

ELECTRONIC TOLLING

Global Study

2019
EDITION

The updated reference
report on electronic
toll collection



Towards connected vehicle payments

The first strategy consulting & research firm entirely focused on augmented mobility & automation

Strategy consulting services

Strategy
definition

Investment
assistance

Procurement
strategy

Innovation
management

Business
development

Project
management

Market research services

Off-the-shelf
reports

Subscription
services

Custom
market
research

Fields of expertise

Mobility services

Car pooling
Car sharing
Smart parking

Multimodal
mobility
Ride hailing

Road side
assistance
Tax refund

Vehicle services & telematics

bCall
eCall
FMS
SVT / SVR

Tracking
VRM
In-car Wi-Fi
Fuel cards

Parking
Navigation
Speed cameras
Traffic information

Usage-based charging

Car As A Service
Electronic Toll
Collection

Mobility-as-a-
Service
Road charging

UBI / PAYD
Vehicle rental
Vehicle leasing

Vehicle data & analytics

AI
CAN-bus
Crowd-sourcing
Data protection

Driving behaviour
OBD
Predictive
analytics

Remote
diagnostics
xFCD

Vehicle automation

ADAS

Autonomous
cars

Autonomous
trucks

Enabling technologies

Positioning (GNSS
/ WiFi / cellular)

M2M /
connectivity
Smartphones

Telematic devices
V2X

Our clients come from across the mobility ecosystem

Analytics, maps & applications providers



Automotive manufacturers & suppliers



Telematics solution providers



Mobile telecom operators



Fleet & fuel, ITS & regulators



Device & location suppliers



Insurers, aggregators & assistance providers

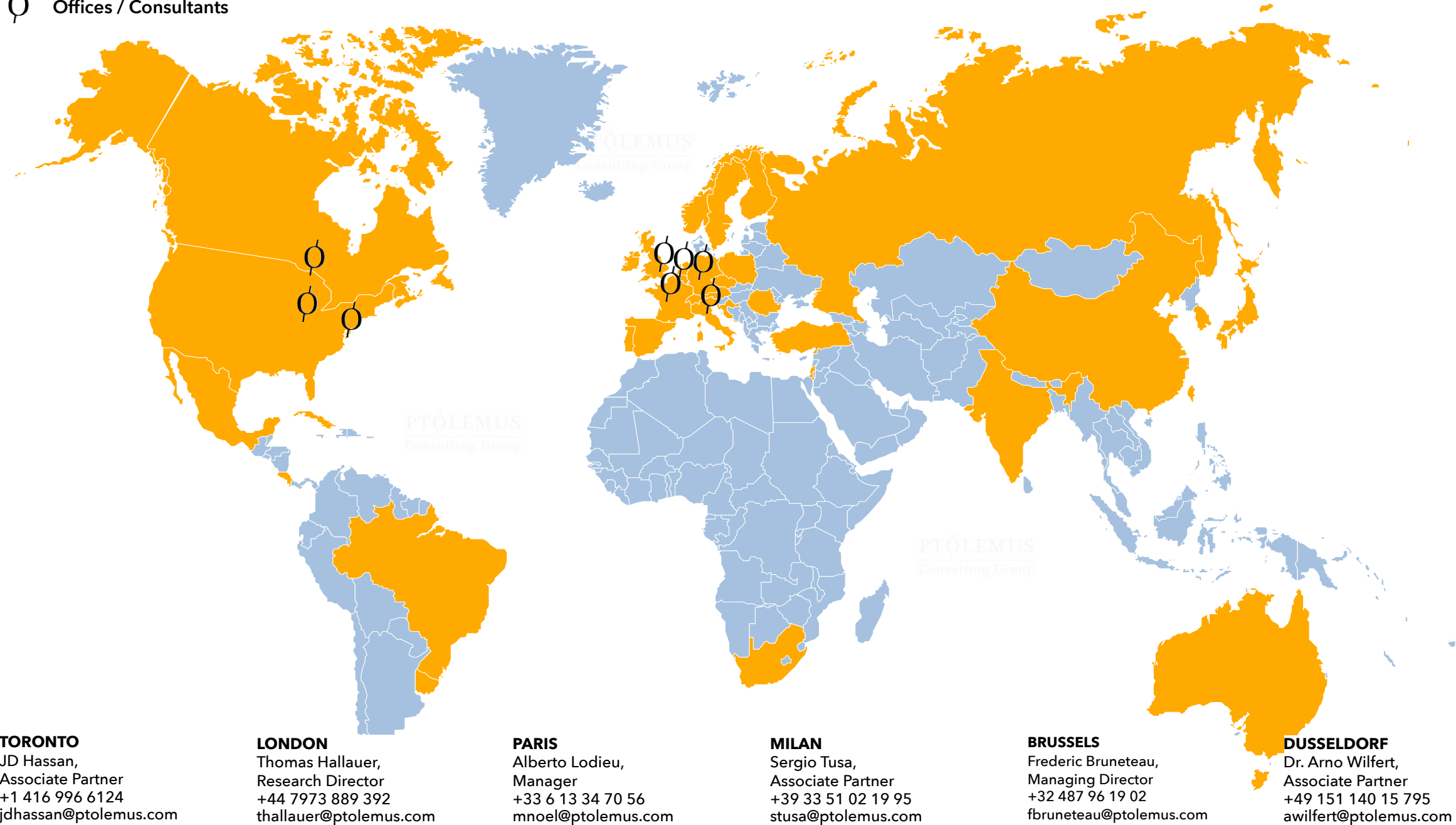


Banks & private equity investors



We are a team of 25 consultants, experts & researchers including 14 nationalities to serve our clients worldwide

Clients
Offices / Consultants



20 assignments to help our clients define & implement their ETC and connected services strategies



Helped a major European Government develop its future HGV tolling strategy



Led a feasibility study of a telematics-enabled shadow tolling scheme



Helped build the company's next generation fleet services strategy & go-to-market plan

Leading global fuel card issuer



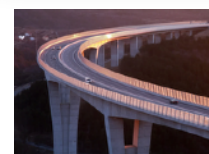
Assisted the board of its technology unit in its strategy definition

Global motorway operator



Defined its new strategy in EU connected fleet vehicle services market

Leading toll/EETS service provider



Defined its global data & analytics strategy to predict incidents

Major road operator



Evaluated the technologies & business potential of the EU electronic tolling market

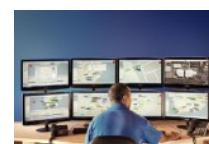


Defined the European pricing & business case for FMS, fuel card services, tolling & tax refund



Defined its future vehicle connected services global strategy

Global roadside assistance group



Built 5-year strategy & go-to-market plan in EU mobility services market

Global electronic tolling supplier



Defined connected vehicle strategy to monetise driving behaviour & diagnostics data

Data aggregator



Assisted in developing its usage-based charging telematics business



Define its 5-year US fleet services strategy & go-to-market plan

Global fuel card company



Defined the company's fleet telematics strategy & services dashboard specifications



How PTOLEMUS can help you beyond this study

- **Strategy definition**
 - Road policy strategy assistance
 - Market entry assistance
 - Data strategy and analysis
 - Mobile tolling strategy development
 - Multimodal mobility design and planning
 - Future vision of vehicle payments
- **Investment assistance**
 - Due diligence
 - Feasibility studies
 - Market forecasting
 - Cost benefit analyses
- **Procurement**
 - Definition of road charging schemes
 - Assistance to tenders
 - Selection and sourcing of ETC technology
- **Business development**
 - Partnership strategy definition
 - Assistance to tender response
- **Project management**
 - Assistance in management of road pricing projects
 - Congestion charge project management

The report was written by a diverse team of international experts



Frederic Bruneteau
Managing Director, Brussels

Frederic is the founder of PTOLEMUS.

He has over 21 years of experience in the mobility domain, including 14 years providing strategic and financial advisory services. At PTOLEMUS he has performed over 100 strategy consulting assignments for global leaders such as **Abertis**, **Arvento**, **Astrata**, **BP**, **Bridgestone**, **Brisa**, **Danlaw**, **Egis**, **ENI**, **ESRI**, the **European Commission**, **Fleet Complete**, **HERE**, **Kapsch TrafficCom**, the **Netherlands Ministry of Infrastructure and Water Management**, **Michelin**, **Scania**, **Sofico**, **Telit**, **Thales Alenia Space**, **Toyota**, **Vodafone** and **WEX**.

Frederic performed a complete review of this report.



Justin Hamilton
Consultant, London

Justin has 6 years of experience within the transportation, electronic tolling, road user charging and urban mobility sectors, focusing on market research and project delivery.

He holds expert knowledge in the fields of electronic toll collection and RUC. At PTOLEMUS, he has participated in multiple major assignments for global road tolling and usage-based charging companies including **AvisBudget Group**, **BP**, **Brisa**, **Circle K**, **DKV**, **ENi**, **Europ Assistance**, **Kapsch TrafficCom**, the **Netherlands Ministry of Infrastructure and Water Management**, **OMV**, **Satellitic**, **T-Systems** and **WEX**.

Justin led the research, writing and publishing of this report.



Sahand Malek
Senior Strategy Consultant, Brussels

Sahand has gained 5 years experience in telematics research and development projects, focussing on data analytics and forecasting

He has helped clients such as **Abertis**, **Baloise Insurance**, **Bridgestone**, **CVC Capital Partners**, **Pioneer** and **ZirconTech**. He has contributed to multiple assignments, including the design, analytics, scoring & pricing strategies for several European insurance companies, and led the due diligence of the analytics solution of a CAN-bus vehicle data collection provider.

Sahand built the market forecast model for this report.



Thomas Hallauer
Research & Marketing Director, London

Thomas Hallauer has gained 17 years of strategy, research and marketing experience in the domain of insurance, fleet telematics, autonomous vehicles and mobility from companies such as **Admiral**, **LexisNexis**, **Liberty Mutual**, **Michelin** and **Octo**.

