INTRODUCTION

Connected and Autonomous Vehicles (CAVs) are on everyone’s mind, with the race among global vehicle manufacturers to create the first fully automated CAV before 2020 mimicking the space race of the mid-20th century. While it is unclear how fast they are likely to become business as usual, it is almost impossible to ignore that they will be part of our environment in the not too distant future.

Our research has shown that there are a range of ideas emerging (summarised here) around how the built environment will be transformed by the introduction of CAVs, there are however few examples of specific urban sites in actual cities and how they may be adapted to suit the various types of CAVs and the people travelling through the sites.

As a result of this, BuroHappold plan to undertake a series of Global Design Sprints in six of our offices across the globe (Bath, London, New York, Berlin, Riyadh and Kuala Lumpur) to address the following question:

‘HOW CAN URBAN STREETS BE RECLAIMED AND REIMAGINED THROUGH THE INTRODUCTION OF CONNECTED AND AUTONOMOUS VEHICLES?’

Global Design Sprints bring a diverse group of people with various skills and expertise together to solve a problem by thinking collaboratively, innovatively, and creatively. The format of a Global Design Sprint is to follow the design process to develop an answer to a specific question within a limited amount of time, but also to have some fun.

Following our Global Design Sprints, we will publish a paper featuring each team’s final ideas and images. Selected teams with outstanding outputs will be asked to prepare a 2 minute presentation, which will be published on BuroHappold’s website.

This brief contains background information on CAVs and their impact on the built environment and explains in detail the process of a Global Design Sprint. If you are attending one of our official sprints we will provide all the tools required, if you wish to hold your own sprint you can contact globaldesignsprints@burohappold.com and we will be happy to send you a copy of the tools that you will require to run the sprint. This brief focuses primarily on passenger vehicles but we also encourage consideration of the movement of goods and services for the Global Design Sprints.

Please feel free to use this brief and organize Global Design Sprints with colleagues in your city.
THE BACKGROUND
THE BACKGROUND

Connected and Autonomous Vehicles (CAVs) present an opportunity to rid ourselves of the bad associated with cars, and to keep and enhance the good by providing a safer, smarter, cheaper and cleaner way to travel.

As a result of introducing CAVs, our cities and societies are likely to face enormous changes, just as they did when the Model T Ford was introduced as a horse-drawn cart without a horse.

At the time, very few foresaw the impact this would have on cities and on our lives. Whereas at the beginning of the twentieth century very few could have even imagined what a cart would look like without a horse, we have become gently prepared for the arrival of CAVs through media, including a range of popular science fiction movies and endless articles and stories. This presents an opportunity to pro-actively reimagine possible futures in a world of CAVs. As engineers, urban planners, designers and transportation planners, we have a responsibility to learn from past mistakes and harness the potential benefits of new technologies to create more liveable cities and urban places, not only for our own benefit, but for the benefit of future generations (Hodson, 2016).

The Global Design Sprint aims to focus on the question of how urban streets can be reclaimed and reimagined through the introduction of fully autonomous vehicles. To tackle this question in the four hours allocated for a Design Sprint, the following information will help you get familiar with the topic of CAVs, the different definitions and types, the projected timeline of their introduction, and the associated benefits and challenges.
There is a lot written and talked about CAVs, yet the term is not always clearly defined. Generally speaking, an autonomous vehicle is a vehicle that can drive itself with little or no human input. For the purposes of this brief, we also define that these vehicles are travelling along road based guideways. There are, however, varying degrees of automation:

- A fully autonomous vehicle operates entirely self-guided. While drivers might have the option to resume control, they are not needed to operate the vehicle.
- A semi-autonomous vehicle contains certain automated features such as autopilot. The vehicle however still depends on a qualified driver who can control the vehicle as needed.
- A connected and autonomous vehicle may be fully or semi-autonomous and connects to other technology at various levels, including devices within the car, other vehicles (V2V), and surrounding infrastructure (V2I).

