Dubai Self-Driving Transport Strategy & Roadmap

Summary

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Executive Summary

Self-driving Transport (SDT) has long been a goal of the transportation technology research community. As far back as the 1970s, early efforts in the US and the UK produced limited self-driving functionalities in automobiles. What was once a distant goal, is now becoming a reality. Self-driving Transport systems offer to transform not only the way we understand and use transportation, but also our social life. SDT technologies promise to transform the private vehicle industry, and even more importantly for Dubai - the mass public transport.

Today, Dubai Metro is one of the largest self-driving public transportation systems in the world while other public transport modes such as first-mile-last-mile shuttles, BRT are also making considerable progress towards achieving self-driving functionalities. His Highness Sheikh Mohamed bin Rashid Al Maktoum has announced a goal that “by 2030, 25% of all transportation trips in Dubai will be smart and driverless.” In view of achieving this goal, this report outlines a strategy and roadmap for developing self-driving transport services in Dubai – focusing primarily on the public transport.

Global studies suggest that the benefits of SDT could be huge ranging from highway safety benefits to reduced parking costs, reduced mobility costs, environmental benefits, improved productivity, and improved quality of life and citizen happiness. In Dubai, it is estimated that these benefits of SDT would be valued at more than AED 22 Billion per year.

The strategy is prepared with clear sight on the current SDT technology status, key challenges, and the trend of technology based on the research and development efforts and the investments made and pledged by worldwide governments and private investors.

While there have been significant developments by car manufacturers such as Tesla, Volvo, Mercedes Benz; technology companies such as Google; and ridesharing companies such as Uber; considerable challenges remain unresolved in safety, legislation and technology capability of the vehicles.

In Dubai, the challenges are further raised by the extreme weather conditions and the diverse cultural mix of drivers and other road-users.

“Today we launched Dubai Autonomous Transportation Strategy, by 2030, 25% of all trips in Dubai will be driverless”

His Highness Sheikh Mohammad Bin Rashid Al Maktoum
Vice President and Prime Minister of the UAE and Ruler of Dubai

A Vision for the Future of Transport

As a part of Dubai's Smart City strategy, His Highness Sheikh Mohammad bin Rashid Al Maktoum recently announced a goal that "by 2030, 25 percent of all transportation trips in Dubai will be smart and driverless."

As part of the initiatives to achieve this ambitious goal, RTA retained a team of Self-driving Transport (SDT) experts to develop an actionable roadmap and an action plan. This Self-Driving Transport Project will provide a vision, roadmap, and policy framework comprising a comprehensive strategy for testing, development, and deployment of SDT.

Considering the technology readiness and the trends, we have developed a unique SDT strategy for Dubai which would set Dubai apart in the following ways:

Multimodal SDT

While other major cities/countries are typically focusing on enabling the self-driving private vehicles, Dubai should target SDT across all 7 modes of public transport fleet including metro, tram, bus, taxi, marine transport, cable cars and shuttle. This means that the industry partners will be able to develop their technology with ease by working in partnership with the RTA. Currently, the self-driving Metro is estimated to serve approximately ~9% of all individual trips in Dubai.

Worldwide Competition

Dubai will host a worldwide SDT competition. SDT practitioners from across the globe will be invited to participate in the competition and showcase their technology, processes, abilities and strengths in SDT.

For Dubai, this will be a great way to not only try out these technologies, learn critical lessons, but also to become one of the leading attractions for SDT investors and technology researchers across the globe.

SDT Operations Policies/Legislation

Dubai should lead the world in policies and legislation for SDT operations. To achieve these unique feats, this report outlines a detailed roadmap for self-driving public transport, connected vehicles, and private SD vehicles. Additionally, the project has developed key building blocks/enablers and detailed initiatives to ensure that the roadmap deployment can be achieved.

