

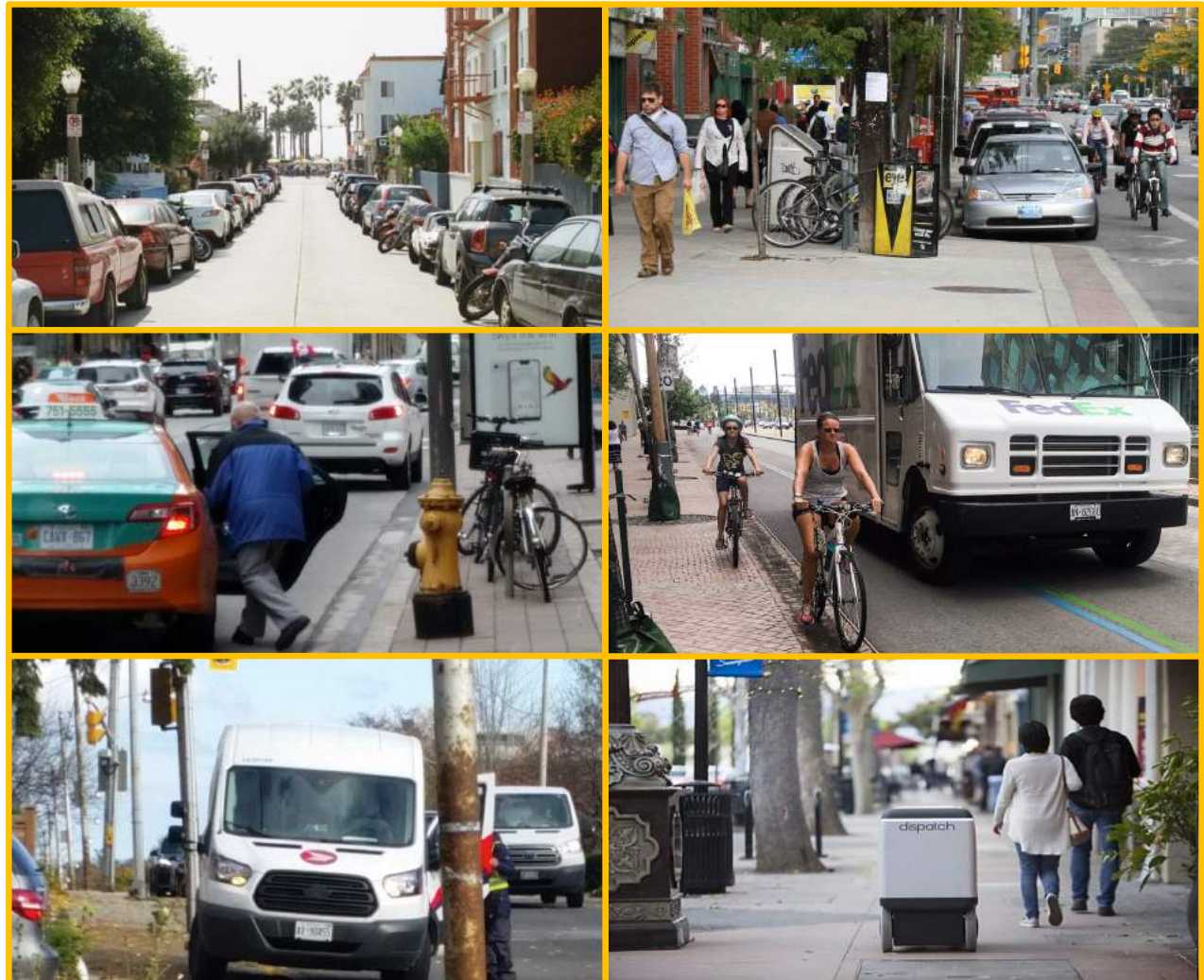
ISO/4448

(ISO/TC204/WG19/TS4448)

Sidewalk and Kerb Operations for Automated Vehicles: Arriving, Stopping, Parking, Waiting, and Loading