Thomas was the lead author of the **Electronic Road Tolling Global Study 2015**, the **UBI Global Study 2016**, the **Autonomous Vehicle Global Study 2017** and the **Mobile Insurance Global Study 2018**.

Thomas provided a complete review of the report.

The report was written by a diverse team of international experts



Marissa Burkett

Senior Business Analyst, Paris

Marissa has more than 3 years of experience in management consulting for organisations such as **Eagle Hill Consulting**, **Nationwide**, the **Netherlands Ministry of Infrastructure and Water Management**, the **United Nations**, **USAid**, the **US Federal Acquisition Service**.

Within PTOLEMUS, she has started developing an expertise in electronic tolling and road user charging. She also recently contributed to the Mobile Insurance Global Study, analysing 16 UBI insurers and 20+ UBI apps, as well as the human factors involved in mobile insurance.

For this report, Marissa analysed the major European service providers, as well as the state of ETC in North America.



Hallgrimur Oddsson

Business Analyst, Brussels

Halli Oddsson has over 6 years experience in market research, consulting and business journalism in Europe.

He has gained experience in the connected vehicle industry through projects for global assistance providers, fleet telematics service providers and device manufacturers assessing the markets for connected services and go-to-market viability. He has worked directly with **Allianz**, **AXA**, **DKV Euro Service**.

For this report, Halli researched the ETC markets in Asia, Europe and Oceania as well as analysing best practices for promoting road charging.



Tong Wang

Business Analyst, Paris

Tong Wang has experience in strategy and management consulting in both China and Europe.

She helped a consortium of car manufacturers and mapping companies forecast the HD map market.

She has also assisted companies including **Allianz**, **AXA**, **DMP** and **Société Générale SA**.

For this report, Tong researched, analysed and wrote the sections on China.



Annie Reddaway

Research Analyst, London

Annie Reddaway has over 4 years of experience in the connected vehicle industry, specifically in the areas of connected car, cybersecurity and mobility services. She has worked with companies including **BMW**, **Car2Go**, **GM**, **Ford**, **TomTom** and **WirelessCar**.

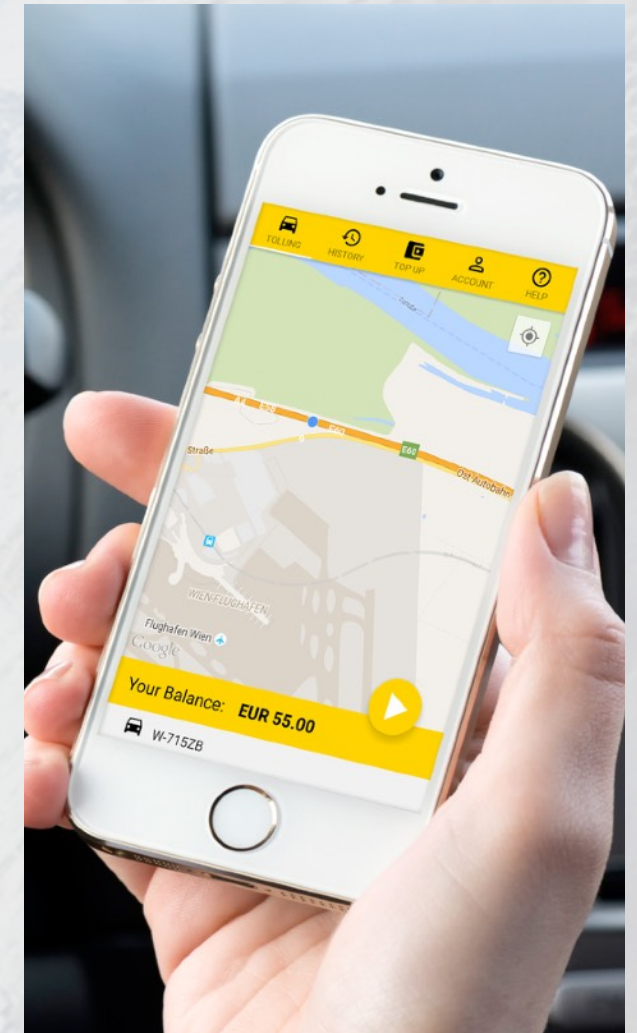
In 2018, Annie was awarded "Best New Mobility Leader, Analyst or Spokesperson" in the Tech Cars Awards from Auto Connected Car News.

For this report, Annie researched and analysed the state of ETC in Latin America and various European countries, as well as the technologies involved in tolling.

Road tolling is undergoing rapid change...

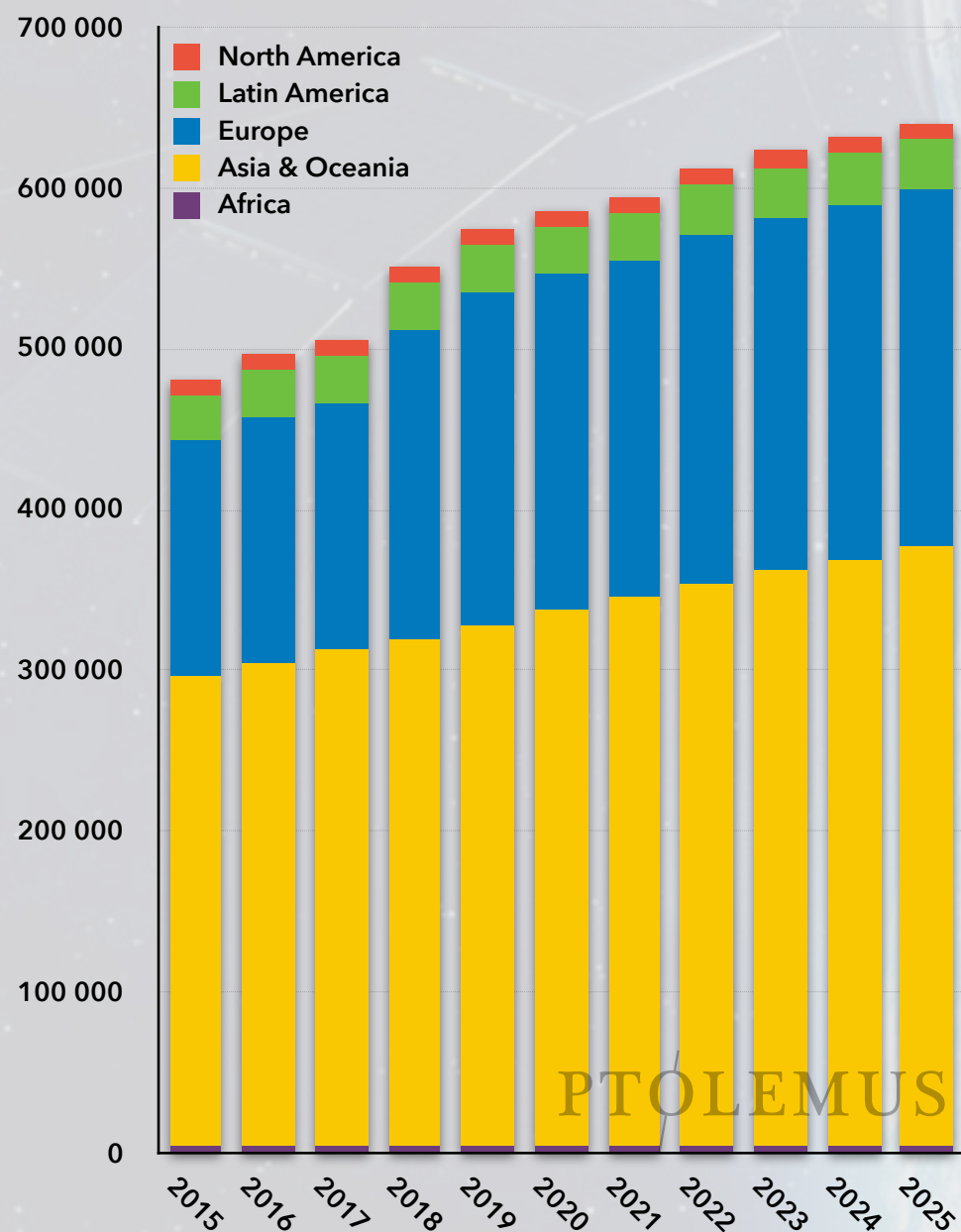
Since the Electronic Toll Collection Global Study in mid-2015, **the electronic tolling landscape has changed markedly** in almost every region of the world:

- In November 2015, **Russia** launched the (then) world's largest HGV toll; collecting per km fees via GNSS across a network of more than 51,000 kms of road
- In April 2016, **Belgium** launched nationwide tolling for HGVs using GNSS technology based on the German model
- **Japan** introduced ETC 2.0, a new national tolling system with data-driven value added services at its heart
- **Australia's** Transurban became the first toll operator to enable GNSS/geolocated smartphone-based payments with the launch of LinktGO in late 2017
- In February 2018, **Audi** became the first passenger car OEM to announce full integration of an interoperable ETC device in the US, delivered by **TransCore**
- Shortly after, US toll service provider **E-ZPass** announced a partnership with Verdeva to deliver in-vehicle payments via the RFID tag
- In May 2018, Shandong province in **China** began trials of smartphone based toll payments via mobile wallets **AliPay** and **WeChat Pay**
- In the same month, **Chile** began the mass replacement of annual payment booths with ETC to decrease congestion and increase the adoption of ETC devices
- In July 2018, **Atlantia** signed an agreement with **Fiat Chrysler Automobiles** to enable full integration of **Telepass** devices into new **Jeep** models
- **India** mandated the sale of RFID ETC tags with all new 4 wheeled vehicles and their use in all commercial vehicles
- **South Korea** began replacing all manual toll plazas with a nationwide 'smart tolling' infrastructure based on ANPR charging alongside the existing DSRC/IR OBU's
- In late 2018, both **Germany** and **Poland** nationalised the operation of their respective HGV tolling schemes by bringing **Toll Collect** and **ViaTOLL**, respectively, into public ownership
- The European **EETS** market finally sprang to life with the registration of 8 EETS providers, including companies owned by **Shell, Daimler, Total, Abertis, Vinci** and **Atlantia**
- US satellite radio services company **SiriusXM** acquired smartphone-based toll services provider **Paytollo**



...Which will have implications for all players across the value chain

Length of tolled road network by region (km)*



Alongside this flurry of activity, **interoperability continues its advance** as India, Colombia, China and Philippines push to integrate their systems.