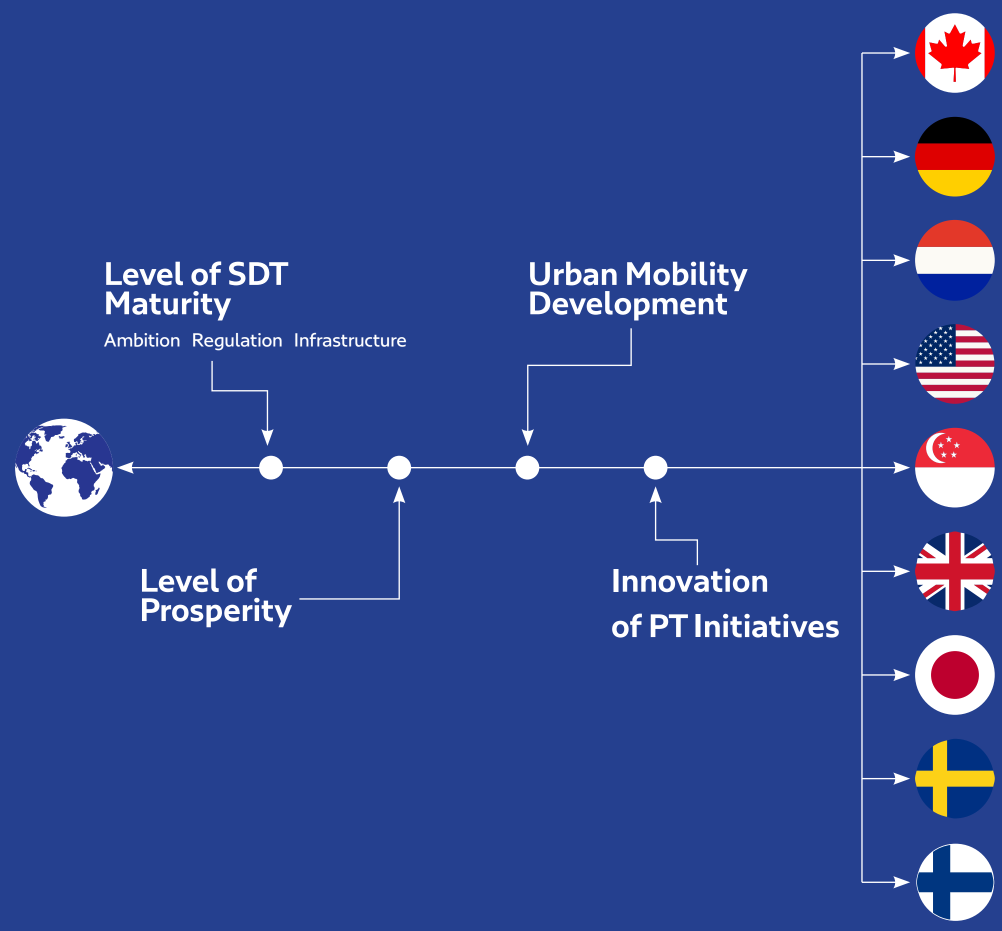
The key pieces of the roadmap and building blocks are:

- Design and deploy a self-driving public transport system
- Deploy HD mapping with over the air update
- Conceptualize, design and deploy a connected cloud
- Study, define and implement robo-taxis
- Infrastructure analytics for the SD vehicles
- A code of practice with a level based approach
- Policy/legislation for the operation of SDT

International Benchmarking

Self-Driving Transport is a worldwide phenomenon. Research and development work on self-driving transport systems is occurring in all major developed countries in North America, Europe, Asia and Australia. Advances in research and development of SDT technology are being announced almost on a daily basis, and industry perception is continually changing for even the most knowledgeable people in the field. There are parallel research and development processes occurring between Self-driving Transport systems and Connected Vehicle (CV) communication technologies. CV technologies enable safer and more efficient driving for both human and computer driven vehicles through warnings and detailed information sharing. Hundreds of projects have been undertaken worldwide to advance both self-driving and connected vehicle technologies.

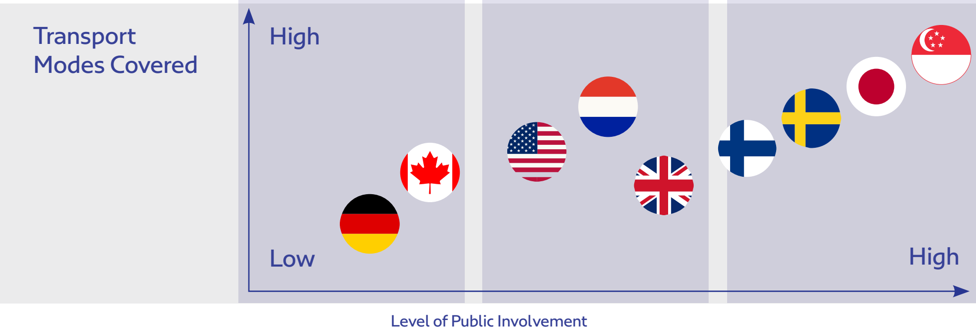
Following countries were selected for detailed study



Three SDT models have been identified from global benchmarks

Common Characteristics	Private Driven Model	Hybrid Model	National Program Model
SDT Target	No clear target	Government sets targets and pvt. consortiums aid decision making	Government leads target setting and decision making
Funding	Limited public support	Equally shared by government	Limited private participation
Mobility Focus	Selected modes	Major transport modes	All public and private transport modes