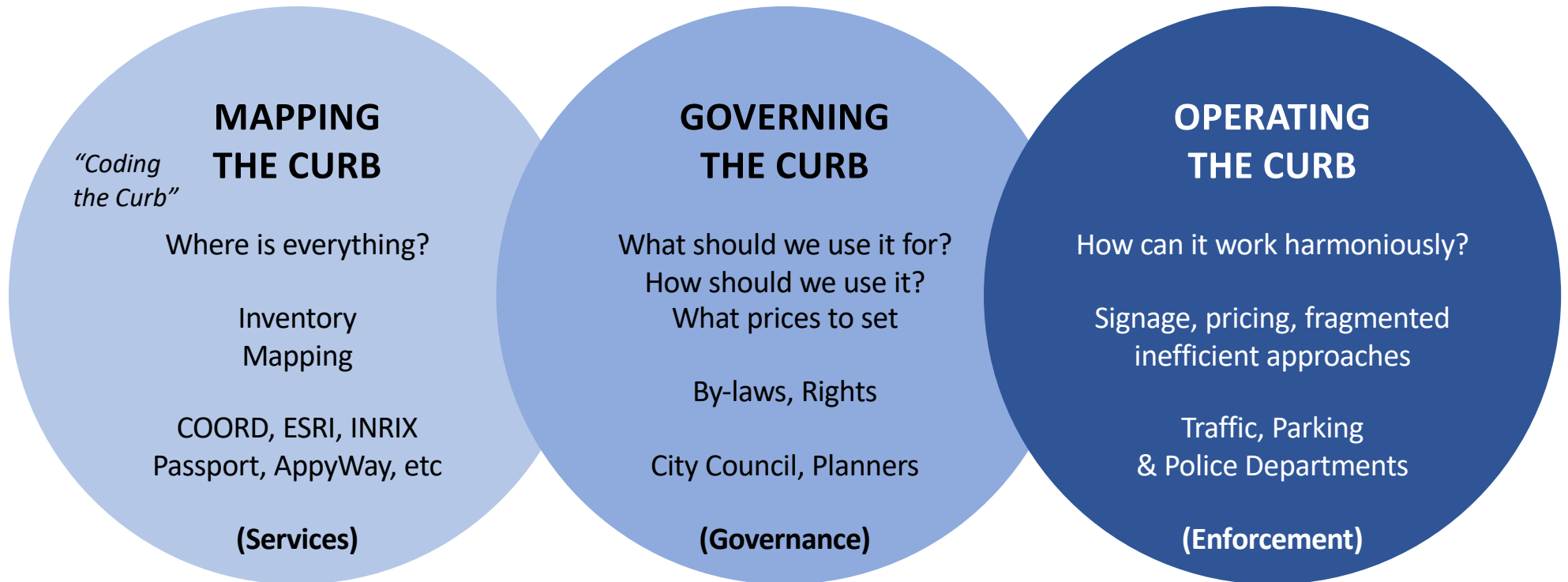
MWCOG
July 9, 2020

Bern Grush
Project Lead ISO/TS4448
Chief Innovation Officer
Harmonize Mobility

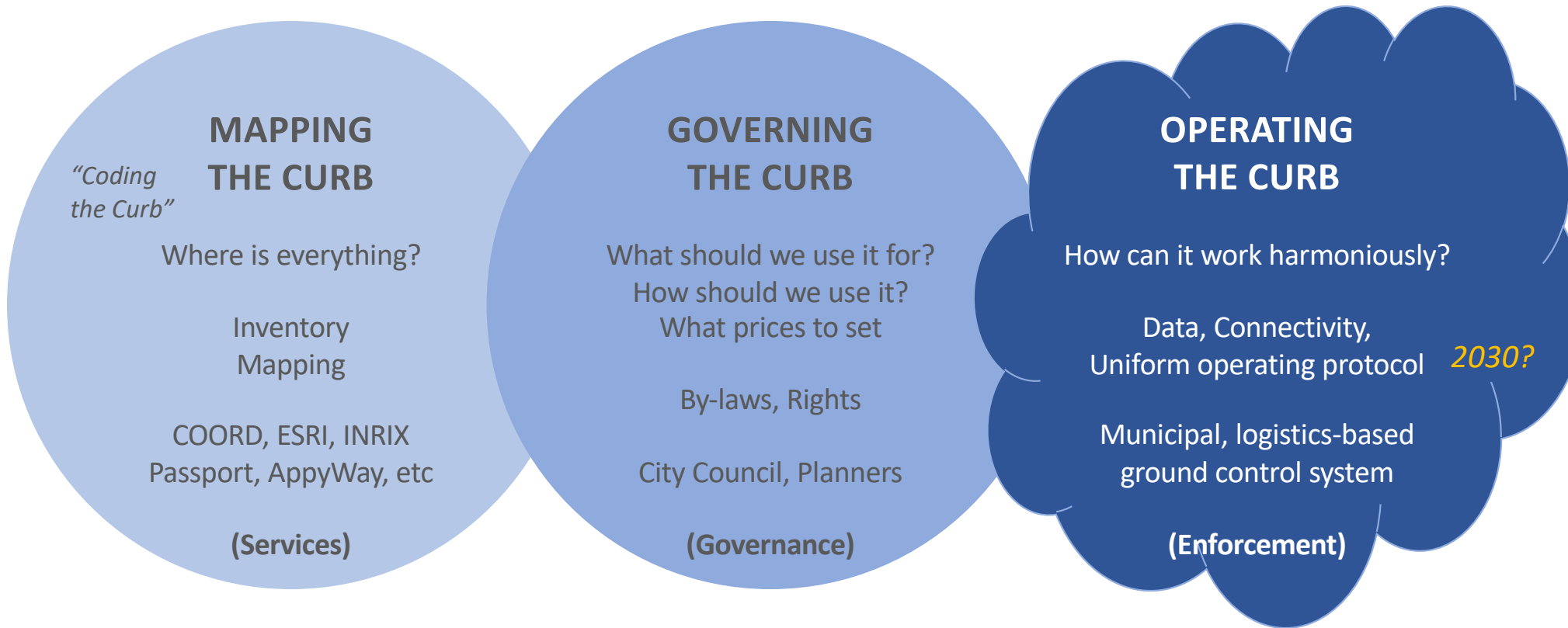