All the while, **advances in technology and lower prices - especially in RFID - are enabling the growth of ETC** to more and more markets at more ambitious scales. Indeed tolling worldwide is entering a golden era as **governments search for funding alternatives** in the wake of rapidly declining fuel tax revenues, combined with a growing need to manage urban congestion and improve air quality.

In this report we break down and guide you through the changes above.

We analyse key qualitative and quantitative questions including:

- The extent to which **smartphone tolling** could disrupt the current value chain
- The **changing role of different stakeholders** as we move towards an integrated, service-driven market and

who will emerge as the owner of the customer relationship

- How to approach new schemes and **effectively communicate** them to motorists

This report is the result of years of primary and secondary research, interviews, discussions, conference attendance, consulting assignments and industry knowledge.

It would not have been possible without the enthusiastic engagement of companies and individuals from across the tolling, road user charging, telematics and automotive industries.

We hope you enjoy reading this report and look forward to ongoing discussions.

Sincerely,

Frederic Bruneteau
Managing Director

The report mentions more than 250 companies (1/4)

Company	Country	Type	Company	Country	Type	Company	Country	Type
A4 Mobility	Italy	Systems integrator	ASETA / SEOPAN	Spain	Association	BlaBlaCar	France	Mobility service provider
ABCR	Brazil	Association	ASFINAG	Austria	Toll charger	BMW	Germany	Automotive OEM
Abertis	Spain	Toll road operator	Ashoka	India	Concessionaire	Bosch	Germany	Device and equipment supplier
Advantage Rent a Car	USA	Rental car company	ATI	USA	Association	BP	USA	Toll service provider
Aecom	USA	Toll services	Atlantia	Italy	Concessionaire	Bradesco	Brazil	Banking/financial services
Agencia Nacional de Infraestructura	Colombia	Government institution	Atos	France	Integrator	Brisa	Netherlands	Road operator
AISCAT	Italy	Association	Audi	Germany	Automotive OEM	BroBizz	Denmark	Toll service provider
Aitek	Italy	Systems integrator	Automatic	USA	OBD dongle service provider	Budget	USA	Rental car company
Alamo	USA	Rental car company	Autopase	Chile	Service provider	BYD Auto	China	Automotive OEM
Alibaba	China	Technology company	Autostrade per l'Italia	Italy	Toll operator	California Department of Transportation	USA	Transportation Authority
Alipay	China	Technology company	Autostrade Tech	Italy	Device and equipment supplier	Caminos y Puentes Federales	Mexico	Government institution
Alliance for Toll-Free Interstates (ATFI)	USA	Association	Avis	USA	Rental car company	Capita	UK	Systems integrator and operator
Allianz	Germany	Insurer	Avtodor	Russia	Toll charger	Ceitec	Brazil	Chip provider
Amazon	USA	Technology company	Axxès	France	Toll service provider	Central Nippon Expressway Company	Japan	Toll operator
American Association of Motor Vehicle Administrators (AAMVA)	USA	Association	Azuga	USA	Device and equipment supplier	Central Texas Regional Mobility Authority	USA	Toll operator
Anhui Wantong Technology Co., Ltd.	China	System provider	BAIC	China	Automotive OEM	Changan	China	Automotive OEM
ANIH Berhad	Malaysia	Toll operator	Baidu	China	Technology company	Chevin	UK	Fleet management service provider
APCAP	Portugal	Association	Banco do Brasil	Brazil	Bank	China Ocean Shipping Company	China	System provider
Apple	USA	Technology company	BancPass	USA	Service provider	Citra Marga Nusaphala Persada	Indonesia	Concessionaire
APRR	France	Road operator	Bank Mandiri	Indonesia	Service provider	Cofiroute	USA	Concessionaire
ARH	Hungary	Device and equipment supplier	Beijing Wanji Technology Co., Ltd.	China	Device and equipment supplier			
Arya Omnitalk	India	Systems provider and integrator	BelToll	Belarus	Toll operator			
			BestPass	USA	Service provider			
			Bip&Go	France	Service provider			

The report mentions more than 250 companies (2/4)

Company	Country	Type	Company	Country	Type	Company	Country	Type
Comdata	USA	Fleet management service provider	EROAD	New Zealand	Fleet management service provider	General Motors	USA	Automotive OEM
ConectCar	Brazil	Service provider	European Commission	Europe	Government institution	Gentex	USA	Automotive supplier
Continental	Germany	Device and equipment supplier	Eurotoll	france	EETS service provider	Greenpass	Brazil	Service provider
Coretex	New Zealand	Telematics service provider	Eurowag	Czech Rep.	EETS service provider	Grundig	Germany	Device and equipment supplier
Daimler AG	Germany	Automotive OEM	Facilpass	Colombia	Service provider	Hellastron	Greece	Association
DARS	Slovenia	Toll service provider and toll charger	FAI Service	Italy	Fleet management service provider	Hertz	USA	Rental car company
DBA Group	Italy	Integrator	FCA	Italy	Automotive OEM	Hino Trucks	Japan	Automotive OEM
Department for Transport, UK	UK	Toll charger	Federal Highways Administration	USA	Federal transportation agency	Honda	Japan	Automotive OEM
DKV	Germany	Toll service provider	Federal Motor Carrier Safety Administration	USA	Federal agency	Hu-Go	Hungary	Service provider
Dollar	USA	Rental car company	Federal Transit Authority	USA	Federal agency	Hungarian Transport Administration	Hungary	Toll charger
Dongfeng Motor Group	China	Automotive OEM	FleetCor	USA	Service provider	Hyundai	South Korea	Automotive OEM
DriveNow	Germany	Mobility service provider	Fleetio	USA	Fleet management service provider	I-95 Corridor Coalition	USA	Association
E-ZPass Group	USA	Toll operator	FleetPride	USA	Automotive supplier	I+D	Mexico	Toll operator
E100 fuel card	Poland	Fuel card provider	Florida Department of Transportation	USA	Transportation Authority	IAVE	Mexico	Service provider
East Nippon Expressway Company	Japan	Toll operator	Florida Turnpike Enterprise	USA	Toll operator	IBI	Canada	Systems provider and integrator
Easytrip	France	Service Provider	Flypass	Colombia	Service provider	IBM	Belgium	System integrator
Edenred	France	Service provider	Ford	USA	Automotive OEM	IBTTA	Global	Toll associtaion
EFKON AG	Austria	Device and equipment supplier	G.E.A	France	Device and equipment supplier	iCell	Hungary	Device and equipment supplier
Egis	Global	Toll operator/ Service provider	GAAR	India	Concessionaire	iDVROOM	France	Mobility service provider
emovis	France	Systems integrator and operator	Gazprombank	Russia	Bank	Illinois State Toll Highway Authority	USA	Transportation Authority
ENI	Italy	Service provider	Geely	China	Automotive OEM	IMS	Canada	Service provider
Enterprise	USA	Rental car company	General Directorate of Highways (KDM)	Turkey	Toll charger	Indian Highways Management Company	India	Toll charger

The report mentions more than 250 companies (3/4)

Company	Country	Type	Company	Country	Type	Company	Country	Type
Indra	Spain	System integrator	MSTS	Netherlands	EETS Service provider	PSA Group	France	Automotive OEM
INVIAS	Colombia	Government institution	National	USA	Rental car company	Q-Free	Norway	Device and equipment supplier
IRB	India	Concessionaire	National Highways Authority of India	India	Government institution	Qualix	India	Integrator
Jasa Marga	Indonesia	Concessionaire	National Payment Corporation of India	India	Government institution	Ramax Group	Russia	Systems integrator
JD.com Inc.	China	Payment application	Navman NZ	New Zealand	Telematics service provider	Reliance	India	Concessionaire
Jenoptik	Germany	Device and equipment supplier	NCS	Singapore	Systems integrator	Rent A Toll	USA	Service provider
Kapsch TrafficCom AG	Global	Device and equipment supplier, system integrator and concessionaire	Neology	San Diego US	Device and equipment supplier	Ressa	Italy	Energy company
Kenwood (Japan)	Japan	Device manufacturer	Nissan	Japan	Automotive OEM	Rhode Island Department of Transportation	USA	Transportation Authority
KIA	South Korea	Automotive OEM	Norbit	Norway	Device and equipment supplier	Rosavtodor	Russia	Toll charger
Korea Expressway Corporation	South Korea	Toll operator	Northgate Public Services	UK	Systems integrator	RosTec	Russia	Toll operator/ Service provider
L&T Construction	India	Concessionaire	Northwest Parkway	USA	Toll operator	RT-invest Transport Systems	Russia	Device and equipment supplier
LogPay	Germany	Toll service provider	Nusantara Infrastructure	Indonesia	Concessionaire	RUC Monkey	New Zealand	Telematics service provider
Mack Trucks	USA	Automotive OEM	NZ Transport Agency	New Zealand	Toll operator	Rutoll	Russia	Device and equipment supplier
Magneti Marelli	Italy	Device and equipment supplier	OMV	Germany	EETS service provider	SafeFleet	Hungary	Telematics service provider
Marga Mandalasakti	Indonesia	Concessionaire	Oregon Department of Transportation	USA	Transportation Authority	SANEF	France	Road operator
Maven	USA	Mobility service provider	OSC	India	Concessionaire	Scania	Sweden	automotive OEM
Miami-Dade Expressway Authority	USA	Toll operator	Pagatelia	Spain	Service provider	Schneider Electric	Global	Integrator
Microlise	UK	Fleet management service provider	Panasonic	Japan	Device and equipment supplier	Secure InterAgency Flow (SIF)	USA	Service provider
Microsoft	USA	Technology company	Pase Urbano	Mexico	Service provider	Sem Parar	Brazil	Service provider
Mitsubishi	Japan	Automotive OEM	PaseYa	Colombia	Service provider	Shell	Global	Energy company
Mitsubishi Heavy Industries, Ltd	Japan	Device and equipment supplier	PayTollo	USA	Service provider	Shenzhen Genvict Technologies Co Ltd:	China	Device and equipment supplier
Morning Station	South Korea	Device and equipment supplier	PLUS Expressway	Malaysia	Concessionaire	Shenzhen Jieshun Science And Technology Industry Co., Ltd.	China	Toll solutions provider and systems management company