**EVOLUTIONARY VERSUS REVOLUTIONARY PATH TO FULLY AUTONOMOUS VEHICLES**

While fully autonomous vehicles will almost certainly take over our streets and cities sometime in the future, there is a lively debate regarding which path the transition will take: The “evolutionary” path sees increasing automation and connectivity of current vehicles (e.g. autopilot features and GPS systems that already exist) towards fully autonomous vehicles. The “revolutionary” path sees fully autonomous vehicles like the one built by Google, become increasingly mainstream.

The graphic demonstrates the two paths (Bhuiyan, 2016).
While images of autonomous cars are becoming ubiquitous, it is important to understand the range of CAV types that are existing and also those that are emerging. Looking further into the future we are unable to predict what types of CAVs will emerge, so this will be left to your imagination.

### TYPES OF CAVS - EVOLUTIONARY

<table>
<thead>
<tr>
<th>Name</th>
<th>CAV Type</th>
<th>Ownership</th>
<th>Description</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highway automation</td>
<td>Evolutionary</td>
<td>Private</td>
<td>Optional system sold on new vehicles allowing hands free driving on limited access highways.</td>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
</tr>
<tr>
<td>Driverless valet</td>
<td>Evolutionary</td>
<td>Private</td>
<td>Optional systems within old and new vehicles allowing a vehicle to park itself without a human driver behind the steering wheel.</td>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
</tr>
<tr>
<td>Truck platooning</td>
<td>Evolutionary</td>
<td>Private/Shared</td>
<td>Optional equipment on a HGV allowing the vehicle to engage in a close formation platoon with other similarly equipped vehicles.</td>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
</tr>
<tr>
<td>After market highly automated vehicle kit</td>
<td>Evolutionary</td>
<td>Private</td>
<td>Third party add-on system for existing production vehicles providing highly automated capabilities. This is equipped sometime after the vehicle is originally purchased.</td>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
</tr>
<tr>
<td>Highly automated conventionally designed vehicle</td>
<td>Evolutionary</td>
<td>Shared</td>
<td>A vehicle that conforms with design conventions and is capable of fully-automated driving in most or all conditions.</td>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
</tr>
</tbody>
</table>

(Adapted from Kim et al, 2016)
## TYPE OF CAVS - REVOLUTIONARY

<table>
<thead>
<tr>
<th>Name</th>
<th>CAV Type</th>
<th>Ownership</th>
<th>Description</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly automated with advanced design</td>
<td>Revolutionary</td>
<td>Shared</td>
<td>Capable of truly driverless operation and does not feature any manual controls – no steering wheel or pedals. The driver's seat is still positioned in a similar way that it is currently.</td>
<td><img src="image1.png" alt="Image" /></td>
</tr>
<tr>
<td>Highly automated with novel design</td>
<td>Revolutionary</td>
<td>Shared</td>
<td>Capable of truly driverless operation and does not feature any manual controls – no steering wheel or pedals. The seating arrangement is unconventional.</td>
<td><img src="image2.png" alt="Image" /></td>
</tr>
<tr>
<td>Riderless delivery motorcycle</td>
<td>Revolutionary</td>
<td>Private/Shared</td>
<td>A 2-3 wheeled vehicle that has a cargo compartment. This operates along a programmed route with no rider. The motorcycle receives remote destination instructions and operates with built-in automation capability.</td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>CAV Type</th>
<th>Ownership</th>
<th>Description</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driverless delivery vehicle (light duty and heavy duty)</td>
<td>Revolutionary</td>
<td>Private/Shared</td>
<td>Operates along a programmed route with no driver. The vehicle receives remote destination instructions and operates with built-in automation capability.</td>
<td><img src="image4.png" alt="Image" /></td>
</tr>
<tr>
<td>Highly autonomous bus with advanced design</td>
<td>Revolutionary</td>
<td>Public/Private</td>
<td>A bus that can operate on existing roads and knows when to stop and pull out of bus stops.</td>
<td><img src="image5.png" alt="Image" /></td>
</tr>
<tr>
<td>Low speed highly automated bus with novel design</td>
<td>Revolutionary</td>
<td>Public/Private</td>
<td>A bus that is small in scale that transports users between defined points – generally used within campus style developments.</td>
<td><img src="image6.png" alt="Image" /></td>
</tr>
</tbody>
</table>

*(Kim et al, 2016)*
HOW DO CAVS WORK?