Managing the Curb today

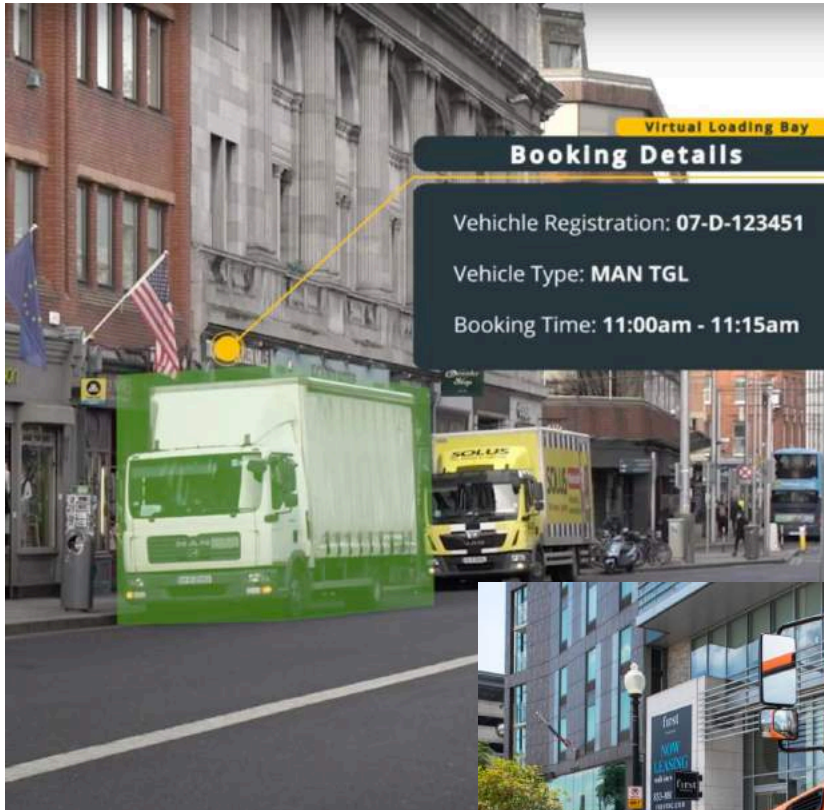
Mapping, Governing, Operating



What happens *as we begin* to replace humans with algorithms?