The report mentions more than 250 companies (4/4)

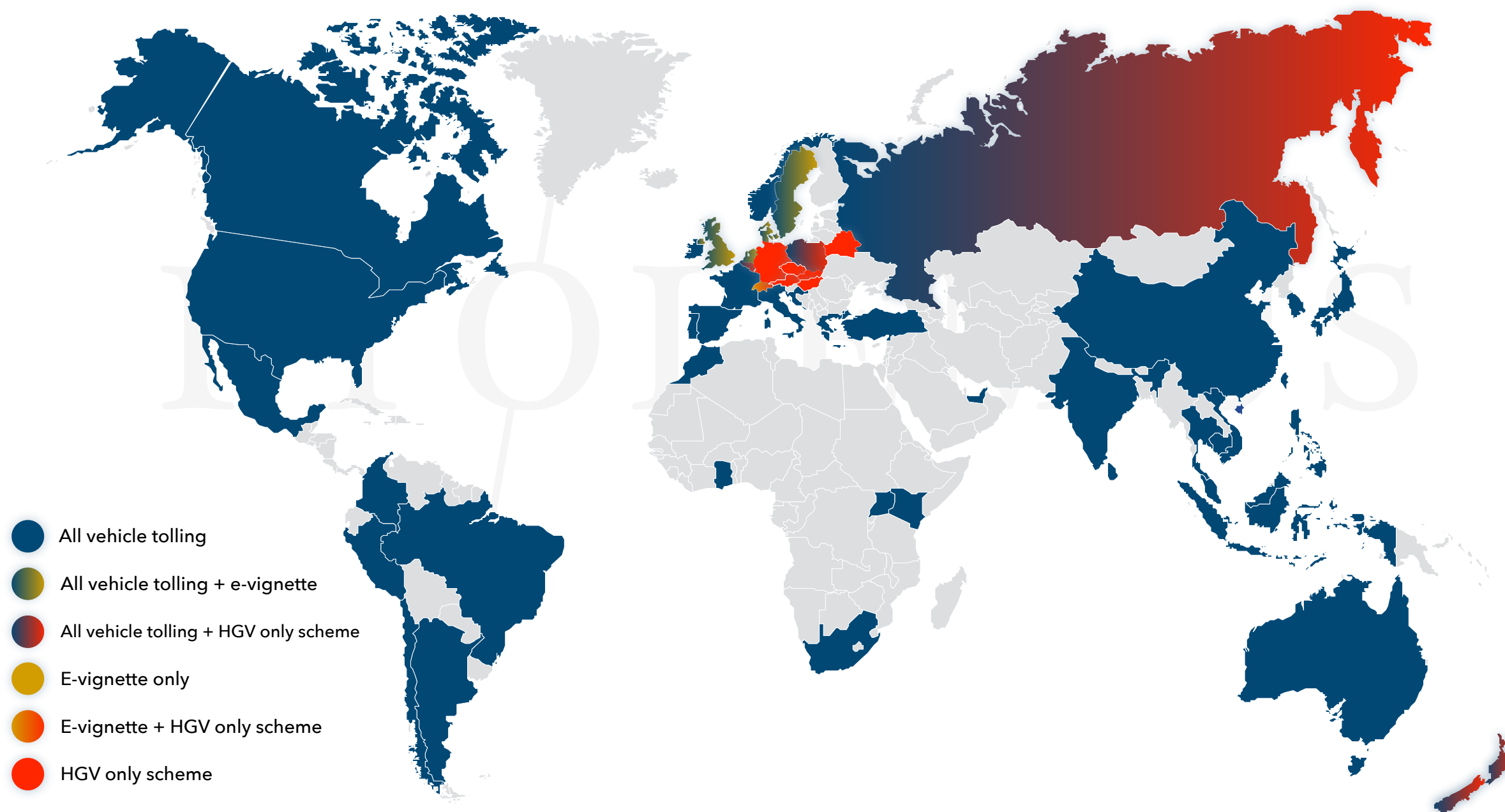
Company	Country	Type	Company	Country	Type	Company	Country	Type
Siemens	Germany	Device and equipment supplier	Toll Collect	Germany	Toll operator	Verizon Telematics	USA	Telematics service provider
Silvercar	USA	rental car company	Toll Service	Hungary	Toll operator	Vialtis	France	Fleet management service provider
Skytoll	Slovakia	Toll charger	Toll4Europe	Germany	EETS Service provider	Vias Chile	Chile	Concessionaire
State Farm Insurance Company	USA	Insurer	TollPlus	India	Service provider	Vinci	France	Road operator
State Toll Road Authority (SRTA)	USA	Toll operator	Tollr	India	Service provider	Vitronic	Germany	Device and equipment supplier
Sunpass	USA	Toll operator	Tolltickets	Germany	EETS Service provider	Volvo	Sweden	Automotive OEM
Survision	France	Device and equipment supplier	TomTom	Netherlands	Telematics service provider	Washington State Department of Transportation	USA	Transportation Authority
Syndicate RFID	India	Device and equipment supplier	TopEurop	France	Service provider	WeChat	China	Technology company
T-Systems International GmbH	Denmark	Integrator	Total	Global	Energy company	West Nippon Expressway Company (Nexco West)	Japan	Toll operator
Tampa-Hillsborough Expressway Authority	USA	Toll operator	Touch 'n Go	Malaysia	Service provider	WEX Fleet One	USA	Service provider
Tattile	Italy	Device and equipment supplier	Toyota	Japan	automotive OEM	Xevo	USA	Telematics company
Teco Smart Technologies Co., Ltd	Taiwan	Device and equipment supplier	Trafineo GmbH & Co. KG	Germany	Toll service provider	ZTE	China	Toll solutions provider and telecomms company
Tecsidel	Spain	Systems provider and integrator	TransCore Inc.	USA	Device and equipment supplier			
Telekom Slovenia	Slovenia	Telecomms company	Transport for London	UK	Transportation authority			
Telekomunikasi Indonesia (Telkom)	Indonesia	Service provider	Transurban Group	Australia	Toll operator			
Telepass	Italy	Toll operator	United States Department of Transportation (USDOT)	USA	Federal agency			
Teletrac Navman	USA	Fleet telematics providers	UTA	Germany	EETS service provider			
Telit	Global	Technology provider	Vaaan Infra	India	Systems provider and integrator			
Tencent	China	technology company	Veloe	Brazil	Service provider			
TERAS Teknologi	Malaysia	Device and equipment supplier	Vendeka	Turkey	Device and equipment supplier, system integrator			
Texas Department of Transportation	USA	Transportation Authority	Verdeva, Inc	USA	Payment application			
Thrifty	USA	Rental car company						

Road tolling is moving from a slow march to a sprint

- Road tolling is often described as being on a 'slow march', nonetheless **subscriptions are expected to rise from 196 million in 2015 to over 540 million by 2025**
- In 2015, approximately 50 countries had at least one significant electronic toll collection (ETC) or road user charging (RUC) scheme in place
- By 2025, we expect this to rise to **more than 60 countries**
- Worldwide, we expect to see **more than €250 billion in collected tolls by 2025**
- Interoperability is changing the face of national but also international tolling; the European project, EETS, today enables trucks to pay tolls in **7 different countries, representing over €6 billion in collected tolls, via a single device**
- **Changes in toll technology are gathering pace:**
 - Use of DSRC will continue to grow and remain the most widely applied technology worldwide, but will fall from 55% of total subscriptions in 2015 to 49% in 2025
 - Despite significant growth in India, Malaysia, Brazil, Colombia and the US, the **share of RFID will fall from 40% in 2015 to 30% by 2025**
 - For trucks in Europe, DSRC will be increasingly replaced with GNSS
 - **Infrared will all but vanish from the global map**
 - However, the introduction of new ANPR and GNSS based models delivered via smartphones will reduce the proportion of 'traditional' technologies to 79% of total ETC subscriptions by 2025
- **Toll models will continue to multiply and fragment rapidly** as they adapt to new requirements and service providers
 - **Urban road pricing schemes will emerge in cities across the world** as a means to reduce congestion and vehicle emissions
 - Open road and free flow tolling will replace manual toll plazas across Europe, North & South America and Asia
- **The business landscape however, is changing at wildfire speed**
 - Mature road operators have already begun to consolidate, particularly in Europe with the acquisition of Abertis by Atlantia
 - The entry of new players will fragment the value chain reducing the ability of single companies to exert complete control
 - Incumbent service providers have made some initial steps into smartphone-based services, but have **yet to establish any meaningful interaction with their customers outside of tolling**
 - As a result, we identified at least 10 types of stakeholders now positioned as toll payment services, including **OEMs, technology giants** and **'mobile wallets'**
 - **Their level of customer interaction dwarfs that of traditional toll service providers and could deliver a serious competitive blow to the ecosystem**

