ON THE MOVE IN
2040
A FORESIGHT STUDY
ON URBAN MOBILITY
IN SINGAPORE
INTRODUCTION

Singapore has developed a world-class urban transportation system over the past few decades. To ensure continued service quality, there is a need to plan for the future. Planners need not only master daily operational issues, they must also develop a well-informed, long-term understanding of mobility systems to address challenges that lie beyond the 5 or even 10 year horizon.

Mobility is a complex, evolving system shaped by various driving forces and uncertainties in our social, economic, technological, political and environmental situations. Its development cannot be projected by simply extrapolating past and current trends. Are there opportunities for Singapore to take advantage of new technologies that could result in changes in mobility patterns? Are there potentially-disruptive technologies that stakeholders should start exploring today? What are the changing social behaviour and norms that would affect the choice of people’s travel modes? These are some of the questions that can be explored through a rigorous long-range planning process using foresight methods.

This report presents a foresight study examining the future of urban mobility in Singapore. This project is part of a series of foresight studies examining the Future of Cities at the Lee Kuan Yew Centre for Innovative Cities, Singapore University of Technology and Design.

STUDY METHODOLOGY

In order to create future scenarios, we employed a detailed process of first identifying key drivers of change through foresight methods of environmental scanning, expert interviews, focus group discussions, and technology scanning. We define influential drivers of change as strong forces that might effectively shape the future mobility landscape in Singapore, such as trends, challenges, and technologies. These drivers of change were subsequently used in a scenario planning workshop in order to create alternative future visions for 2040.

MOBILITY

Mobility is a complex, evolving system shaped by various driving forces and uncertainties in our social, economic, technological, political and environmental situations.

Our study covers land transport in Singapore. We examine both the passenger and freight transport sectors, with a time horizon that extends to the year 2040.

Our core objective is to develop scenarios for the future of urban mobility. We hope this study will facilitate future policy implementation by highlighting long-term challenges and opportunities for transportation planning in cities. Aside from transport planners, this research is also intended for industry players in the transportation sector, and any stakeholder interested in conducting long-range planning studies on urban transportation.
First, we conducted a detailed environmental scanning by reviewing related urban mobility foresight studies done globally, academic literature, and mass media articles from newspapers and magazines. We identified twelve foresight studies on urban mobility and logistics around the world. These studies covered time periods from as near as 2018 to 2100, with the bulk of studies looking towards 2040. Through this process, we identified some of the drivers of change that are commonly being discussed in several cities. To supplement insights from our review of foresight studies around the world, we also compiled regional and local factors that were potentially influential, in particular, the threat of terrorism, which has affected public transport in several cities. Another factor is Singapore’s smart nation vision, which requires the country to develop greater innovative capacity, and encourage companies to place engineering at the core of their businesses to harness technology to the fullest. Lastly, Singapore’s intention to reduce greenhouse gas emissions intensity by 36% from 2005 levels by 2030 (National Climate Change Secretariat, 2016) is likely to impact the transportation sector, which is a substantial contributor of greenhouse gas emissions in Singapore.

Some of the influential drivers of change common among cities include vehicle automation, virtual travel, robotics and intelligent transportation system integration, rise of on-demand transport service models, uncertain energy mix and prices, climate change and environmental sustainability.

Second, as a primary method of research, we conducted structured interviews with 51 experts involved in various aspects of urban mobility in Singapore. The objective of the interviewing process was to gather insights from people who are specialists in their respective fields. This series of face-to-face interviews had representation from the government, academia, as well as industry professionals. During these interviews, experts shared their views on the top trends, challenges, and technologies for the future of transport. In addition, they discussed specific issues within their realm of expertise, sharing insights about the underlying forces influencing change in their sectors.
Focus Group Discussions

The main objective of conducting focus group discussions in this study was to understand users’ behaviour, concerns and ideals regarding getting around in the future, as well as any current challenges they experience with regards to mobility services.

