organizations better understand diverse needs, improve service and reduce attitudinal barriers. Shared data standards and open APIs can make these tools accessible across cities and services.



Opportunity space No. 2

## Wayfinding and Navigation

Helping visitors move confidently through spaces, step by step.

Getting from one place to another can be a complex task when navigating with a child with different needs. Small obstacles - unclear signage, sudden changes, or a lack of structure - can make a big difference. Families need not only accurate directions but tools that guide them at their own pace and comfort level.

### How Citiverse can help:

Ai supported accessibility navigation and real-time maps can guide families through unfamiliar environments with clear visual or auditory prompts. Smart infrastructure like IoT-enabled streetlights or indoor positioning systems can provide context-aware updates. For example: alerting users to elevator access, alternative routes or safe, quiet zones.

A key example is wheelchair-accessible wayfinding, where families can get step-by-step guidance along verified accessible routes, avoiding stairs, curbs, steep slopes or narrow entrances.

AR navigation and or wearable technologies like smart glasses or headphones can offer hands-free guidance and support during movement.



Opportunity space No. 3

## Communication and Information Access

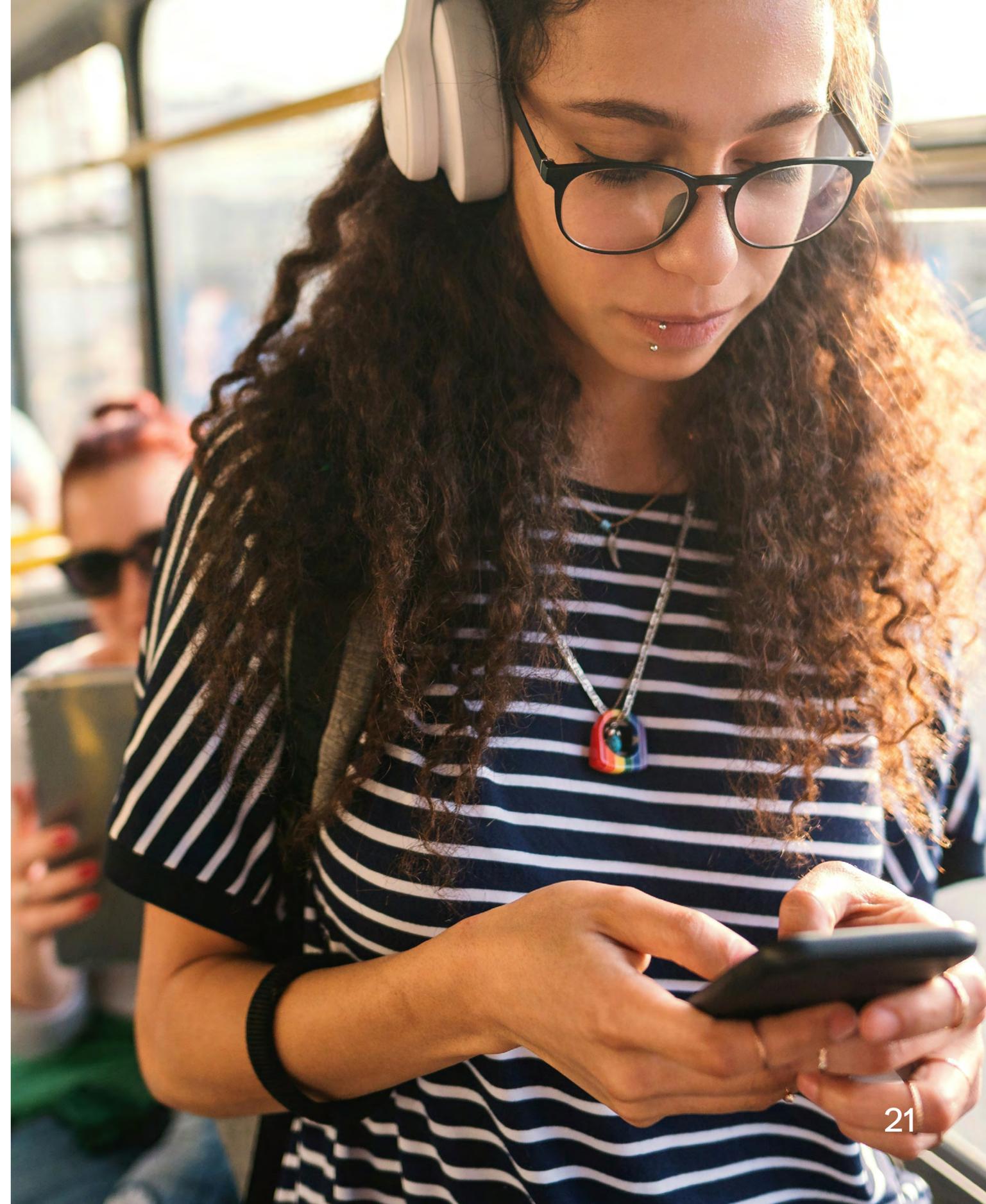
Delivering the right information in the right way, for everyone.