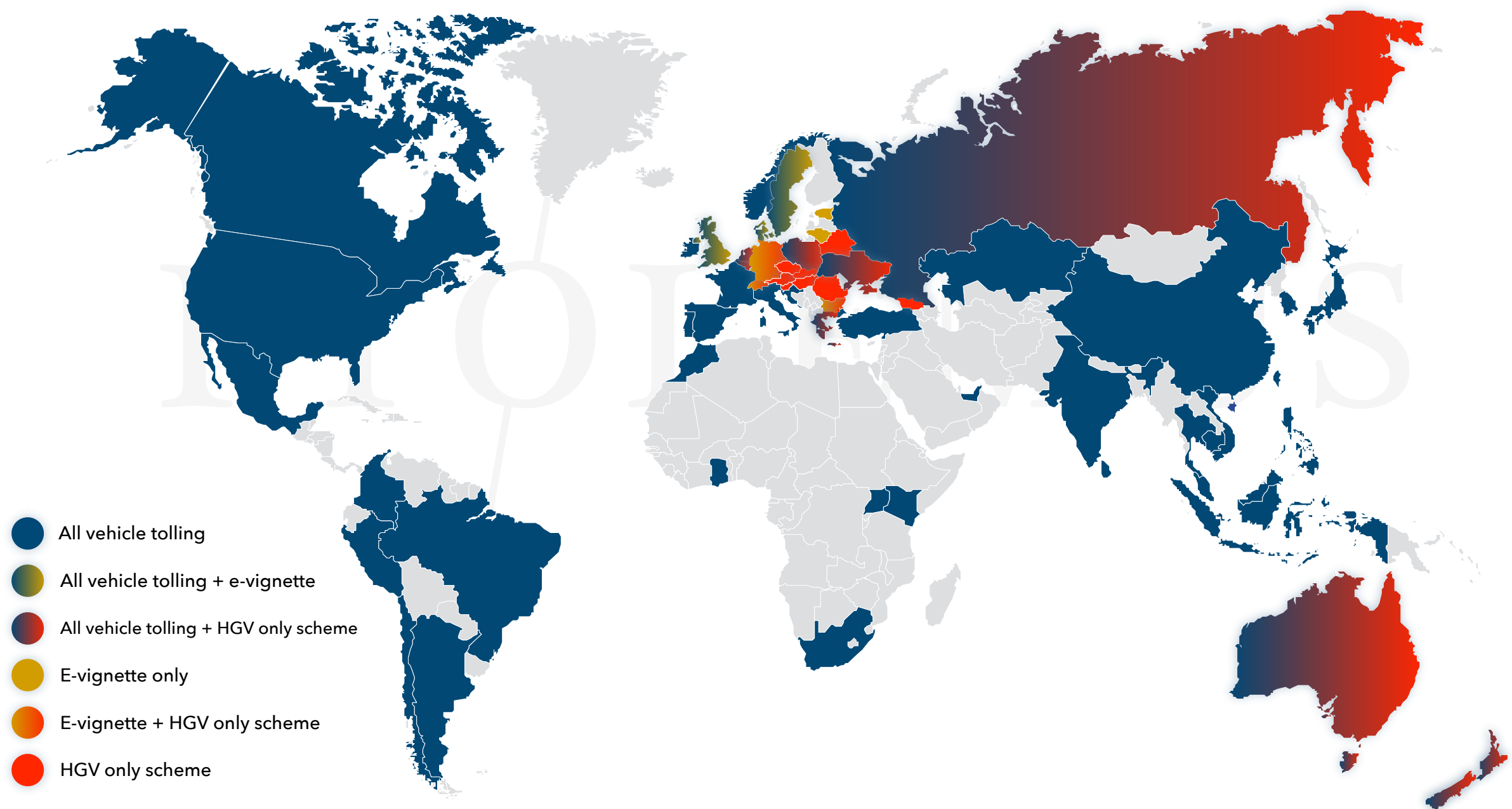
Road tolls are already widespread and, outside of Europe, typically applied to all vehicles...

Tolling schemes in place, 2018

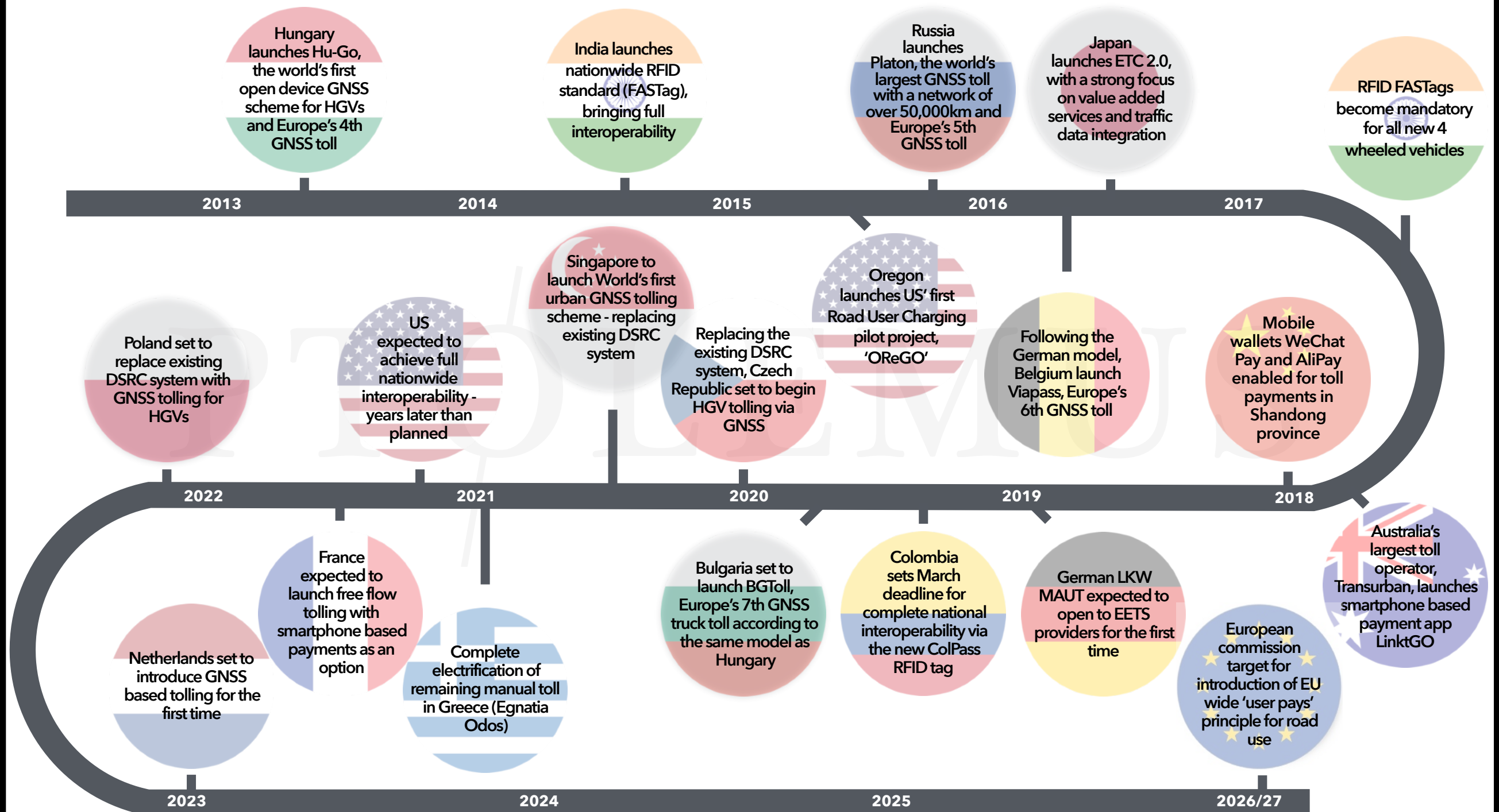


...This will remain the case, while the European picture will become more complex ...