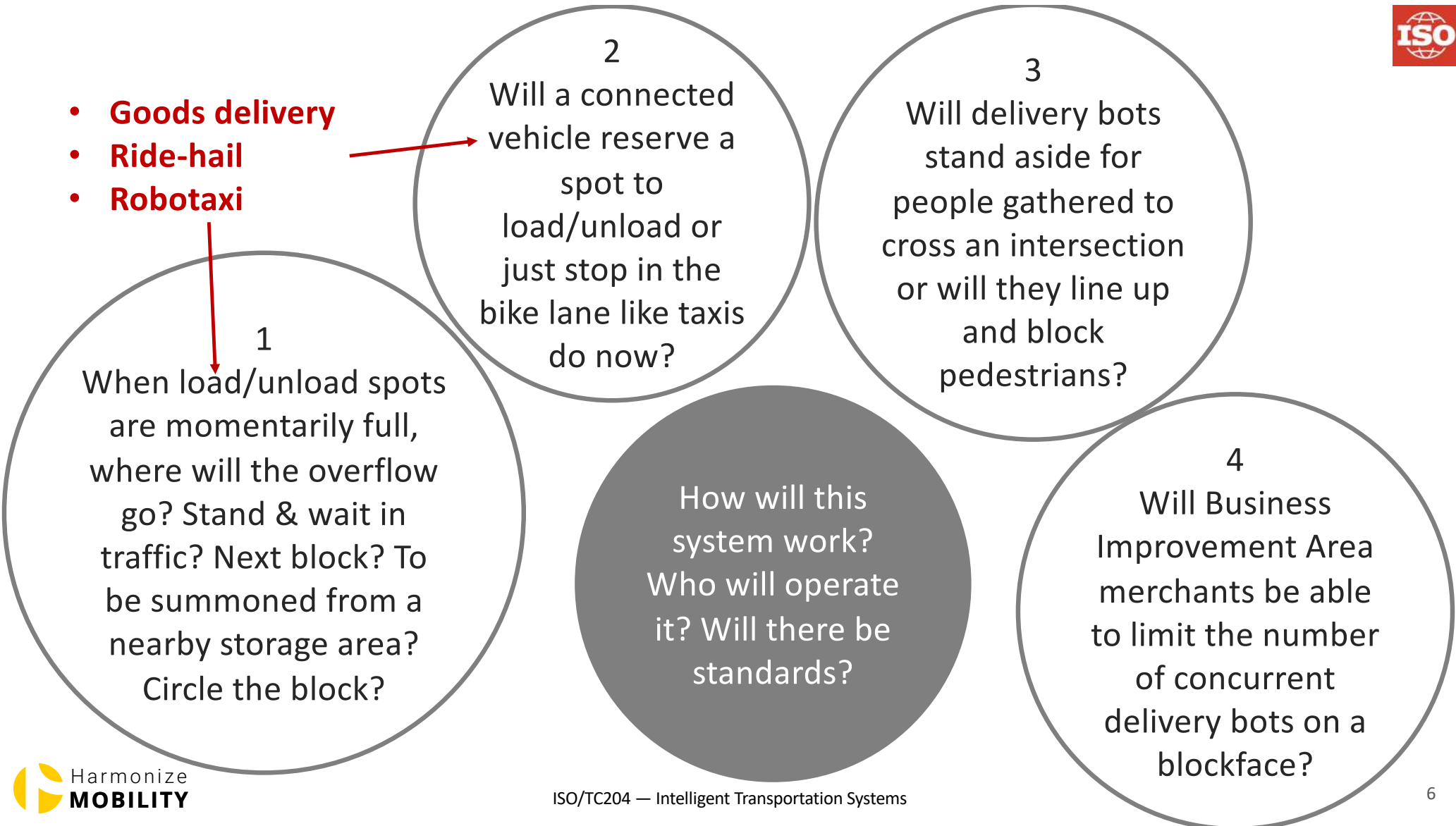


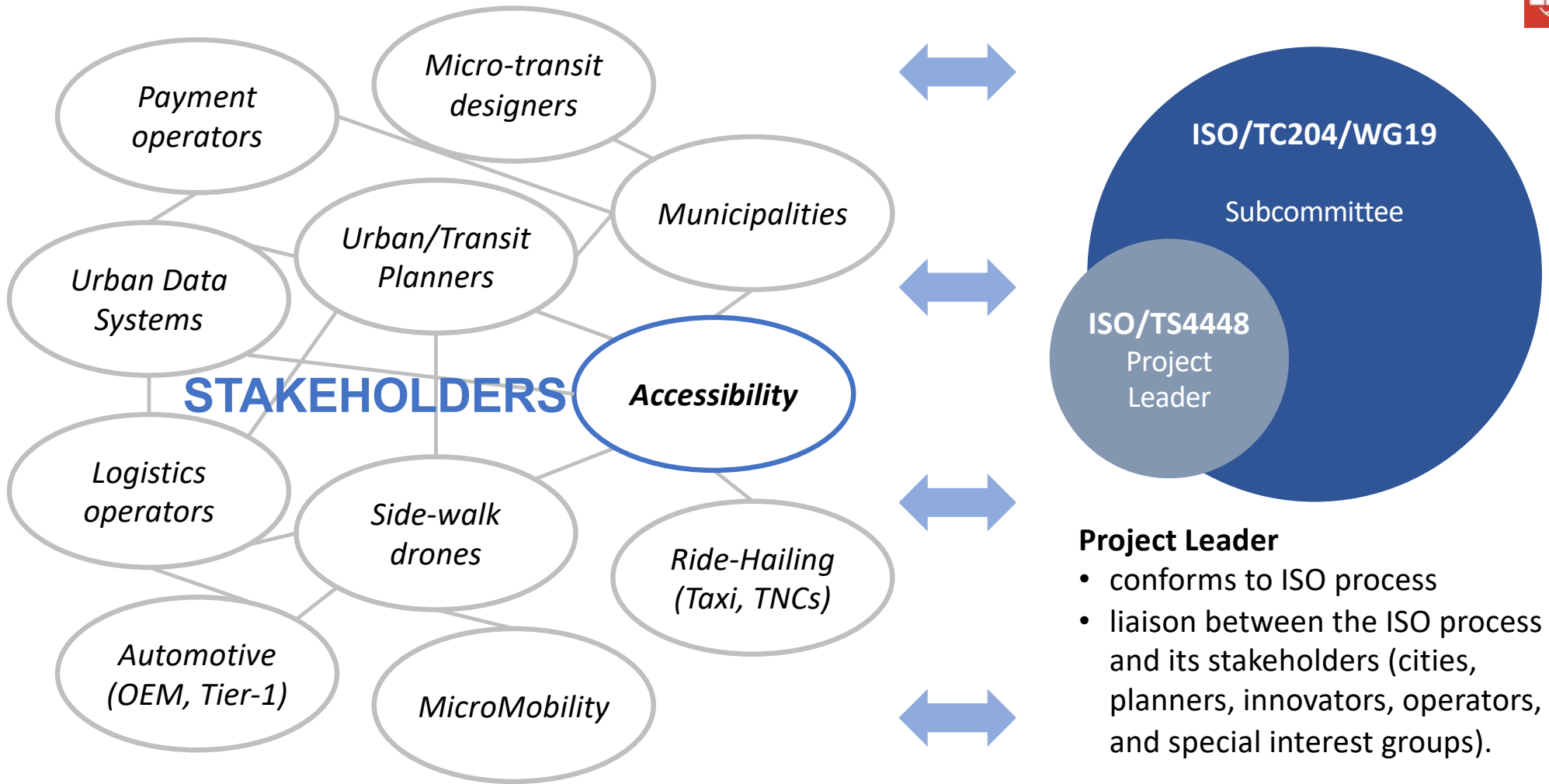
“...we need consistent data definitions and a coherent body of realtime communication protocols to enable multiple operators, multiple manufacturers, multiple developers, multiple systems, and multiple business associations to collaborate for multiple activities for both people and goods happening in what are generally highly variable and constrained spaces that require human safety, the ability to conduct commerce, and permit maintenance services — all while maximizing urban livability.”