There are three key components required to turn a regular vehicle into a CAV.

The first is a GPS system similar to those found in many vehicles today. A GPS system is a vital part of a CAV’s over-arching technology. No different than Google Maps’ driving directions, it defines the “mission” of the CAV by setting the starting and ending point of the route. It looks at all the roads and chooses the best path for the journey.

The second is a system to recognize dynamic conditions on the roads, generally in the form of radar, camera, LiDAR and ultrasound. Select the buttons below to see what is detected by each part of the system:

The GPS and recognition of dynamic conditions systems form the CAV’s ‘world model’ (Pullen, 2015). The third component turns the information from these two systems into actions for the vehicle (Pullen, 2015). This is generally called the ‘CAN bus’ (which stands for controller area network). This in-vehicle electronic network has been in vehicles for decades and is a central computing system that analyses all the data from the various sensors to manipulate the steering, braking, and acceleration (Armstrong, 2016).
WHAT OWNERSHIP MODELS WILL EMERGE WITH THE INTRODUCTION OF CAVS?

One of the most exciting opportunities of CAVs, at least discussed among progressive transportation planners, is the potential for shared ownership and usage. The rise of on-demand transportation provides a glimpse of what this future could look like, and the first sign of the adoption of CAVs within this model has emerged sooner than expected with two separate announcements in August 2016, one from Uber in Pittsburgh, America, and one from nuTonomy in Singapore, both declaring that they are to begin trialling CAVs as on-demand services in these locations (Harris, 2016).

People no longer own their individual cars, but use smart phone applications to access the particular vehicle needed at a specific point in time – be it a mini-van for moving households on a Saturday, a vehicle to drive to the countryside on a Sunday, or a shared taxi ride home after a Friday night out in the city.

This provides enormous opportunities to further increase the efficiencies introduced by CAVs. Studies show that individual cars remain unused for around 95% of the time (Metz, 2016). Compared to this inefficient use of vehicles, a fleet of autonomous taxis could circulate non-stop, instantly matching supply with demand. This would drastically reduce the need for vehicles. Researchers at the MIT’s Senseable City Lab analyzed the 170 million taxi trips taking place in New York over the course of a year and showed that if people shared rides, the number of trips could be reduced by 40% with minimal inconvenience to the people. This would not only save riders money, but would have beneficial impact on road congestion, air quality, and the environment in general (http://hubcab.org/).

It is however far from certain that this will be the future model of ownership. Millennials, the generation born between the mid-1980s and 2000s, seem to increasingly embrace this sharing model with car ownership and even driver licenses dropping significantly among this cohort. It is, however, doubtful that many car makers see car sharing as their future business model. The most likely outcome will be a hybrid of different ownership models, from full individual ownership, to subscription and pay per ride models that are already emerging, to own and share models where you can rent out your car similar to how you can already rent out your apartment on Airbnb.

Even if we will not have a fully shared ownership model, it is anticipated that the sharing model, especially in dense urban centers, will grow and we will therefore be able to benefit from the greater efficiency in our road networks. This impacts the way we have to rethink (and potentially reclaim!) our roads and streets, our squares and intersections.
KEY BENEFITS

*SELECT EACH OF THE BUTTONS FOR DETAILS
THE BACKGROUND

KEY CHALLENGES
*SELECT EACH OF THE BUTTONS FOR DETAILS

- LEGISLATION
- SOCIAL
- ETHICAL
- TECHNOLOGY
- SAFETY
- CYBER SECURITY
THE IMPACTS OF CAVS ON OUR CURRENT STREETS AND PUBLIC REALM
EXISTING RESEARCH AND CURRENT IDEAS

CURRENT RESEARCH ON HOW CAVS MAY IMPACT OUR STREETS AND PUBLIC REALM

BuroHappold is not alone in its quest for finding innovative solutions to how we plan our cities for the age of CAVs. However, none of the below mentioned studies have looked at specific cities and locations to grapple with the question.