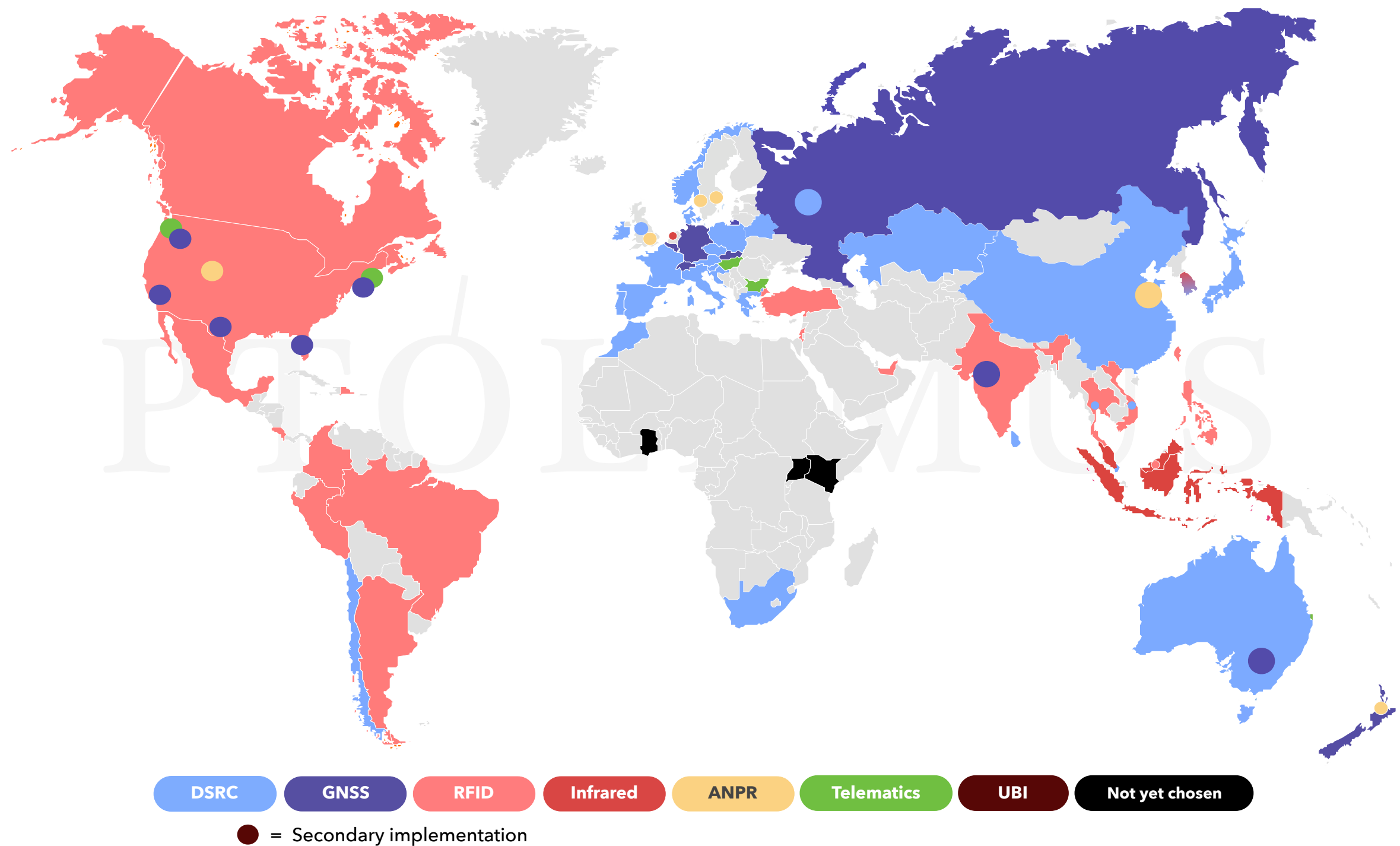
Tolling schemes in place, 2025



...and in addition to new schemes, the global market see a growing number of country specific developments

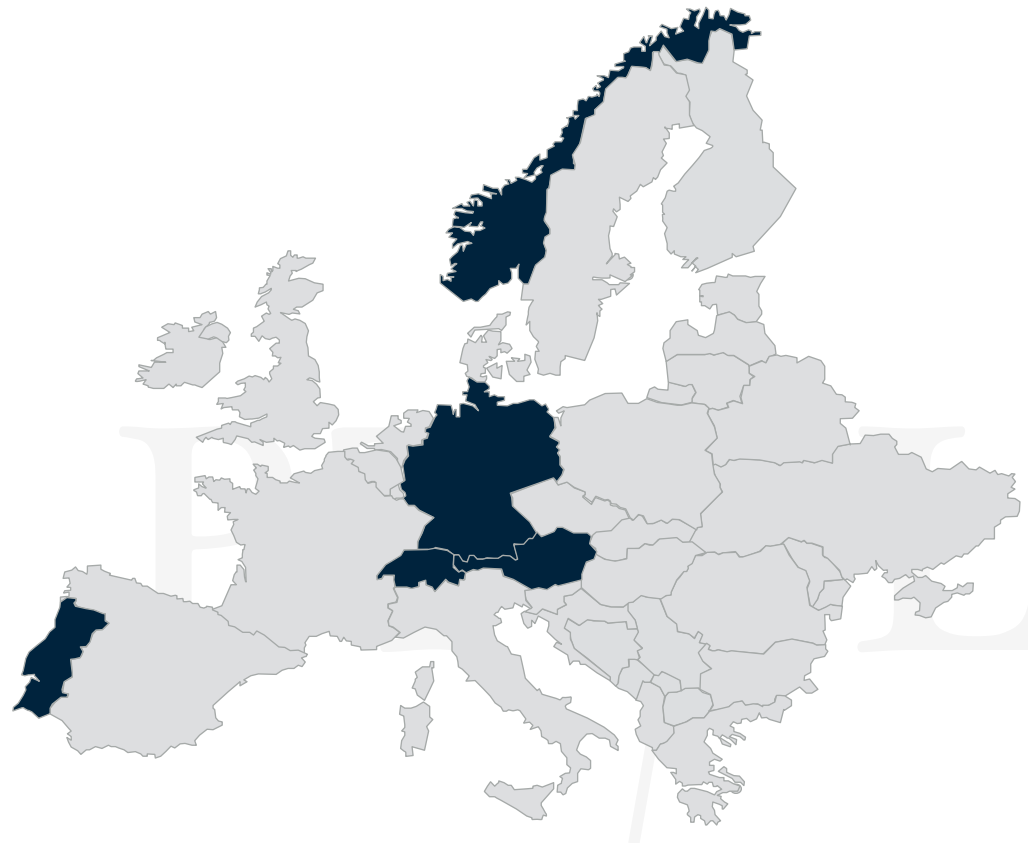


Tolling technology is also fragmented and constantly changing



Meanwhile tolling models are also shifting towards free flow and open road tolling

Countries with FFT or ORT in 2005*



- Free Flow Tolling (FFT) and Open Road Tolling (ORT) refer to toll check points that do not require the driver to either stop or slow down
- In 2005, **FFT and ORT was mostly limited to the HGV tolling schemes in Austria, Germany and Switzerland**
- Additional FFT infrastructure was also in place across concessions in Portugal and Norway

Estimate of countries with FFT or ORT in 2025*



- **By 2025, we expect to see some form of FFT or ORT in almost all countries with road tolling infrastructure**
- All vehicle tolling domains such as France, Spain and Italy are already in the process of replacing manual payment booths
- **Slovenia's new HGV toll, DarsGo, will probably be the last DSRC only toll to launch in Europe**

This shift comes alongside significant efforts to achieve national and international interoperability



Ireland's central clearing house has become a model of public authority - led interoperability. The structure supports 11 different toll roads and 14 service providers, processing over 50 million interoperable transactions per year



The European Electronic Toll Service (EETS) programme is the only truly international interoperability project. EETS doesn't use a clearing house. Instead, it places the responsibility and cost for interoperability on private service providers



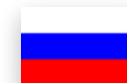
In response to a federal mandate the ATI Hub, a central clearing house, was created. It allows toll chargers to exchange billing information based on the vehicle licence plate



Colombia is the latest country to mandate national interoperability. It will be achieved via a central clearing house model, similarly to Ireland or the US



With FASTag, India created in 2014 a single charging protocol and a fully interoperable solution. It is now applied across all new and existing tolls domains in the country



Russia has also developed a 'clearing house' which allows toll operators to exchange charging and billing information



China has mandated the use of a single DSRC protocol across the country. However signs suggest long-term interoperability will come from licence plate recognition and smartphone apps

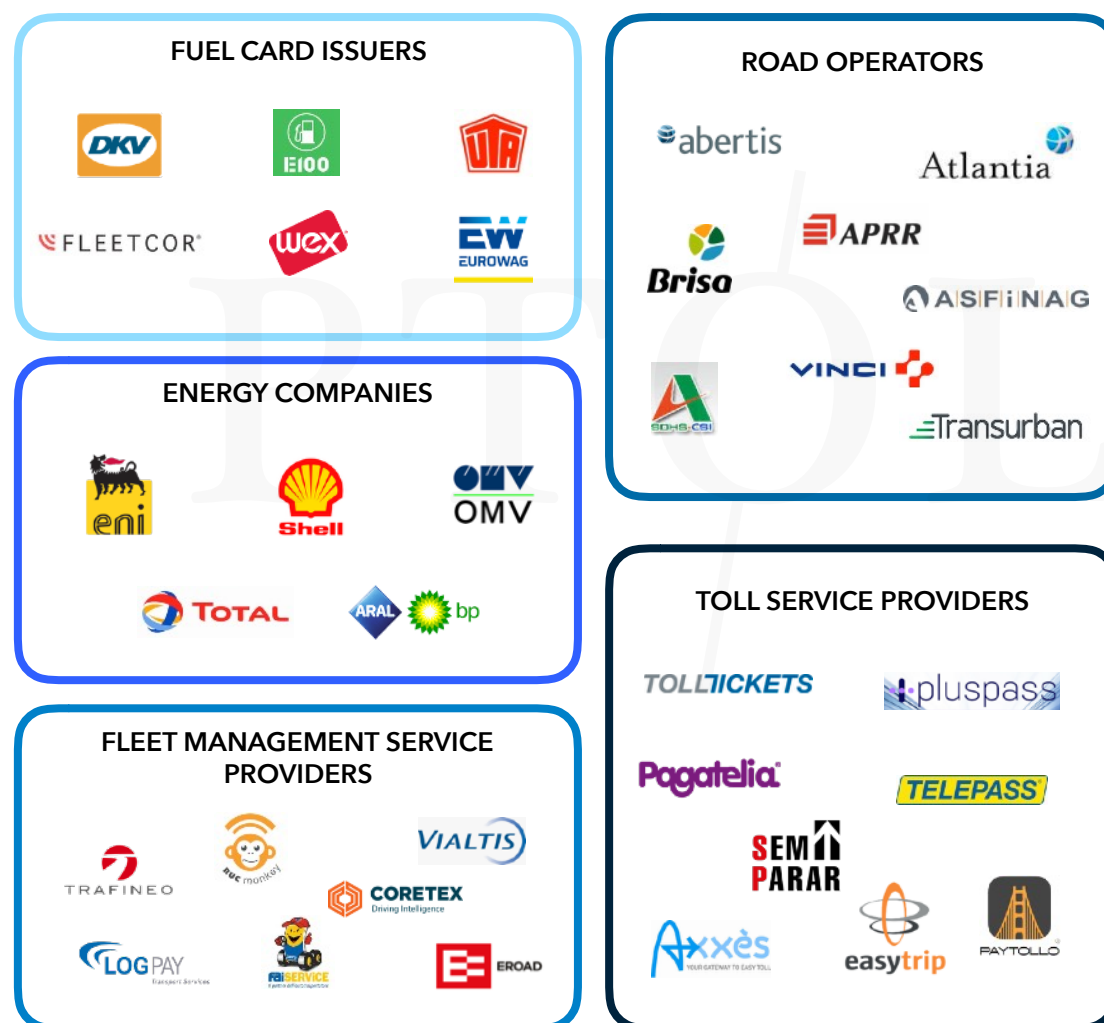
Toll chargers and service providers are also beginning to embrace a wider variety of third party devices...