- Goods-related reservation systems are becoming available for dedicated zones
- What about dynamic zones?
 - Multiple purposes
 - Automated and non-automated
 - Goods and passenger vehicles
 - Realtime re-allocation
 - Multiple sensor manufacturers
 - Multiple fleet operators
 - Dynamic and emergency reconfiguration
 - Virtual allocation
 - Accessibility issues
 - Mixed manual and automated vehicles
 - Mixed active transportation & sidewalk bots
- Need common negotiation and protocols

- **Goods delivery**
- **Ride-hail**
- **Robotaxi**





Purpose and Justification

Safety and conflict avoidance

- Multiple fleets; multiple vehicle types; multiple purposes; multiple priorities
- Mixed automated and non-automated; segregate or integrate?
- Spatial, speed, and access conflicts; vulnerable users

Planning

- Projects to design, format, reorganize streets and street use
- Current planning guidelines do not admit automation
- Developers, zoning; what is permitted/constrained?

Commercial

- Levels of commercial use, levels of automation, un/load passengers, un/load goods
- Reserving, queueing, bumping, reassigning
- Business Improvement Association (how can they determine/inform local operations?)

Operations

- Residents, shoppers, merchants, shipping, receiving; mixed automated and non-automated
- Schedules, queues, priorities, rights-of-way
- Dynamic; realtime resets; just-in-time