The key themes that emerged from the focus group discussions are as follows:

1. Participants’ reasons in opting for or using one travel mode over another.
2. Their experiences with the travel modes currently available to them.
3. Their behaviours in response to these past or current travel experiences (e.g., coping or accommodating strategies).
4. Their future expectations and aspirations with regard to mobility services in Singapore in 2040.

Technology Scanning

Based on the insights gathered through environmental scanning, expert interviews, and focus group discussions, possible game-changing technologies in urban mobility were identified. The intention of technology scanning was to describe technologies and their role in Singapore’s mobility system, document their current state, and detail challenges to their development and implementation in the next 25 years, as well as to present possible impacts of each technology on Singapore’s mobility system.

This helps transport stakeholders in planning to develop and/or invest in appropriate technologies. For instance, autonomous vehicles could help provide mobility for the elderly and disabled, personal mobility devices could complement feeder bus services for first- and last-mile travel, and V2X technologies together with data analytics could reduce traffic congestion by dynamically routing transit vehicles through the city more efficiently.

Game changing technologies in urban mobility

- **Data Analytics**: The analysis of big data gathered via smart devices can provide usable information on real-time happenings.
- **Mobile Technology (including Applications for Shared Mobility)**: High level of smartphone penetration provides a platform for many types of mobile applications to meet huge demands.
- **V2X + IoT**: Connected vehicles use wireless technology to communicate with infrastructure (V2I), other vehicles (V2V), or other objects such as pedestrians or personal devices (V2X).
- **Virtual Reality & Telecommuting**: VR is an immersive virtual simulation to create real-life situations that may influence transportation patterns by substituting actual commuting with telecommuting.
- **Drones and Freight Robotics**: Adoption of drones and robots to perform freight movements in urban areas.
- **Shared City Cars**: City Cars are “right-sized” vehicles (usually for 1-3 people) for use in urban areas, are more fuel efficient, lightweight, and require fewer materials in construction.
- **Autonomous Vehicles**: Autonomous vehicles are capable of handling all aspects of driving on all types of roads and in all environmental conditions.
- **Electric/Autonomous Fuel Vehicles**: EVs rely on electric powertrains and significantly reduce noise and air pollution. AFVs run on biofuels, compressed or liquid natural gas, or hydrogen.
- **Personal Mobility Devices**: PMDs (such as electric scooters, hover boards, skateboards, etc.) are lightweight, can travel up to 25 km/h, and typically carry a single person.
**DRIVERS OF CHANGE**

Environmental scanning, expert interviews, focus group discussions, and technology scanning helped to identify key drivers of change. We collected factors with direct or indirect impact in shaping mobility landscape of the future. After clustering them for consistency and dependency, we categorised them into 19 key drivers of change. Then, we sorted these 19 drivers into 5 influencing areas: demographics and urban form, evolving travel behaviour, transportation technologies, macro factors, and global drivers. These drivers are then used in the scenario generation process in the scenario planning workshop that follows.

### 19 KEY DRIVERS OF CHANGE

#### DEMOGRAPHICS AND URBAN FORM
- **AGEING POPULATION**
  Evolving mobility needs due to the increase in number of senior citizens.

#### EVOLVING TRAVEL BEHAVIOR
- **E-COMMERCE**
  Online shopping for goods and services, results in changing travel behavior.
- **SHARED MOBILITY**
  Adoption and commercial interest in car sharing, carpooling, ride-sharing mobility—on—demand services eg, Grab & Uber
- **ACTIVE MOBILITY**
  Adoption of cycling and walking, especially for the first and last mile travel.
- **MULTI-MODAL TRANSPORT**
  Shifting commuter behavior to adopt as well as government policies to promote a multi-modal approach in getting from point-to-point.
- **VIRTUAL TRAVEL**
  Telecommuting and teleworking resulting in changes in mobility demand.