<table>
<thead>
<tr>
<th>Name</th>
<th>Authors</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Making Better Places: Autonomous Vehicles and Future Opportunities</td>
<td>WSP</td>
<td>Parsons Brinckerhoff in association with Farrells</td>
<td>2016</td>
</tr>
<tr>
<td>Re-Programming Mobility</td>
<td>NYU Wagner, Rudin Center</td>
<td>2016</td>
<td>This report presents a set of four alternative future scenarios set in major American metropolitan cities in the year 2030.</td>
</tr>
<tr>
<td>The Death of the Traffic Light</td>
<td>Massachusetts Institute of Technology (MIT), the Swiss Institute of Technology (ETHZ), and the Italian National Research Council (CNR)</td>
<td>2016</td>
<td>These researchers have developed slot-based intersections that could replace traditional traffic lights, significantly reducing queues and delays.</td>
</tr>
<tr>
<td>U.K. City Is Designing a Future of Fewer Cars — By Focusing on Its Roads</td>
<td>NextCity</td>
<td>2015</td>
<td>An article setting out the ambitions of Milton Keynes, a UK city that is currently the host of a set of driverless car trials funded indirectly by the UK government.</td>
</tr>
<tr>
<td>How Driverless Cars Can Reshape Our Cities</td>
<td>Curbed</td>
<td>2016</td>
<td>Curbed spoke with 5 urban design experts to speculate how CAVs may reshape our cities.</td>
</tr>
<tr>
<td>Driver(less) is more</td>
<td>Bjarke Ingels Group (BIG)</td>
<td>2010</td>
<td>BIG’s proposal for the Audi Urban Future Award five finalists of the competition.</td>
</tr>
<tr>
<td>Interzone</td>
<td>Curbed</td>
<td>2016</td>
<td>As part of a challenge posed by Ford Motor Company, six teams of students at Parsons School of Design in New York imagined mobility as something entirely different.</td>
</tr>
<tr>
<td>The Disruption of the Automotive Industry and Reinvention of Mobility</td>
<td>Johann Jungwirth – Chief Digital Officer at Volkswagen AG</td>
<td>2016</td>
<td>A blog post about the mobility revolution that is currently happening.</td>
</tr>
<tr>
<td>Autonomous Vehicle Technology – A Guide for Policymakers</td>
<td>RAND Corporation</td>
<td>2016</td>
<td>This report acknowledges that careful policymaking will be necessary to maximise the benefits of CAVs, and aims to assist policymakers in making wise policy decisions.</td>
</tr>
<tr>
<td>Connected and Autonomous Vehicle Blog Series</td>
<td>BuroHappold Engineering</td>
<td>2016</td>
<td>A blog series written by BuroHappold’s Transport and Mobility team revolving around our research on CAVs.</td>
</tr>
</tbody>
</table>
THE RESPONSE
The aim of the Global Design Sprint is to bring people with different backgrounds and expertise together and provide a platform to stimulate innovative design thinking in response to a specific question or problem. It is an outcome-driven process completed within a limited time period (in this case, four hours).

The focus of this Global Design Sprint is to reimagine how our streets may look and be used in a future of CAVs, taking into account different user groups and various types of CAVs that may exist. The specific question to tackle is: How can urban streets be reclaimed and reimagined through the introduction of connected and autonomous vehicles? The question will be tackled in the specific urban context of the city in which the Global Design Sprint is being held.

The following six step approach to a Global Design Sprint will guide your group through the process and help you with organizing and structuring a Global Design Sprint, from brainstorming and selecting ideas to designing a solution. The approach is a guide and meant to provide help to get to an outcome within the four hours, but please feel free to bring in your own ideas and working style where preferred.

The outcome of the Global Design Sprint will be a series of images presenting solutions to the question above. As BuroHappold is organizing these Sprints in cities across the world, we expect a wide range of ideas, perspectives, and solutions to the question. BuroHappold will publish the different solutions, film presentations of the best ideas, and present the different perspectives on our website and at a Happold Foundation Cities Conversation event.
**THE OVERVIEW**

**THE DETAILS:**
The Design Sprint process should take 4 hours and accommodates a maximum of 4 teams. We would recommend you do not invite more than 20 people to your sprint to keep it manageable.