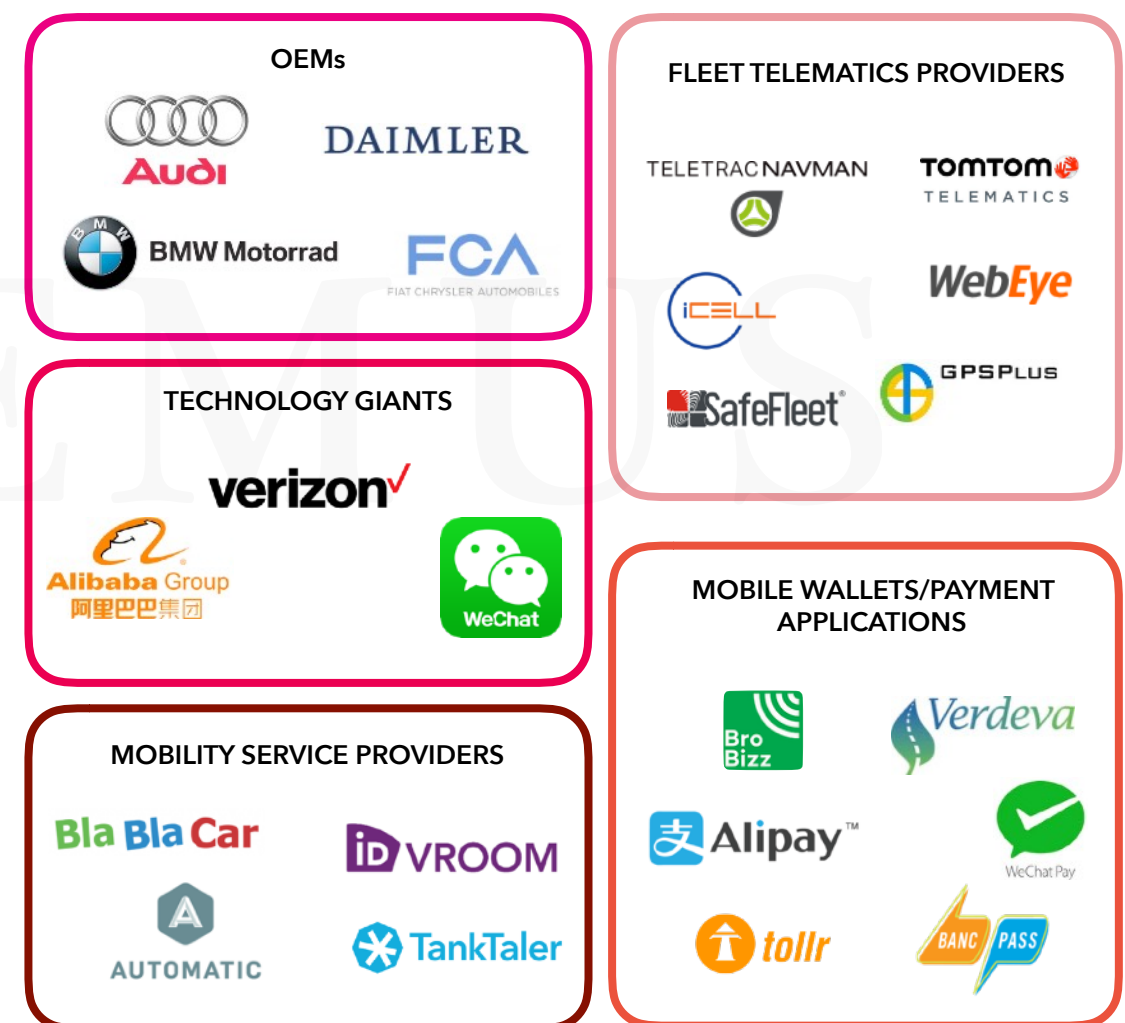
...which is enabling the entry of new service providers, including technology giants, mobile wallets and mobility platforms

10 groups are now positioned as toll service providers

Traditional providers



New entrants



The study will answer the key strategic questions

What technology and model will be used in my geographical market in 2025?

What toll technology should I invest in to future-proof my business?

What will be the split between manual and electronic toll payments by 2025?

How is AliPay changing tolling in China?

Will new technologies help drivers accept tolling?

Who in the new value chain will own the end customer?

Will toll devices disappear?

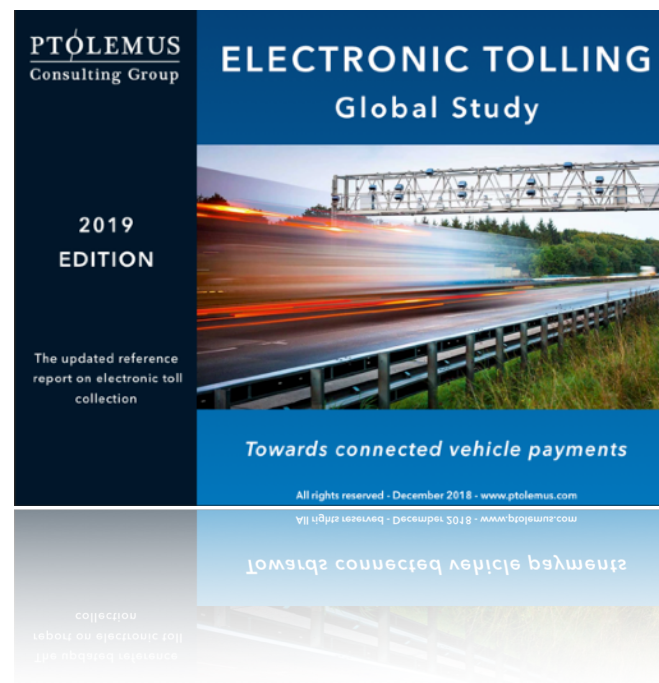
As competition explodes, how to gain market share in the future tolling market?

What is the impact of interoperability programmes on toll chargers and service providers?

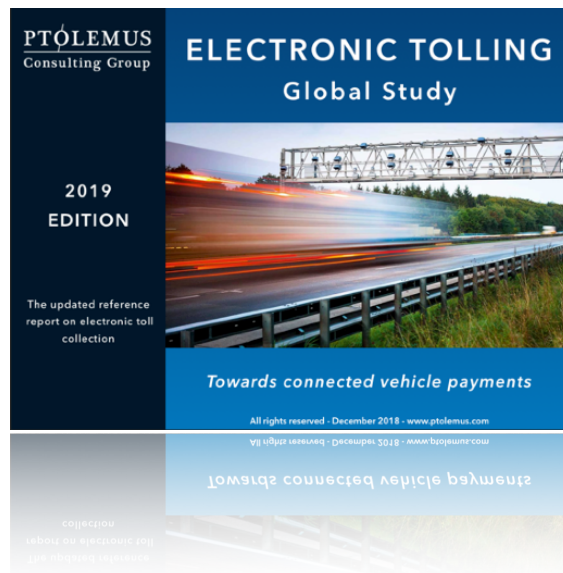
Will the tech giants take over toll payment processes?

Will OEMs manage customer interface and service delivery in the future?

To what extent smartphones will supplant existing tolling devices?



The most comprehensive report on electronic tolling and road user charging



More than just market research.

A strategic analysis on the future of ETC as a connected mobility service

- An **update to our 2015 Electronic Toll Collection Global Study** providing an all-encompassing overview and outlook on the electronic tolling market
- A **750-page analysis of the global electronic tolling landscape** based on:
 - 7 years of constant market surveillance
 - 50 interviews with key stakeholders
 - 6 months of desk research by a team of 7 consultants
 - 20 strategy consulting assignments
- An **in-depth review of the 40 biggest toll domains worldwide** with traffic volumes, technology, model, size and revenues projections
- A **comparative assessment of all tolling technologies**:
 - Deployment models and impacting trends for ANPR, DSRC, Infrared, GNSS and RFID
 - Forecast of the technology mix
- An **impact analysis of interoperability in tolling**:
 - Forces and models shaping interoperability
 - Review of current projects in Europe, US and Colombia
 - Impact of the different models on toll chargers and service providers
- **12 EETS service providers profiled, analysing**:
 - Strategic position
 - Service breakdown
- **The study is a strategic tool for service providers and toll chargers worldwide**
 - Effectively promote tolling as a funding mechanism
 - Defining and outlining a sound communication strategy
 - Lessons learned from best practices around the world
 - Learn how the competition for toll service provision will transform the ecosystem
 - The role of vehicle manufacturers, technology giants, fleet telematics providers and mobile wallets
- **Strategic recommendations to service providers**
 - Best practices for winning market share in future tolling markets
 - How to ensure control of the future toll payment interface
- **2015 - 2025 bottom-up market forecast**
 - Global scope: **40 countries investigated in details**
 - **Regional and global projections** of the toll and electronic toll market: toll revenues, subscription volumes, share of ETC, key influencing factors
 - 1,100-line Excel file with **subscription volumes by technology** and vehicle type, devices sold, total revenues collected and ETC-only revenues collected