Access to relevant, clear, and trustworthy information is key - but many families struggle with overly generic, outdated or inaccessible communication. It is not only about having information available, but about receiving answers that match individual needs in a format that is easy to understand and act on.

### How Citiverse can help:

AI-powered guides or assistants can deliver personalized, accessible information based on user preferences and needs - including preferred language, reading level or assistive technology. This can include simplified instructions, sign language videos or symbol-based guides.

Smart displays can help visitors access real-time guidance in physical spaces. Accessibility settings can ensure that different formats - audio, visual and easy-to-read content - are supported and easy to switch between depending on the situation.



Opportunity space No. 4

## Engagement and Inclusion

Making participation motivating, meaningful and socially shared.

For many children with disabilities, motivation plays a crucial role in participation. Exploring something new can be both exciting and overwhelming - and small nudges can make a real difference in building confidence. Inclusive digital experiences can help families feel more welcomed, curious and in control.

### How Citiverse can help:

Interactive elements - such as simple challenges, rewards or progress tracking - can make visits more engaging and support exploration, independence and sustained interest. Immersive environments and digital storytelling can also help lower thresholds by making city and event visits feel more understandable and motivating.

At the same time, engagement should be designed with care. The goal is not endless or addictive experiences, but supportive interaction that helps people participate on their own terms - without creating stress, overuse or “never-ending” loops.



Opportunity space No. 5

## Adaptability and Real-Time Responsiveness

Responding to needs and changes as they happen.

Even with careful planning, real-life situations change. A closed entrance, a loud concert warm-up or a delayed bus can disrupt carefully made plans. For families managing complex needs, flexibility in the moment is essential.

### How Citiverse can help:

IoT sensor networks can monitor real-time conditions – such as broken elevators, crowd density or noise levels – and feed that data into apps and maps families already use.

Real-time alerts can notify users of unexpected changes and suggest adaptive solutions, such as quieter routes or nearby amenities. AI agents can also learn from user behaviour and preferences to anticipate needs and make personalised recommendations in the moment – improving safety, comfort and confidence.



# What's next?

European Citiverses Uniting for Inclusiveness is an EU-funded project running until 2027. Following the insights in this report, the project is now moving into an iterative phase of concept development and prototyping, exploring how emerging technologies can support more inclusive city and event experiences.

Prototypes will be tested with families of children with disabilities / a broader diversity of abilities, young adults with mixed profiles and the wider public – with the aim of reducing barriers to participation and ensuring real user value.

As part of the project outcomes, a publicly accessible prototype environment will be made available to demonstrate the results and enable broader engagement.

Follow the project's journey and get updates by visiting our website and subscribing to the newsletter: <https://cu-project.eu>

*“We’re at a really exciting point where real user needs meet cutting-edge tech – while the world around us is changing fast. Bringing those perspectives together is where truly exciting solutions start to take shape.”*

Johan De Paoli, Digital Concept developer at Goteborg & Co.

*“Activities without any order or structure don’t work for us. For example midsummer celebrations; it’s just a bunch of activities like dancing around, ‘fiskdamm’ and lotteries – all scattered around.”*

Interview with a parent of a neurodivergent child

*”Both kids get really excited when they see a map - they always run up to look at those things. Both want to orient themselves beforehand. They just want to familiarize themselves with what’s ahead, how far it is to something they want to see. If our kids could visit virtually before the actual visit somewhere; that would be great for borth. They would be exited! ”*

Interview with a parent

*“Theater, musicals, and similar events...  
We’ve gone through the routine multiple times:  
entering, waiting, sitting down. We’ve practiced.  
That makes it easier at a new place because  
she knows what to expect.”*

Interview with a parent of a youth with intellectual disability.