**THE FACILITATORS:**
Each Design Sprint will have a lead facilitator that essentially organizes and then runs the event. The lead facilitator may wish to have sub-facilitators that support them throughout the event. All facilitators should learn the process of the Global Design Sprint inside out before the event in order to ensure that it runs as smoothly as possible.

**THE SUPPLIES:**
You are free to choose how you want to work during the Design Sprint (i.e. work on paper, use a computer/tablet, or any other preferred means). If you are attending one of our official sprints we will provide:
- Sticky notes (normal size and super size)
- Voting dots
- Timer (one that rings very loud when the time is over!)
- A3 paper
- Water and coffee
- Marker pens

You may wish to bring:
- Laptops

Please contact us with any suggestions or facilitation material you may require and our team will try and accommodate where possible.

**THE TOOLS:**
You will require a number of tools throughout the sprint. If you are attending one of our official sprints then you will be provided with the following:
- Sprint Canvas (page 1 and 2)
- Site Images
- Site Plans
- Thinking Hats (round 1)
- Thinking Hats (round 2)
- Storyboard

If you’re holding your own sprint please get in touch with us on globaldesignsprints@burohappold.com and we will be happy to send you the above tools.

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<table>
<thead>
<tr>
<th></th>
<th>Understand</th>
<th>What we already know</th>
<th>Introduction to Sprint</th>
<th>10 (mins)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Define</td>
<td>Setting the focus</td>
<td>Matrix site selection</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>Discover</td>
<td>Be a curious explorer</td>
<td>Idea generation zen voting</td>
<td>10 15</td>
</tr>
<tr>
<td>3</td>
<td>Decide</td>
<td>Selection of the best idea</td>
<td>Storyboarding project pitches (with thinking hats)</td>
<td>10 30</td>
</tr>
<tr>
<td>4</td>
<td>Design</td>
<td>Develop a concise design together</td>
<td>Feedback from project pitches and preparation for validate stage influence design</td>
<td>90</td>
</tr>
<tr>
<td>5</td>
<td>Validate</td>
<td>Home your design</td>
<td>Project analysis and responses (with thinking hats)</td>
<td>40</td>
</tr>
</tbody>
</table>

**BREAK**
1. UNDERSTAND

BACKGROUND – BEFORE THE SPRINT

Before you take part in the sprint it is highly recommended that you familiarise yourself with the topic of connected and autonomous vehicles. We have made this as easy as possible for you by compiling our research on CAVs into the background section of this interactive brief. This should give you a basic knowledge of:

- The various types of CAVs and when they are expected to be on our urban streets;
- How the technology behind CAVs works;
- The types of ownership models that are currently emerging;
- Key benefits and challenges of CAVs;
- The potential impacts CAVs may have on our streets and public realm;
- A summary of recent studies on CAVs.

If you are now familiar with all of the above, you are ready to take part in one of our Global Design Sprints.

INTRODUCTION TO SPRINT – 10 MINUTES

When you arrive at your sprint the room will be set up and ready for you to get into your designated teams of 4-5 people, please familiarise yourself with others at the sprint and find the table with your name on it.

At the beginning of the sprint there will be a short introduction to what you are going to be doing, during which time the process of the sprint approach will be explained. See the diagram by selecting the ‘+’ below.

You will also be introduced to the question that you will be responding to during the sprint:

“How can urban streets be reclaimed and reimagined through the introduction of connected and autonomous vehicles?”

TIP: The sprint canvas has two pages, one of which is designed to simplify the whole sprint process and the other to allow your group to dynamically track the progress of your sprint.

2. DEFINE

MATRIX – 10 MINUTES

On your table you will find a pack of information containing photographs and plans of three sites that have been selected for the sprint in your city. In your group, you will choose one of these sites to focus on during the sprint. You are also welcome to choose your own site and prepare photographs and plans ahead of the sprint.

Facilitators should encourage a good diversification of site choice at this stage.

Your group should then write on your space on the sprint canvas which site you have chosen so all teams are aware which site has been selected by each group.

TIP: You can find the matrix for your city on the sprint canvas. You can also find a copy of the matrix in the brief.