#### TRANSPORTATION TECHNOLOGIES
- **AUTONOMOUS VEHICLES**
  Self—driving vehicles for private and public passenger transport, as well as for freight.
- **REAL TIME INFORMATION**
  Use of real—time information, big data and Internet—of—Things, mobile apps, and intelligent transport systems.
- **PERSONAL MOBILITY DEVICES**
  Personal Mobility Devices such as electric scooters, unicycles, etc.
- **V2X INFRASTRUCTURE & COMMUNICATIONS**
  Communication between road infrastructure and vehicles, with capabilities that include dynamic traffic routing to respond to incidents on the roads, increased safety as vehicles communicate their intentions to each other, and improved congestion management with platooning.

#### MACRO FACTORS
- **GOVERNMENT POLICIES**
  Drive or limit transportation demand and supply, including commercial investments and innovations.
- **GREENHOUSE GAS REDUCTION**
  Influence on transportation policies to reduce greenhouse gas emissions intensity by 36% from 2005 levels by 2030.

#### GLOBAL DRIVERS
- **COST OF ENERGY**
  Drastic fluctuations in global oil prices influencing innovations and developments in transportation sector.
- **GLOBAL TERRORISM**
  Greater concern about transportation system security and resilience.
- **ENVIRONMENTAL AWARENESS**
  Resulting in greater public and commercial interest in electric & alternative fuel vehicles. Also, increasing awareness of environmental impact of transportation systems and infrastructure.
- **INNOVATIVE CAPACITY**
  Singapore’s capacity to innovate is ranked behind several other developed countries. There is increased drive to foster home—grown innovations rather than importing ready—made solutions.

### FACTORS SHAPING FUTURE MOBILITY

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ON THE MOVE IN 2040
SCENARIO PLANNING WORKSHOP

We used a scenario planning process to inform our mobility foresight study. A full-day workshop was conducted at Singapore University of Technology and Design in March 2016. Workshop participants were chosen again based on purposive sampling. Invited participants were domain expert and stakeholders within the transport sector in Singapore. There were a total of 22 participants and they can be classified into three broad categories based on their professional affiliations: academia, government agencies and industry. In the workshop, participants were first briefed on the significance, potential impact and nature of uncertainty of all the key drivers of change. After which, participants were asked to rate the drivers based on their inherent uncertainty and impact on the future of urban mobility in Singapore. After this exercise, five drivers of change were identified that reflected a collective opinion of workshop participants.

Two scenarios:

- **Shared World**
- **Virtual World**

**THESE FIVE DRIVERS (ACCORDING TO PARTICIPANTS) ARE BOTH HIGHLY UNCERTAIN AND HIGHLY IMPACTFUL**:

1. Local innovative capacity,
2. Personal mobility devices,
3. Virtual travel,
4. Multi-zone districts, and
5. E-commerce.
In this scenario, there is a radical shift towards embracing shared living concept. Shared mobility is an innovative transportation strategy that enables users to gain short-term access to transportation modes on an ‘as-needed’ basis, such as the shared use of a vehicle, bicycle, or other modes. The term includes various forms of carsharing, bikesharing, ridesharing (carpooling and vanpooling and on-demand ride services). (Shaheen et al, 2015)

Multi-zone districts are an overhaul of the current land use plan that fundamentally changes travel patterns and reduces cross-island travel for Singaporeans. In this future urban form, each district of approximately 3–4 sq. km is organised in clusters of self-sustaining zones, complete with residential blocks around the circumference of each zone and commercial activity hubs, shopping centres, educational institutes, healthcare, metro stations and other facilities at the centre of each zone.