Countries Mapping



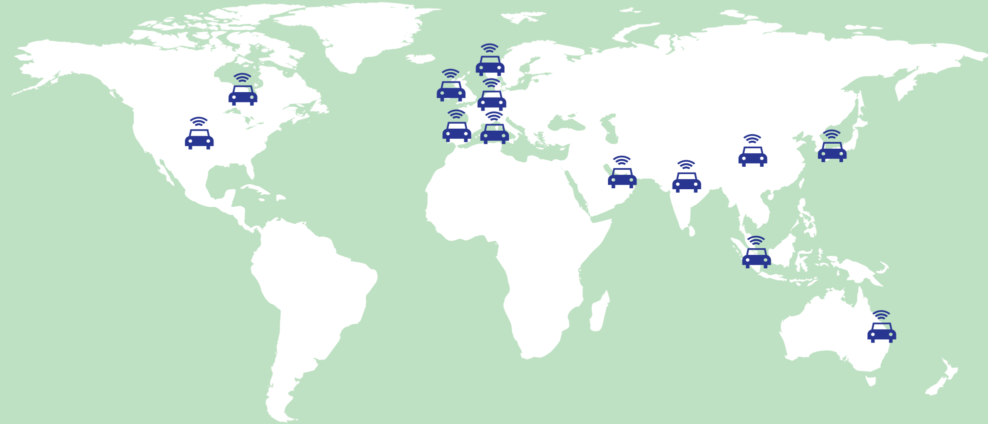


Figure 1: SDT - A worldwide phenomenon

Local Challenges

Additionally, Dubai offers unique challenges to the SDT with extreme weather conditions, cultural diversity and challenges related to first mile last mile applications due to the high temperatures in the summer.

Extreme Weather Conditions

Humidity, Fog, Sandstorms

Cultural Diversity

People Acceptance

First Mile/Last Mile

High Temperatures

Dubai Strategy

The uniqueness of the Dubai SDT Strategy is focused on the provision of comprehensive, multi-modal SDT services. SD public transport services have the potential to transform mobility in Dubai as a key component of the Dubai Smart City and Smart Life strategies.

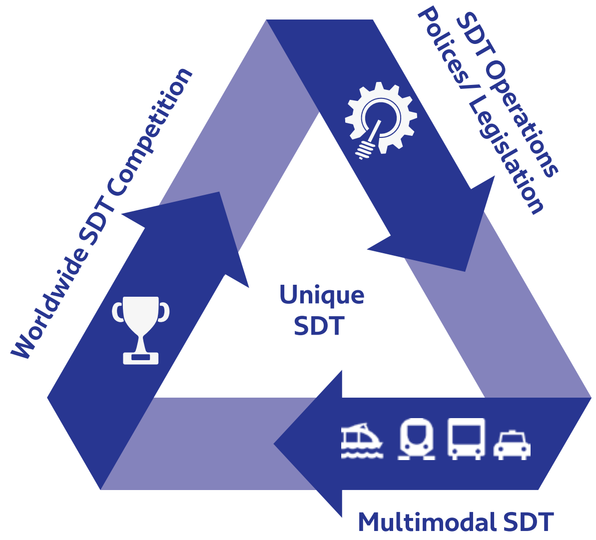
While vehicle manufacturers are generally taking an evolutionary, driver-centric approach to providing SD vehicles, SD public transport can evolve quickly in Dubai using public transport and first-mile, last-mile connections.

Dubai can meet the 25% SDT trips goal faster by focusing on systems that RTA can control and by bringing more travelers to the Metro and other public transport modes.

Dubai is also among a small number of unique governments in the world with an integrated transport agency structure. Transport management in the U.S, Canada, Australia, UK, and Europe includes a patch-work of local, regional, state and federal agencies that have varying levels of responsibility and jurisdiction. While the collective resources of regions such as the U.S and Europe may be larger than Dubai and the UAE, the distributed nature of funding, regulatory authority and inter-regional politics makes the path to progress less smooth.

In particular, the management of public transport services and traffic services is generally separated in most other first-world transport agencies, and will slow progress in public transport service provisions. With the inspirational support provided by Dubai leadership, the pace of development and deployment in Dubai will be accelerated with respect to other first-world regions with targeted investment, smart partnerships, and unwavering dedication to implementing the activities on the roadmap and the building blocks.

Overall, three (3) areas have been identified for Dubai to be the leader in the world for SDT.



Multimodal SDT

As described in the previous sections, a lot of major cities have allowed SDT testing in their respective jurisdictions. However, these places have been focusing primarily on automation of private vehicles and freight movements through automation of heavy vehicles (trucks).

In contrast, Dubai should target Self-driving Transport across all 7 modes of public transport. This will enable a harmony of SD systems across transport modes and will accelerate the conversion of traditional trips to SDT trips.

Worldwide SDT Competition

As part of the SDT target announcement by His Highness Sheikh Mohammad Bin Rashid Al Maktoum, he envisioned Dubai to host a worldwide SDT competition which will be unlike any other such competition. The details of this competition will be announced very soon, but it is important to note that this will be an opportunity for all manufacturers, operators, researchers and academics to showcase their strengths and capabilities, to further propel SDT in this region and throughout the world. This competition will be a key part of Dubai's strategy.