SITE INSPECTION

In your team, you will be encouraged to carry out a “Site Inspection” by reviewing the pack of information provided on the site and considering the street features that:

- Are there already...
- May change...
- May be required...

Within your team, jot down some observations on sticky notes and ad them to the relevant location on the sprint canvas. Your observations and discussion at this stage are likely to help you focus on the next task.

3. DISCOVER

IDEA GENERATION – 10 MINUTES

Following the site inspection you will, as an individual participant, be given sticky notes and 10 minutes to come up with as many ideas as possible for your chosen site answering the question:

“How can urban streets be reclaimed and reimagined through the introduction of connected and autonomous vehicles?”

At this stage you are encouraged to think about the question as widely as possible, your responding ideas could involve a new use for a space, a reinvented street feature or a new masterplan for your site.

You may wish to use the matrix on the sprint canvas for inspiration during this stage, for example you could apply a combination of user and CAV types to generate ideas. At this stage, place no limit on your imagination as to how the use of our streets may change. No idea is a bad idea and details are not a concern at this stage.

ZEN VOTING – 15 MINUTES

You will all be asked to stick all of your ideas up on one wall. You will be offered a mini break while a facilitator begins to cluster ideas. The facilitator will talk all participants through the clustering process and summarise the key clusters.

You will then be given 20 votes each (in the form of stickers) and must place your votes on your favourite individual ideas (you can put as many of your votes as you want on one idea). While you are voting, you will not be permitted to have any discussion with any other participants so that your opinions are not influenced by others.

If you have not used up all of your votes by the end of the time then you will lose them—so get voting quickly!

Following the voting, the facilitators can pick out individual ideas or key clusters of ideas for group discussion. Feel free to use this time to develop ideas; confirm; clarify them; or connect them with new ideas.
4. DECIDE 🤔

**STORYBOARDING — 10 MINUTES**

In your team you will then choose an idea to draw up a storyboard to further illustrate the idea in full. You can select any ideas; a popular idea, an 'underdog' idea or a combination of ideas.

**TIP:** You can use the storyboard tool provided.

**PROJECT PITCHES & TEAM RESPONSES — 20-30 MINUTES**

Each team is allocated a MAXIMUM of 2 minutes to pitch their storyboard to the other team's in the sprint. The pitches will be timed and no overrunning will be allowed.

During the pitches, each participant is allocated a thinking hat to pose suggestions and make comments on each team’s idea. Each participant should note these comments and suggestions on sticky notes and then, following the presentation, should stick these on the relevant group’s feedback strip on the sprint canvas.

**THINKING HATS FOR GROUP RESPONSES**

The thinking hats at this stage will be passed around just before the first presentation, you will be free to choose your own thinking hat. At this stage the thinking hats will be centered around one of the following:

- User-centered;
- Pragmatist;
- Optimist;
- Devil’s advocate.

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5. DESIGN 🎨

**DESIGN STAGE — 90 MINUTES**

It is now time to flesh out the initial idea in more detail. All ideas should be drawn on to site images and maps where relevant and then pinned on the team’s designated canvas areas. You are welcome to present your ideas in a different way if you feel that it would better suit your idea.

In preparation for the validation stage, as well as to assist and influence you throughout the design of your idea you can also consider:

- The potential benefits and risks associated with the idea;
- The social and economic impact of your idea;
- An idea of what policy could back up your design;
- The environmental impact of your design;
- How your design will stand the test of time;
- What kind of technology could enhance a user’s experience of your site.

In order to inform the design of the idea the teams may revert back to the matrix and use the types of CAVs and users to help influence their design further and add extra elements to the idea.

Teams should take a mini break in the middle of the design stage.

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6. VALIDATE 📊

**PROJECT ANALYSIS & RESPONSES — 40 MINUTES**

Each team is allocated a MAXIMUM of four minutes to present their developed idea to the other teams in the sprint. The pitches will be timed and no overrunning will be allowed.

The thinking hats at this stage will be passed around just before the first presentations, you will be free to choose your own thinking hat. This time the thinking hats are as follows:

- Policy
- Environment
- Social
- Economics
- Future-proofing
- Technology

During each presentation, all participants should use their thinking hat to come up with some final comments and observations on each presented idea which will then be stuck onto the sprint canvas.