**GOVERNMENT POLICIES**

The government has taken up the dominant role in shaping the mobility landscape and designing the new urban form. The government has focused on developing shared mobility systems in Singapore to increase utilization per vehicle and giving people an alternative to buying their own cars. In 2040, shared mobility systems has the highest share of modal split among all vehicle miles travelled in Singapore. Moreover, since the late 2010s, the government has re-invented the education structure to nurture innovation and creativity, and to promote entrepreneurship and cultivate more risk-taking behaviour in young Singaporeans. By 2030, reforms in the education system have borne fruit as Singapore is among the top 10 countries in the world for innovative capacity. As a result of this increasing innovative capacity, Singapore is benefiting from harvesting home-grown innovation in the mobility sector. Lastly, due to the policy shifts in education system towards making “Every School a Good School”, household relocation for priority placement in schools has now become a thing of the past.

**MOBILITY MODES**

The primary modes of transport within the districts are autonomous shuttle buses, shared personal mobility devices (PMDs) such as e-bikes, e-scooters, and a vibrant culture of active mobility. Since early 2020s, infrastructure was being built to make walking and cycling more conducive, comfortable and efficient way to travel short distances. Shared PMDs are extensively being used for intra-districts trips as well as first/last mile trips to/from metro stations as “Park-and-Ride” and “shared stops” facilities at stations make it convenient for commuters to park their PMD and embark on a train ride.

By 2030, PMD models specially designed for the aged have also been adopted by elderly population. For cross-island travel, the vast state-run mass rapid transit network, which was completed by 2030, forms the backbone. It is further complemented by car sharing and ridesharing facilities. This was a radical shift in Singaporean users’ travel behavior compared to 2016, where cars were perceived as status symbols in Singapore.

**LIFE AND WORK STYLE**

In an attempt to reduce cross-island travel for daily trip purpose, both government and companies are constantly developing innovative ways to provide people with most facilities within their districts. By 2030, another form of commercial centers starting springing up that can act as combined work spaces for several companies. In this new era of work culture, employees go to commercial centres in their districts, find a desk, enter their passcode in the virtual reality headset, and find themselves in a virtual office attending meetings and chatting with their colleagues – who are also tuned in through virtual reality headsets from different districts. By 2040, most companies invest in virtual offices, rather than land and physical locations. This new urban form has allowed the elderly and impaired to pursue their interests without travelling long distances. By 2035, the retirement age has increased to 80 as people are living longer and healthier lives.

Multi-zone districts have resulted in a very different urban environment. With the co-location of work centres, schools, leisure and recreational activity hubs, it is common to see district centres to operate round the clock. It is almost like districts never sleep. People have adopted more flexible working hours, as opposed to fixed 9–6 schedule. Mobility modes have evolved to satisfy the demand of 24-hour communities, with autonomous buses operating throughout the night as well.

“...INCLUDING VARIOUS FORMS OF CAR-SHARING, BIKESHARING, RIDE-SHARING (CARPOOLING AND VANPOOLING AND ON-DEMAND RIDE SERVICES).”
URBAN FREIGHT

In this scenario, e-commerce has grown significantly, but still accounts for less than two-thirds of total retail. Most people still enjoy shopping at brick-and-mortar stores given its social dimension. However, they no longer need to carry their purchases with them due to a new form of urban freight within the districts. A web of underground tunnels connects each residential cluster with shopping centres and supermarkets. Purchases are deposited at freight delivery centres located inside the shopping malls, and tagged with the recipient’s address. By the time a person reaches home, his goods are waiting at a freight receiving centre near his residential block. Moreover, the significant rise of e-commerce, together with sophistication of shared mobility systems has led to the provision of Peer-to-Peer (P2P) freight delivery services. By 2040, most urban deliveries are being undertaken by this independent courier network.

“...WITH THE CO-LOCATION OF WORK CENTRES, SCHOOLS, LEISURE AND RECREATIONAL ACTIVITY HUBS, IT IS COMMON TO SEE DISTRICT CENTRES TO OPERATE ROUND THE CLOCK. IT IS ALMOST LIKE DISTRICTS NEVER SLEEP.”
IMPLICATIONS OF SHARED WORLD

INDIVIDUAL

Shared World is likely to be a favourable scenario for individuals. The new public transport chain will become more efficient, as autonomous buses will solve issues of bus bunching and erratic schedules, and PMDs will provide first- and last-mile transport for commuters to access the MRT. Individuals will no longer feel the need or desire to buy a car as shared mobility systems become cheaper and more efficient. Moreover, having elite schools within each district and onsite accommodation for institutes of higher learning will eliminate the need for students to travel long distances. Lastly, residents of each district will likely experience a greater sense of belonging that would in turn encourage them to contribute actively to the welfare and betterment of their districts.