SDT Operations Policies/Legislation

While there are many trials/demonstrations of self-driving vehicles underway throughout the world, there exists a clear and significant gap in policies and legislation related to the revenue based operation of self-driving vehicles.

Dubai should lead the world in developing these policies and legislation to allow full operation of self-driving vehicles on the public streets of Dubai.

The initiatives listed above include capital intensive projects such as public transport, robo-taxis and infrastructure projects. However, there are opportunities to partner with the private entities to offset some capital cost and mitigate some risks of operation and maintenance of new assets. Further, these partnerships will ensure that Dubai stays at the frontier of new technologies without always having to renew investments.

The efforts required to undertake the proposed initiatives and building blocks span across the RTA agencies. The agencies will need to invest significant effort in study, design and development of the initiatives in coordination with internal and external stakeholders. Equally, the execution of the roadmap activities will require a champion to oversee the entire initiative, review progress made by each agency and external stakeholders, and strategize how to stay on course to achieve the 25% target. In addition, the report proposes that the feasibility of a RTA Center of Excellence (CoE) be studied further. The CoE would lead the research and development of new technologies and would create an ecosystem to drive technological concepts to their deployment stage.

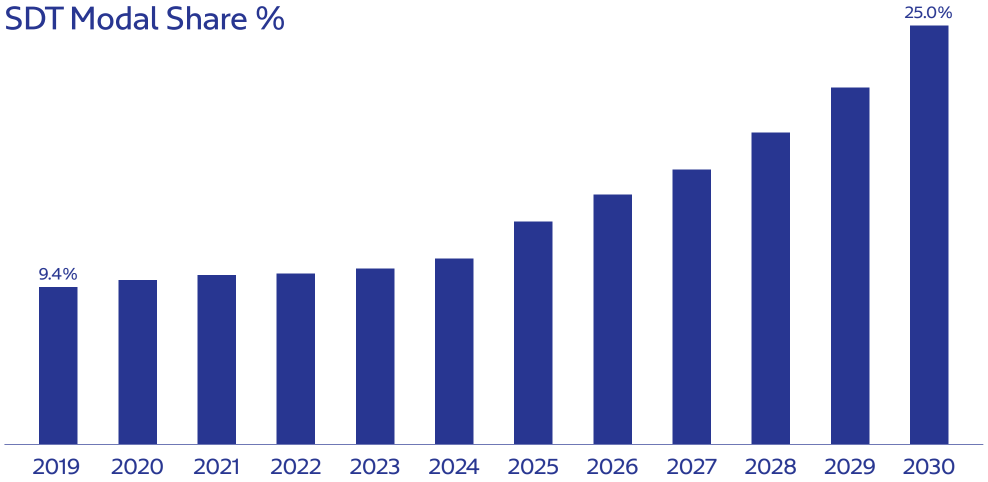
Based on the technology readiness, SDT strategy and roadmap and the building blocks initiatives, it is estimated that public transport, robo-taxis, first-mile last-mile and private cars will account for majority of the 25% of self-driving trips in Dubai by 2030. Incentives and other enablers for SD private vehicles will likely drive the percent of SDT to more than 25% by 2030.

As shown below, different transportation modes will contribute to SDT adoption and the percentage of SDT individual trips will build on over the years as the public transport modes design, test and deploy SDT systems in Dubai.

1. Legislation	• Testing • Operations
2. Driver Behavior & Acceptance	• Driver behavior in Level 2-3 vehicles • Driver acceptance of SDT
3. Driver & Vehicle Licensing/Registration	• SDT driver licensing • SD vehicle testing, registration, renewal
4. Insurance/Liability	• Crash liability of self-driving vehicles • Insurance requirements
5. Infrastructure Requirements	• Infrastructure improvements for SDT • Crowd sourcing and analytics
6. Cyber Security/Data Privacy	• Self-driving vehicle security • On-board data recording and retrieval
7. Connected Vehicle Enablers	• Communication (V2I, V2V, V2X) • Connected cloud
8. HD Mapping	• Accurate HD mapping • Over the air update

It is projected that the SDT modal share will grow from the current expected level of approximately 9% to reach 25% in 2030

SDT Modal Share %



SDT Roadmap

SDT Implementation Plan to Achieve 25% SDT by 2030

Contribution to 2030 SDT %

Mode	Metro/ other Rail	Bus	Marine	Taxi/Shared Mobility	Beyond PT[1]	**Target 2030** (% Total Trips)
SDT Strategy	**11%**	**2.6%**	**~0.1%**	**~1.8%**	**9.5%**	**25%**

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