**END OF SPRINT — 5 MINUTES**

All participants will be asked to fill in a feedback sheet asking how the design sprint went and what could be done better next time.

Global Design Sprints will continue to happen across our offices and once they are all completed, ideas will be collated into a report. Some groups will be asked to present their ideas in a presentation that will be recorded and posted on BuroHappold’s website.
BATH: WHY HAVE WE CHOSEN THESE SITES?

GREAT PULTENEY STREET
This picturesque street sits between the center of Bath and the A36, but does not allow any traffic (other than buses and taxis) to travel directly between the two as Pulteney Bridge is inaccessibly to general traffic. It is a residential street with wide pavements and parking on both sides. The roundabout is very wide and spacious with not much traffic passing through, there is also parking on the street corners adjacent to the roundabout. Great Pulteney Street is also a cycle route. This presents a good example to think about how CAVs might affect our roads in residential areas and roundabouts, and how the introduction of CAVs may lead to better connections between the A36 and the center of Bath.

DORCHESTER STREET BUS STATION
This busy street has many buses pulling up along the bus stops outside the bus station throughout the day. Passengers waiting for these buses rest on benches outside the station, adding to the already busy pavement with many people passing through. It is also rather unpleasant for pedestrians due to the emissions from the buses. The bus station has bays for many buses behind it, and these exit via the side of the station onto the busy street. The street also feeds into the junction with St James Parade, which many pedestrians cross to enter Bath city center and visit the high street shops. It would be interesting to think about how CAVs might affect the design of streets with so many bus stations, buses and pedestrians to take into consideration.

ST JAMES PARADE JUNCTION
This junction provides an interesting site to study as it has lots of traffic coming through from St James Parade and the Somerset St junction just before it. There are also cars entering and exiting an underground parking facility from this street. At the junction, traffic can turn into Dorchester Street, those coming from the other direction (mainly buses and coaches) must turn at the junction and enter the A367. The junction is very busy with pedestrians as it leads to the city center and shops. There is a triangular island which pedestrians can be stranded on when the lights change, and at the entrance/exit to the underground parking it is difficult for cars to move due to the flow of pedestrians. With CAVs, this junction could be completely different with regards to how the vehicles exit/enter the junction and interact with pedestrians.
BERLIN: WHY HAVE WE CHOSEN THESE SITES?

SCHLOSSSTRASSE
The Schlossstrasse is the major shopping street of the district "Steglitz-Zehlendorf" and Berlin’s biggest retail location. It is highly frequented and well connected with the rest of the city. The introduction of CAVs could be a great opportunity to eliminate the park road attendant and create more space for pedestrians and roadside green.

FRIEDRICHSTRASSE
The Friedrichstrasse is located in Berlin’s central district "Mitte", it is one of Berlin’s most popular streets known for its big variety of cultural opportunities and shopping possibilities. The Friedrichstrasse runs from the northern part of old "Mitte” down south to the "Hallesches Tor” in the district "Kreuzberg". Due to its north-southerly direction it forms important junctions with the east-western axes. The road is very narrow in comparison to other roads with a similar traffic volume and business density. The street segment around the train station Friedrichstrasse is one of Berlin’s hot spots and is connected to many different kinds of transportation modes like the tram, the underground and the regional railway.

HUFELENDSTRASSE/BUETZOWSTRASSE
The corner Hufelandstrasse/Boetzowstrasse in Berlin’s district “Prenzlauer Berg” is close to the park “Volkspark Friedrichshain” and is a mixed residential area with many small cafes and shops. It is planted very densely and has a calm and welcoming atmosphere and is dominated by local residents’ traffic. Through the introduction of CAVs there is the possibility to create an almost car-free zone and eliminate park place seeking.
LONDON: WHY HAVE WE CHOSEN THESE SITES?

EUSTON ROAD
Euston road is one of the most unpleasant thoroughfares in London – both for drivers and pedestrians. Its central connecting function from Regent’s Park, via Euston to King’s Cross makes it extremely busy throughout the whole day. Reimagining this multi-lane streetscape with the unattractive pavement for the age of CAVs might offer both to car-drivers and pedestrians a more enjoyable passage through this road.