SOCIETY

On the societal level, this scenario is likely to have largely positive implications as well. With greater utilisation per vehicle, more land is freed up for other purposes. Less resources will be needed to meet the needs of the population. Moreover, shared systems will promote ground-up ownership and decision-making, traits that can make society more resilient and self-reliant. Lastly, the overall decrease in congestion due to shared mobility systems will increase public satisfaction and reduce the transportation environmental externalities. However, emergence of autonomous buses might drastically reduce the need for drivers, and increase the level of skilled expertise required for the transport sector.

“...THERE WILL BE A MIX OF WINNERS AND LOSERS IN SINGAPORE’S INDUSTRIES.”

INDUSTRY

There will be a mix of winners and losers in Singapore’s industries. On one hand, the conventional taxi industry is likely to suffer from the emergence of shared mobility systems. On the other hand, there will be new business opportunities for social network and technology companies as they are likely to form the backbone of shared mobility systems. Data analysts will find work in the space of real-time distribution of shared vehicles and autonomous PMDs. There will also be opportunities for new industry players to operate the autonomous buses in the public transport system. Lastly, shared workspaces and satellite offices are likely to result in significant cost savings for companies.

GOVERNMENT

In the new urban form, more meticulous planning will be required to determine the right mix of commercial, residential, and industrial developments for each district. Similarly, there will be a need to develop routes and infrastructure for autonomous buses, active mobility and intra-district travel. Moreover, as multi-zone districts start to spring up around the island, there will be a need to constantly monitor traffic patterns and underlying causes for that. For instance, employment patterns need to be monitored to analyse what percentage of people prefer to reside and work in the same district, or how many students prefer to choose educational institutes based on location. The government will also need to enable the clear resolution of legal liability issues for shared vehicles and in freight through clear legislative frameworks. Lastly, public and private sector players will need to collaborate to ensure the success of shared-service models.
The Virtual World scenario depicts a future in which technology has made leaps and bounds in becoming smarter and seamlessly integrated. This is the age of artificial intelligence and the Internet of Things. At the dawn of the 21st century, the rise of individualism and advancement in technology meant that people were becoming less dependent on each other for work, information, and social engagements. In this scenario, Singaporeans have adopted individualistic lifestyles across the board. Many live in single-person homes or small households, surrounded by high-tech gadgets, working, shopping and engaging in social and recreational experiences through their personalized virtual reality gadgets, and even travelling in personal travel pods.

In this scenario, market players dominate in driving innovation and systems while the government plays an assistive role. In the early 2020s, the regulatory environment encourages companies and start-ups to test-bed various new technologies and introduce new business models quickly in Singapore. As a result, Singapore quickly became one of the most tech-savvy countries in the world. Major technology giants started opening their research and innovation hubs in Singapore, and local companies benefited from increased investment by international venture firms and hedge funds. By the mid-2030s, Singapore was being called the “Silicon Valley of the East”. This change in approach transformed Singapore’s status from being a technology importer to a net technology exporter. Technology exports became a significant portion of Singapore’s national GDP.

The primary mode of transport in this scenario is the personal travel pod. These are hybrids of personal mobility devices that first gained prominence in the late 2010s, and autonomous city cars that became dominant in 2020s. These autonomous pods are fully enclosed capsules, with climate control features and work stations that can seat either one person or two people. The pods are much more than just mobility devices: they are equipped with artificial intelligence, enabling them to serve as robotic personal assistants and virtual presence devices. People can instruct them to carry out various tasks, such as going to stores and picking up groceries for them, or even travelling to offices and attending meetings on their owners’ behalf. A nation-wide infrastructure was developed for these pods in the 2020s.