*“VR on a Liseberg ride would have been so cool. For example, testing Valkyria in VR first. That could really work! If she started to panic, she could just take off the glasses. Plus, you could ride as many times as you want without waiting in line. Right now, it’s also a bit important because her classmates are riding it and she isn’t”*

Interview with a parent

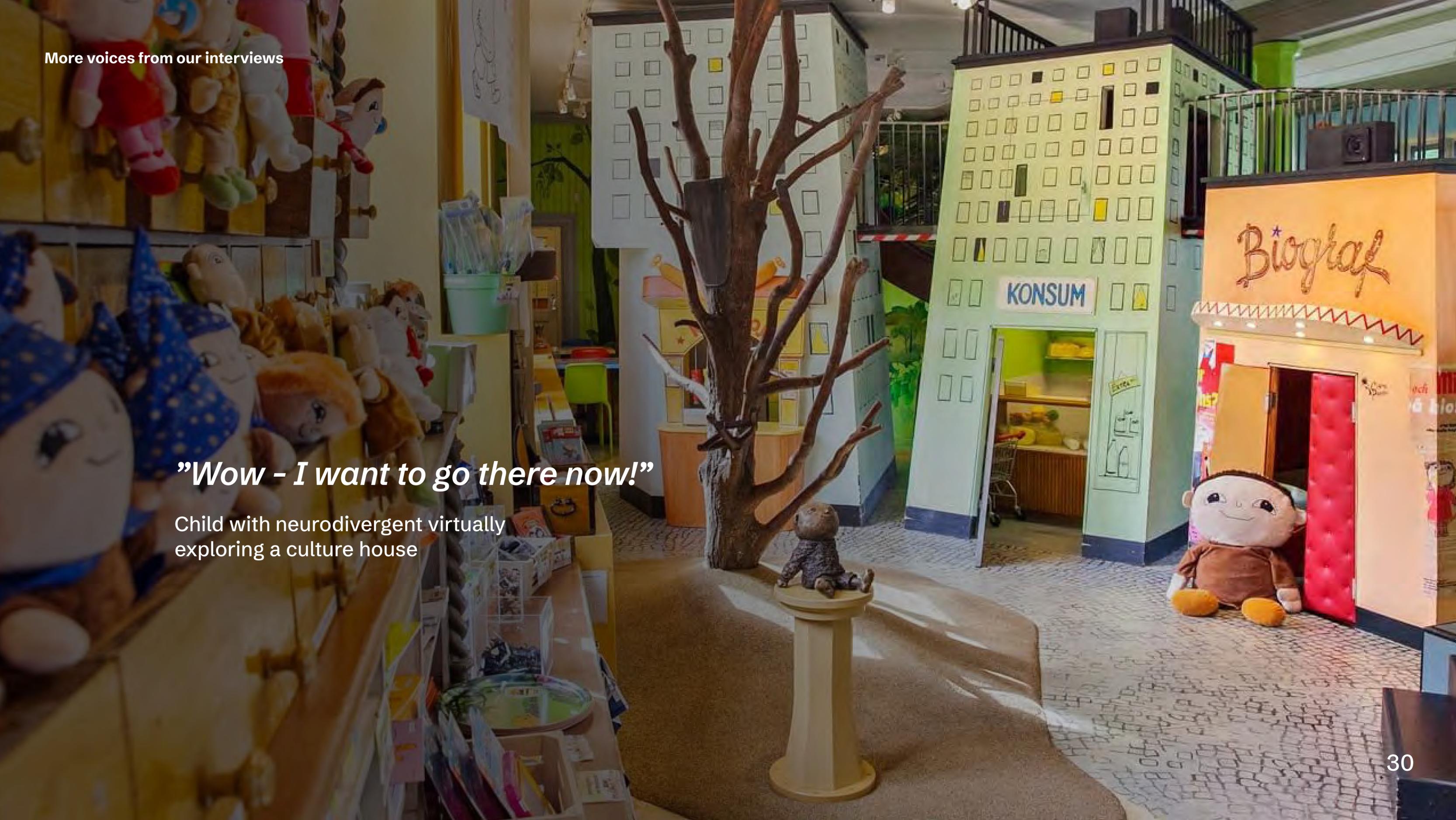


*“If I can check where the elevator is beforehand, I gladly do. Sometimes they are so hidden. Then all the energy goes into just getting around.”*

Interview with a parent

*“Wow – I want to go there now!”*

Child with neurodivergent virtually exploring a culture house



# Want to learn more?

To learn more about universal design, this insights report, or access in-depth research materials, contact [www.ournormal.org](http://www.ournormal.org).

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For questions about technical development and the prototype work currently underway, contact:

Johan de Paoli!: [johan.depaoli@goteborg.com](mailto:johan.depaoli@goteborg.com)

## Follow the project on social media:

LinkedIn: [linkedin.com/company/european-citiverses-uniting-for-inclusiveness/](https://www.linkedin.com/company/european-citiverses-uniting-for-inclusiveness/)

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