WATERLOO BRIDGE
Waterloo Bridge is a central element to linking major tourist areas north of the Thames, such as Covent Garden, with Southbank. Regardless of the bridge’s central role, it is purely dominated by the car and enjoying the great views is rather unpleasant. How might bridges be rethought and used in previously unimagined ways in the age of CAVs?

OLD STREET ROUNDABOUT
The Old Street Roundabout is a central node in east London, where major roads from all cardinal directions come together. The massive extent of this roundabout creates an awkward space in the middle with little appeal to linger. The age of CAVs might transform the whole interchange and give both street and island a new, interlinked purpose.
NEW YORK: WHY HAVE WE CHOSEN THESE SITES?

5TH AVENUE

5th Avenue in Manhattan is one of the most iconic shopping streets in the world, a street with five car lanes. Despite the relatively wide pavements and clear traffic signals, people regularly spill over into the street or jaywalk (any New Yorker’s hobby), creating chaos. The junction 5th Avenue and 50th Street, with the Rockefeller Center at one corner of the intersection, and St. Patrick’s Cathedral at the other corner, is one of the busiest intersections as commuters, shoppers, and tourists clash. Rethinking this street and more specifically this intersection in an era of autonomous vehicles will draw attention from around the world.

FDR UNDERPASS AT 34TH STREET

One of the most controversial urban planners, certainly in New York, is Robert Moses. Among many other things, he created New York’s highway system to support his vision of the automotive city. New York’s Franklin Delano Roosevelt (or FDR as New Yorkers call it) along the East River is part of this system. Reimagining a piece of infrastructure clearly built for twentieth century cars such as the FDR its underpass is exciting in and of itself. The section at 34th Street that takes up valuable waterfront land for roads and parking provides a great opportunity to reclaim our streets.

STATE STREET, BROOKLYN

A typical brownstone Brooklyn street provides an opportunity to rethink the residential street in an era of autonomous vehicles – will cars still be parked on the streets in front of the houses? How will kids play outside their front doors? Do streets remain divided between pavement and road space?
RIYADH: WHY HAVE WE CHOSEN THESE SITES?

OLAYA STREET

Olaya Street is one of the busiest streets in Riyadh during rush hour. However, during the day, it rather has the character of one big car park, due to its massive amount of parking lots alongside as well as in the middle of the road. The introduction of CAVs might give this streetscape a more pleasant appeal.

PRINCE MAJED BIN ABDULAZIZ ROAD

This site is located in the busy neighborhood of Ar Rayyan. It provides opportunities to go grocery shopping and offers a variety of restaurants. Considering the dense uses, there might be the possibility to transform this streetscape into a more pedestrian friendly meeting place through the introduction of CAVs.

PRINCE MAMDUH BIN ABDULAZIZ STREET

A smaller version of Prince Majed Road, different shops and restaurants can be found here. Through the introduction of CAVs, the ground floor uses could profit from more open space in front of their doors, instead of directly facing a row of parking lots and a narrow pavement.
KUALA LUMPUR: WHY HAVE WE CHOOSEN THESE SITES?

BANGSAR VILLAGE – TELAWI 3 STREET

Bangsar Village is a residential suburban neighbourhood as well as a vibrant entertainment and shopping area. Telawi 3 is one of the busiest streets, lined with bars and restaurants on one side and a shopping mall on the other. Heavy car traffic and parked cars on the road result in a dangerous and polluted environment.

BUKIT BINTANG – SULTAN ISMAIL INTERSECTION

The intersection is located in downtown Kuala Lumpur, surrounded by shopping centres, restaurants, hotels and a monorail stop, making it a prime tourist destination. Alleviating congestion and traffic pollution would help the neighbourhood to develop to its full potential.

MONT KIARA – JALAN KIARA

Mont Kiara is one of the many mixed use township area in Kuala Lumpur. It has residential areas as well as offices and educational facilities. Its use patterns result in high congestion during peak hours, with commuters moving in and out of the development through its access roads. Improving its connections and internal traffic will be important to ensure high quality of life for its residents.
REFERENCES


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