Pod lanes use state-of-the-art technology that allow pods to take in electricity from the road to recharge their batteries on the move. Since these pods are autonomous and small, their road space usage efficiency is significantly higher than conventional cars. The government embarks on an ambitious plan to “pod-everything” in the late 2030s. According to this plan, all personal vehicles on the road are autonomous pods. Use of these individually-owned pods is complemented with access to an extensive metro (MRT) network.
URBAN FREIGHT

E-commerce technology has made leaps and bounds, and is widely adopted as a preferred mode of shopping after 2020. By late 2030s, E-commerce technology has advanced significantly. For instance, artificial intelligence can now predict individual buying behaviour by analysing people’s consumption and buying behavior. Goods are delivered even before the purchases have been made, aided by anticipatory logistics. In this age of technology, urban freight is being moved primarily by autonomous freight robots and delivery drones. As soon as purchases are predicted or made, the goods are picked up by autonomous robots in warehouses and carried to the buyer’s doorstep. In the food sector, drones are now the primary mode of delivery.

"... HIGH-TECH GADGETS, WORKING, SHOPPING AND ENGAGING IN SOCIAL AND RECREATIONAL EXPERIENCES THROUGH THEIR PERSONALISED VIRTUAL REALITY GADGETS, AND EVEN TRAVELLING IN PERSONAL TRAVEL PODS."
IMPLICATIONS OF VIRTUAL WORLD

INDIVIDUAL
The virtual world scenario is likely to be favourable for individuals due to tremendous time savings. Individuals can conduct their day-to-day activities in virtual worlds, and autonomous pods can provide personal transportation services to all segments of society. Time freed up from commuting becomes leisure time for people to engage in recreational and social activities. This scenario will also make it possible for the elderly and handicapped to be employed without much differentiation. Moreover, artificial intelligence (AI) will take human productivity to unprecedented levels. People can instruct AI to carry out low-value tasks while they keep themselves occupied with leisure or work that may be difficult to imagine today. However, the virtual world might increase social isolation as individuals pursue their interests in their own virtual worlds.

SOCIETY
Singapore will experience much less congestion as people adopt virtual lifestyles, increasing transport efficiency and reducing the environmental impact of society. Also, schools and colleges can transcend capacity constraints as virtual classrooms can house any number of students. On the flip side, society might experience large-scale unemployment as automation and artificial intelligence might replace humans in several industries. There would also be a negative impact on the society if isolation increases and social engagements decrease.

“...SOCIETY MIGHT EXPERIENCE LARGE-SCALE UNEMPLOYMENT AS AUTOMATION AND ARTIFICIAL INTELLIGENCE MIGHT REPLACE HUMANS IN SEVERAL INDUSTRIES.”

INDUSTRY
As with the industrial revolution of the 19th century and technological revolution of the 20th century, this scenario is likely to create tremendous advancement and opportunities. For instance, sensor systems, IoT, and connectivity around the island will be implemented, providing opportunities for companies and start-ups to expand their businesses and employ more people. Similarly, there will be tremendous opportunities to advance R&D in specific fields such as artificial intelligence, robotics, and virtual reality. There is also a business case for developing virtual world software and technologies that can lead to a new age of architects, designers, and engineers. However, retail shops might suffer as they are replaced by warehouses, and pods will replace humans for shopping.