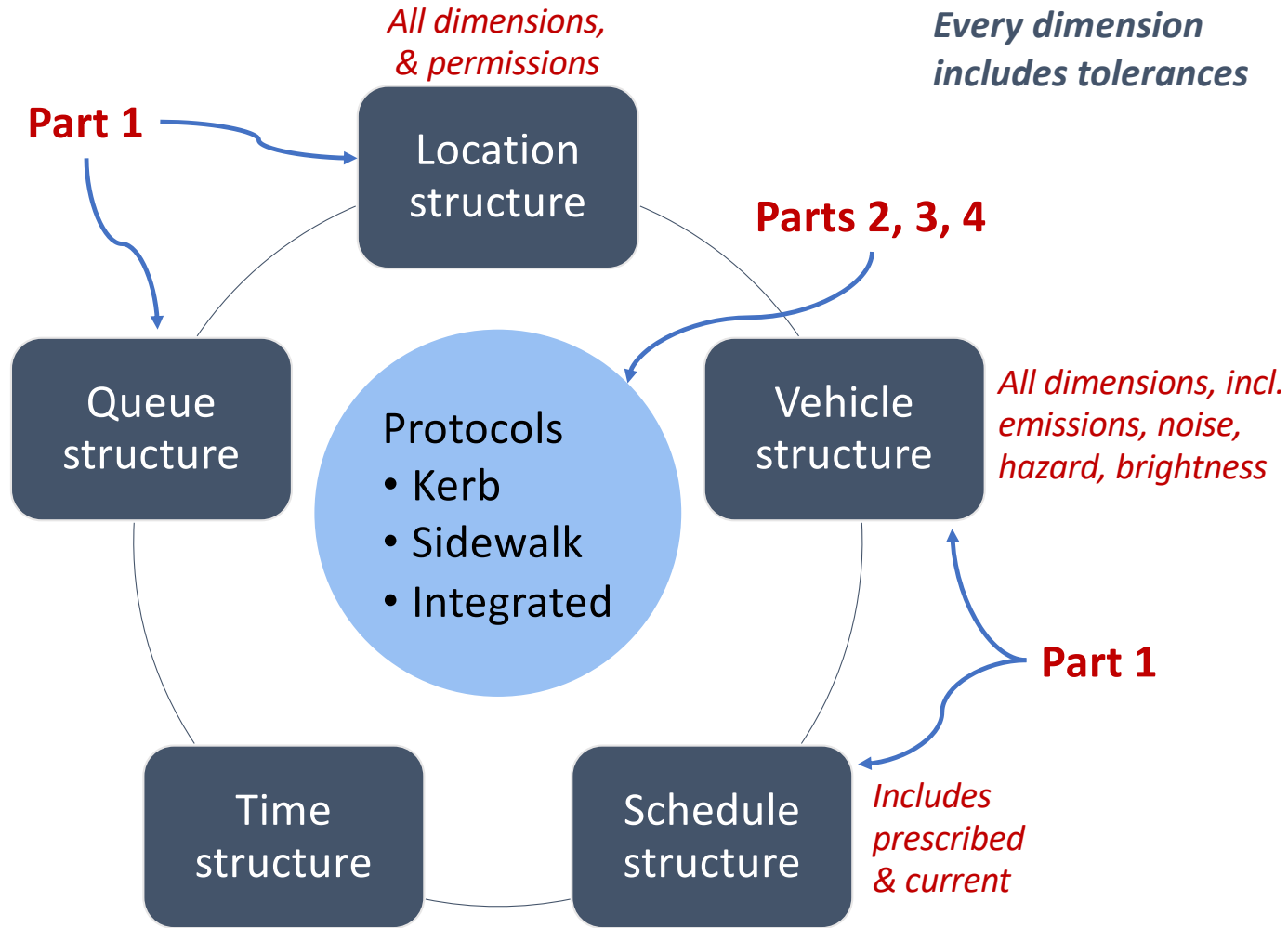
Legal, Liability & Insurance

- Certification for operations: e.g., non-automated only, automated-only, mixed?
- Residents, customers, businesses, visitors
- Per-block guidance may be used to judge risk or liability

Note: The *Purpose and Justification* covers all Parts.

The *Scope* of Part 1 is constrained to definitions and architecture.

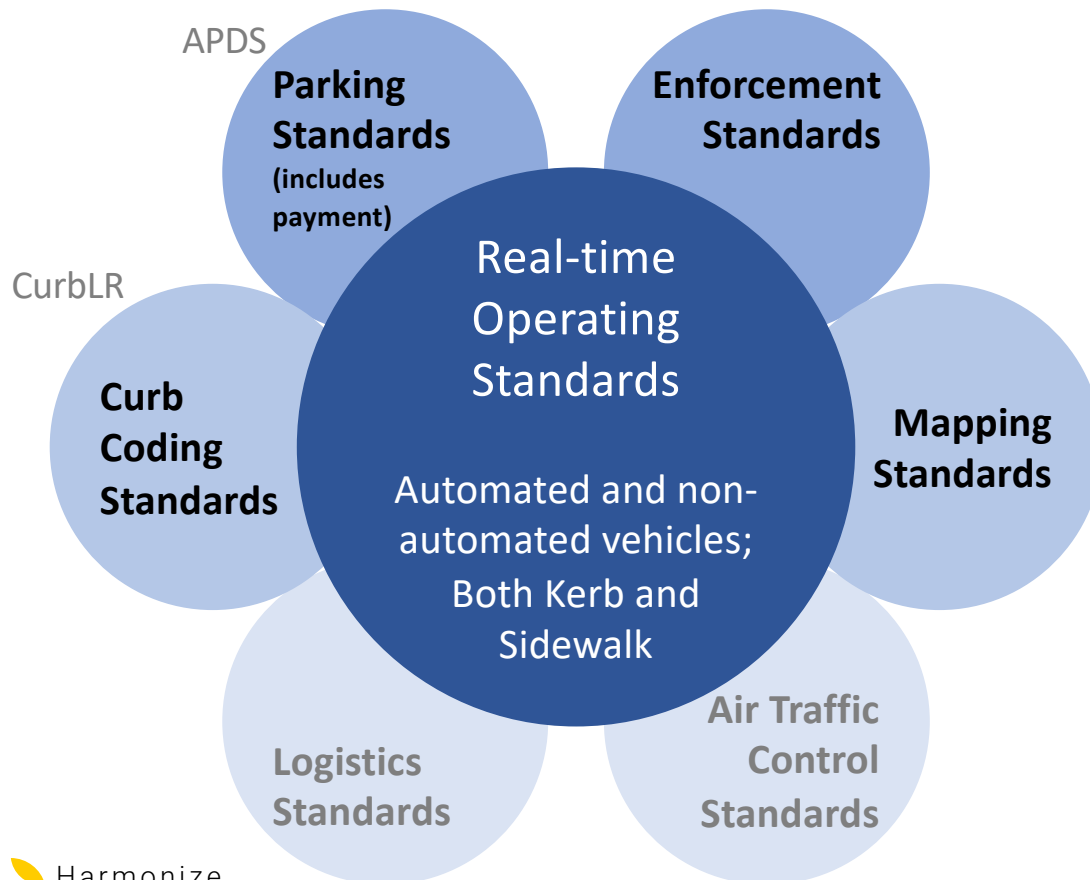
ISO/TS4448



Illustrative cases

- Vehicle asking for a spot: assigned, bumped, reassigned
- Oversized vehicle needs multiple adjacent spots
- Request that cannot be satisfied
- Service vehicle request: area access
- Change in pedestrian through zone (affects bots)

Build on existing foundations

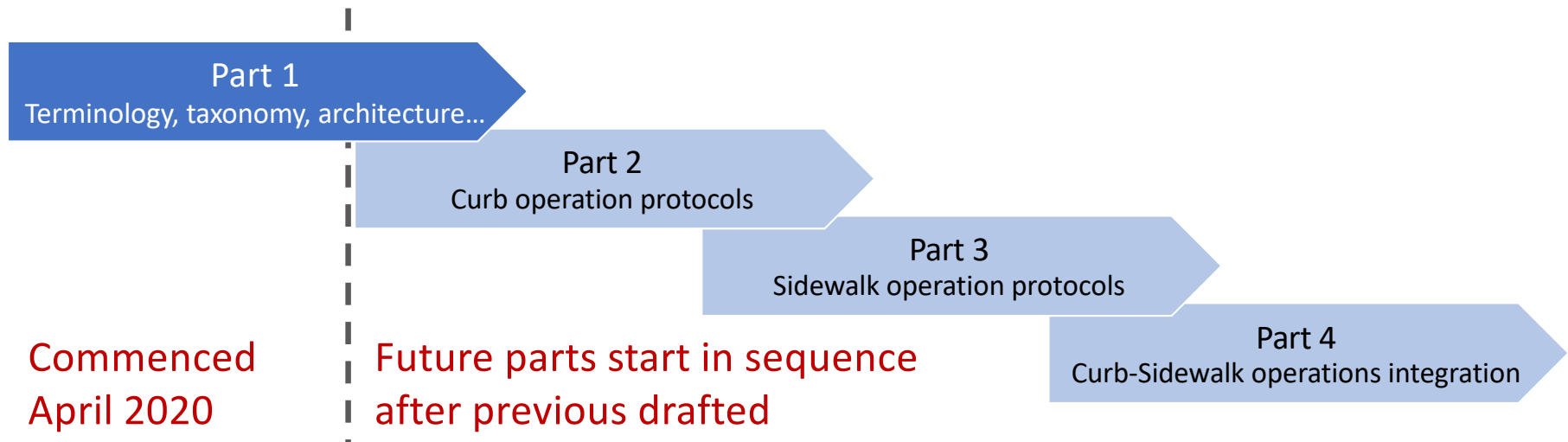


Build on existing data and operating standards from appropriate sources.

Additional standards would be consulted if this list is insufficient:

- Municipal planning standards
- Human Factors
- Telecommunications

Overlapping project stages



Each Part's scope is distinct...



Draft description of automation levels for sidewalk or curb.

To be **assigned** (or certified) at a particular **level**, a sidewalk or curb must be both fit and governed.

To be **fit for automation** it must be physically suitable (arranged, dimensioned, graded, maintained, signed, marked, connected, mapped, etc.) for the automation level intended.

To be **governed**, it must be permitted, regulated and enforced) at the intended level.

Sidewalk and curb are independent of each other, so that a curb and its adjacent sidewalk may be at different automation levels — with important implications for automated logistics.

This table will be extended for maintenance schedules, tolerances, certification, exceptions.

Level 0	Level 1	Level 2	Level 3	Level 4	Level 5
Unstructured	No hands-off automation	Assisted automation	Conditional automation	High automation	Full automation
No structured consideration for any purpose.	Managed access, park, stop, (un)load	Assisted, partial and monitored automation permitted (mostly fully manual vehicles & devices)	Conditional, mixed and monitored automation	Highly automated/assisted operation	No manual vehicle or mobility device permitted
May be unsigned, unmarked	Signed, marked	Signed, marked, mapped (update frequency: ___)	Signed, marked, including conditions. If conditions are dynamic, then variable signage updated to match the frequency of the dynamic conditions.	Signed and marked for active transportation. All vehicle indications must be digitalized, real-time (V2I and I2V).	No signs or marks required
Local bylaws or rules may apply	ADA (or equivalent) compliant	Automation without approximate human in control (e.g. "safety operator" or "steward")	Assisted operation in operation.	Automated operation including monitored, teleoperated and assisted.	Automated operation including monitored, teleoperated and assisted.
	No vehicle in automated mode. Last-meter parking operator inside/vehicle is permitted	Only a fully automated vehicle or device requires human accompaniment. Enforced.	Manual operation permitted by default. Any exceptions must be marked, signed and enforced.	Guarded manual operation permitted. (special training? Certification? Licensing? Insurance?)	This is aspirational and unrealistic. It might be achieved in a location that is solely manufacturing or logistic in nature. This is not intended for a residential or retail environment.