GOVERNMENT
The regulatory environment may change to support developments in Singapore’s high-tech systems. For example, land transport planners may have to strongly support telecommunication regulations, which are integral for the smooth operation of the transportation system. Since roads will be dominated by autonomous pods, road infrastructure will have to be modified with new lanes, charging capabilities, and V2X infrastructure as Singapore shifts towards ‘pod-everything’ transport policy. This may also result in redundancy and excess capacity in the existing public transport system. Lastly, for this scenario to function seamlessly, the onus will be on the government to collaborate with industry players by sharing data collected throughout the island from various sensor systems.
CONCLUSION

We conducted this foresight study to consider various drivers of change that can influence long-term urban mobility planning in Singapore. Our study utilised scenario planning approach as mobility is a complex and multi-faceted problem, influenced by several internal and external factors. How these factors will play out in the future depends on how policy makers and stakeholders address current and upcoming trends and challenges. By using scenario planning approach, we hope to prepare stakeholders for the future that is inherently uncertain but shaped by our decisions today.

The two scenarios, Shared World and Virtual World, illustrate the alternative futures that would result in when different policy directions are pursued and different technologies become dominant. In the Shared World, for instance, government plays an active role in crafting the urban form and promoting shared consumption of resources. In this scenario, shared mobility services are encouraged and barriers to owning personal cars become too high to deteriorate people from spending on them. In the Virtual World, on the other hand, government lets the dominant technologies shape consumer behavior and reacts to consumer preferences. In this scenario, market forces shape the urban mobility landscape. It is possible that the actual future might have elements from both these scenarios, or it will be predominantly, inclined towards one scenario. However, by analysing the differences between the two scenarios, we identified that there are three critical uncertainties that would decide how inclined the future would be towards one scenario versus the other. These are 1) influence of future land use and urban form, 2) people adopting individualistic lifestyle over community living, and 3) sophistication of virtual reality technologies.

PEOPLE ADOPTING VIRTUAL AND INDIVIDUALISTIC LIFESTYLE OVER COMMUNITIC LIVING

Second major uncertainty that leads to one scenario over the other springs from the question of how we will live in the future? In our research, we have found strong opinions for both point of views. One group strongly supports the idea that humans are, at the end of the day, social animals and will prefer physically meeting other humans for work, leisure, and experiences. The other group advocates that adoption of trends, such as emergence of social media, and devices, such as smartphones, is a testament to the fact that we are preferring more virtual and individualistic lifestyles. This group advocates that we will be more receptive to lifestyles inclined towards work-from-home, school-from-home, e-commerce and social media. Stakeholders in long-range transportation planning should closely monitor the trends in human behavior over adoption of individualist or community living lifestyles to prepare for the future.

SOPHISTICATION OF VIRTUAL REALITY TECHNOLOGIES

Although there are several technologies, such as autonomous vehicles, personal mobility devices, drones, etc., that will play an influential role in how people and goods will move in the future, virtual reality technologies hold the potential of fundamentally changing the meaning of travel. Thus, one of the most disruptive technologies under development today could be virtual reality technologies. When it comes to virtual reality technologies there are three key uncertainties: 1) when will these technologies become sophisticated enough to replicate real life experiences in virtual world, 2) whether these technologies will be able to give people an opportunity to experience virtual world with several senses or would it just be limited to one or two senses, and 3) would these technologies be adopted like smartphones of today whereby people carry their personalised virtual reality gadgets with them all the time and use them to ‘transport’ themselves wherever they want to. It is likely that either of the three uncertainties hinder the influence of virtual reality technologies, but stakeholders in transport planning should monitor the trends in the development and adoption of these technologies to plan for the future.

INFLUENCE OF FUTURE LAND USE AND URBAN FORM

One of the major differences between the two scenarios is the radical shift in urban form. In the Shared World, government has taken active role in designing a new urban form for the island state of Singapore. This urban form is centered around multi-zone districts and all the mobility modes and services are introduced to complement efficient travel both within and across the districts. This scenario would not be likely without government’s stringent policies on car ownership and urban redesign. In contrast, Virtual World would more likely be the scenario if organic evolution of city happens. If market forces were to influence the society’s behavioural patterns, then we can expect Singapore to evolve more towards Virtual World.
RESEARCH TEAM

This study was performed by a multi-disciplinary team of researchers based at the Singapore University of Technology and Design (SUTD).

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