DRAFT

Benefits of Sponsorship and Collaboration

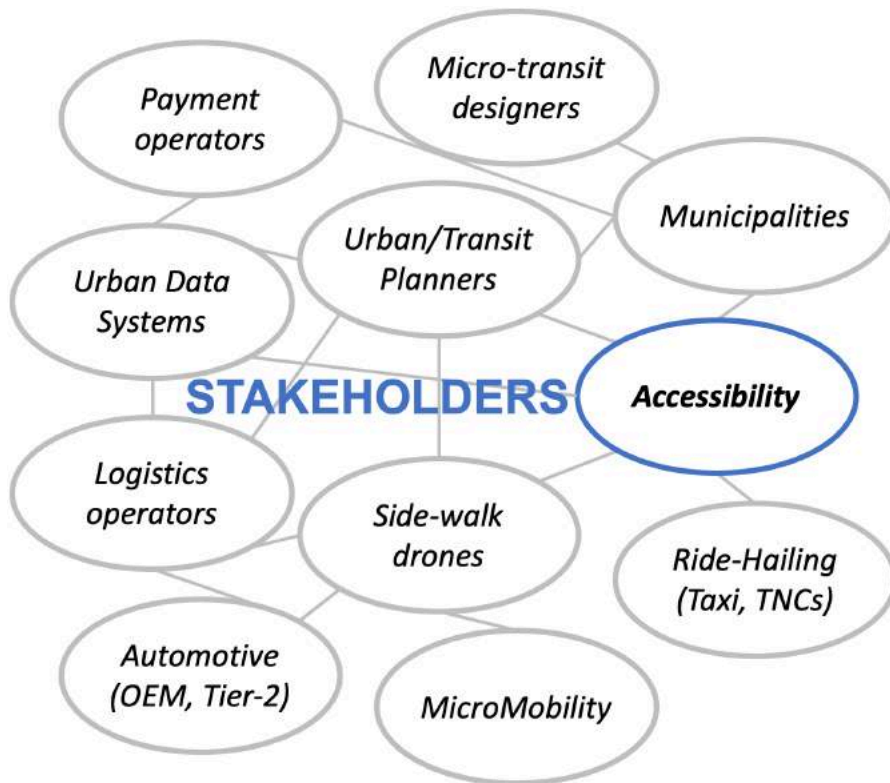
A Standard (and its subsequent systems) that is more likely to work for you, if you are:

- Operator (trips, goods, payment)
- Manufacturer
- Planner (city, transit, traffic)
- Municipal traffic manager, parking manager
- App builder
- etc

A Standard (and its systems) that is more likely to work for all stakeholders (larger markets)

- Residents (citizens)
- Visitors
- Businesses
- Monetizers
- (any city)

How stakeholders can engage with this project



- Sponsorships provide:

- Multiple written updates for review (confidential to sponsors and ISO)
- Live video meeting with review and discussion
- Opportunity to **submit proposed additions, changes,** deletions to the draft standard (both Normative and Informative) directly to the Project Leader / Project Editor. **(Each will be reviewed and considered)**

- Sponsorship levels

- Commercial
- Municipal
- Industry Association
- Not-for-profit
- Bern@HarmonizeMobility.com to set up a call.

THANK YOU!

Next Panel August 5:
Monetizing the Automated Sidewalk
and Kerb: Stakeholder panel #3

Automated Vehicles at the Sidewalk and Kerb: A stakeholder panel

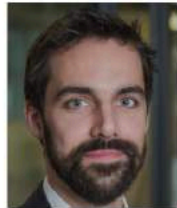
May 27, 2020



Kevin Borrás
Thinking Cities
WebPanel moderator



Tim Gully
Policy Advisor, Smart Cities
Leuven, Belgium



Ben Boucher-West
Aoppyway, Head of Mobility
Kerbside & Parking Solutions



Iris Ruysch
Future Mobility Network,
Rotterdam



Jerry Boyer
COO, Harmonize Mobility
WebPanel host



Tara Kajaks, PhD
McMaster University
Accessibility and Aging



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Automated Service Vehicles at Sidewalk and Kerb: Stakeholder panel #2

July 8, 2020



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Thinking Cities
WebPanel moderator



Ahmed Hashish
Systems Engineer, Future
Mobility Network, Delft



Peter Jones, Professor
of Transport & Sustainable
Development, UCL



Andres Kõiva
Co-founder
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Neluka Leanage
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