1. The world of electronic tolling and road user charging

- A. How ETC is leading a global renaissance in road tolling
- B. Traditional devices and technologies competing to charge and enforce tolls
 - Global technological overview
 - RFID
 - DSRC
 - GNSS
 - Infrared
 - ANPR/ALPR
- C. The electronic tolling value chain and power players
 - Value chain integrators
 - Device manufacturers
 - Active toll chargers
 - Service operators
 - Systems specialists
 - Active and passive smartphone platforms

2. Promoting road charging as an infrastructure funding mechanism

- A. Road tolling as a means to fund new infrastructure
- B. Identifying the benefits of road tolling
- C. Promoting tolling to a skeptical public
- D. Best practices when promoting and implementing tolling

3. Electronic tolling as a connected service

- A. The changing nature of ETC charging technology
- B. The 10 groups positioning themselves as toll service providers
 - The traditional players
 - The new entrants
 - How new entrants and smartphone based services will shake up the market
- C. Utilising data to deliver a winning service proposition

- D. Best practices for winning and retaining market share as a toll service provider

4. One device, one contract: The global movement towards tolling interoperability

- A. The European Electronic Toll Service (EETS)
 - The requirements to become an EETS provider
 - Data provision and relationships with third parties
 - The business case behind EETS
 - The continued expansion of the EETS market
 - Company profiles for EETS providers and relevant re-sellers
- B. Connecting America's toll systems
- C. ColPass: Colombia's path to national interoperability

5. A quantitative look at road tolling across the world

- A. Quantitative view of road tolling in Europe
- B. Quantitative view of road tolling in North America
- C. Quantitative view of road tolling in Latin America
- D. Quantitative view of road tolling in Asia-Pacific
- E. Quantitative view of road tolling in Oceania
- F. Quantitative view of road tolling in Africa

6. Country specific analysis

A. North America

- Canada
- USA

B. Latin America

- Brazil
- Chile
- Mexico

C. Europe & Africa

- Austria
- Belarus
- Belgium
- Bulgaria
- Czech Republic
- France
- Germany
- Greece
- Hungary
- Italy
- Norway
- Poland
- Portugal
- Russia
- Slovakia
- Slovenia
- South Africa
- Spain

- Sweden
- Switzerland
- The Netherlands
- The UK
- Turkey
- Ukraine

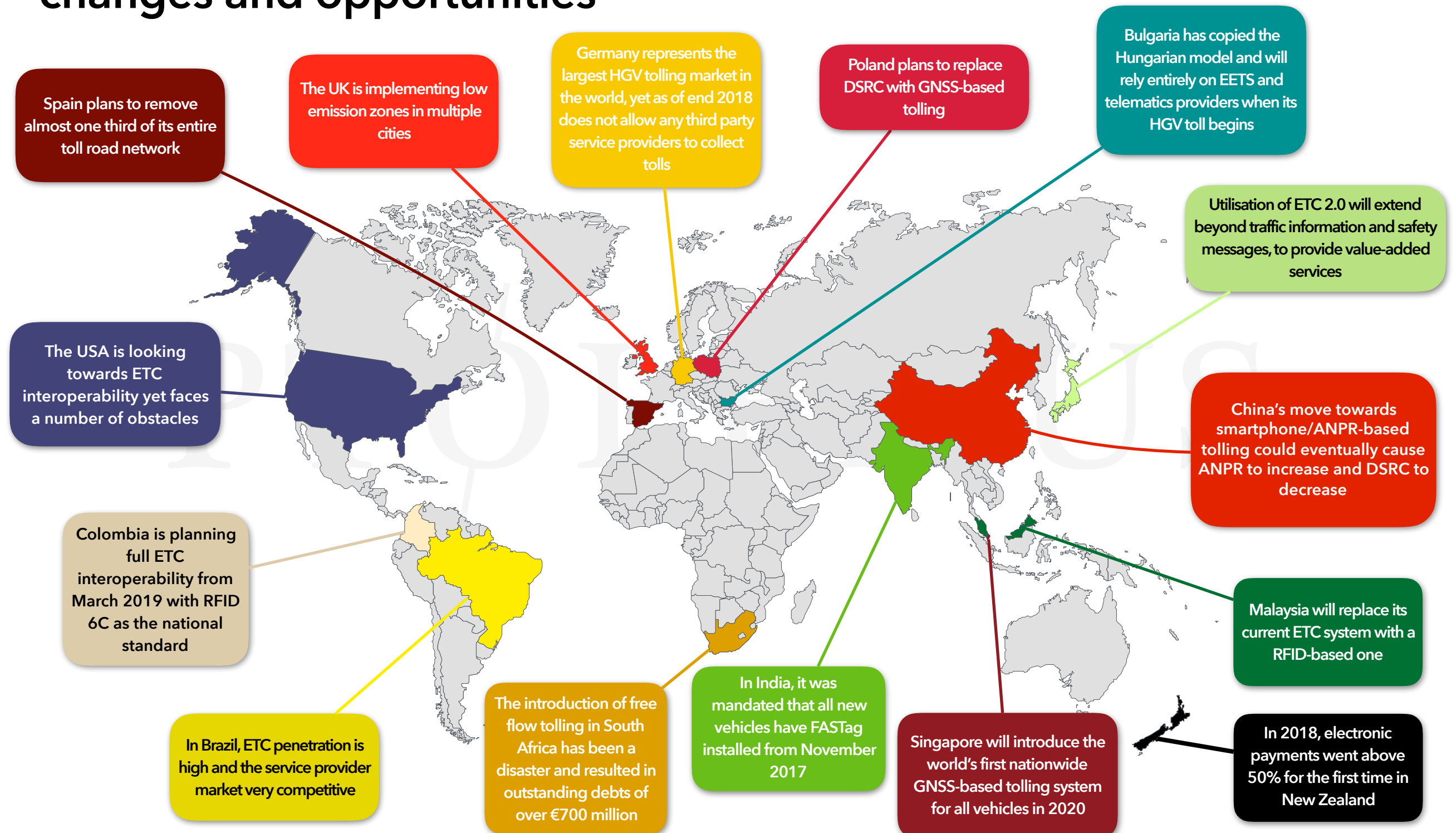
D. Asia and Oceania

- Australia
- China
- India
- Indonesia
- Japan
- Malaysia
- New Zealand
- Philippines
- Singapore
- South Korea
- Taiwan

7. Conclusions

- A. Roads as a paid utility: the future of ETC and RUC

Each market requires an individual strategy to respond to different changes and opportunities



This report contains 40 profiles of toll domains worldwide

North America

Canada



USA



Latin America

Brazil



Chile



Mexico



Europe & Africa

Austria



Belarus



Belgium



Bulgaria



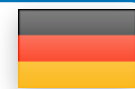
Czech Republic



France



Germany



Greece



Hungary



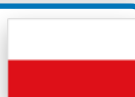
Italy



Norway



Poland



Portugal



Russia



Slovakia



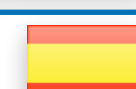
Slovenia



South Africa



Spain



Sweden



Switzerland



The Netherlands



Turkey



UK



Ukraine



Asia-Pacific

Australia



China



India



Indonesia



Japan



Malaysia



New Zealand



Philippines



Singapore



South Korea

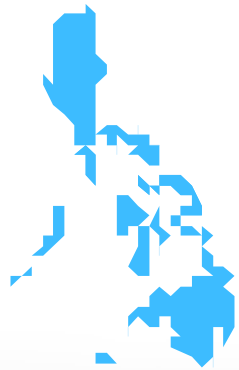


Taiwan





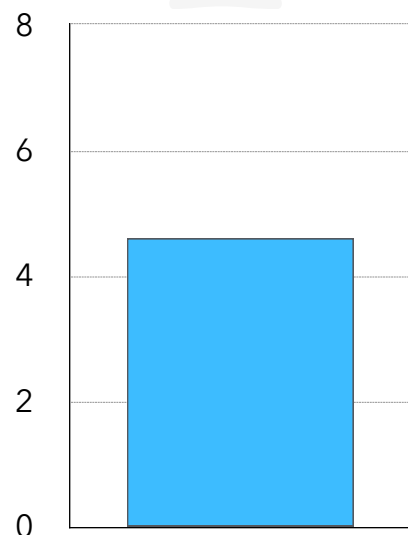
ETC interoperability has improved greatly in Philippines in 2018



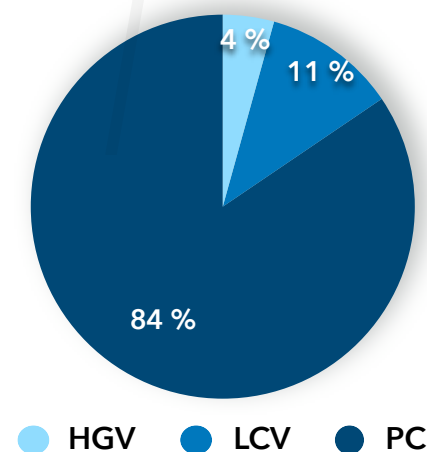
Philippines

- **Population:** 105 million
- **Total road network:** 32,868 km, of which 31,035 km are paved
- **Total toll road network:** 420 km of expressways
- **Current tolling schemes:** All toll roads operated by concessionaires with RFID-based ETC
- **Future schemes:** RFID with full interoperability between two providers

Total number of registered vehicles (million, 2017)



Domestic vehicle split by vehicle type



Qualitative analysis

- Philippines has a 420 km long network of tolled expressways, maintained and operated by concessionaires
- The concession-holders/operators are subsidiaries of either the **Metro Pacific Tollways Corporation (MPTC)** or the **San Miguel Corporation (SGC)** via **San Miguel Infrastructure**
- **Lack of interoperability** has been a huge obstacle for ETC implementation in the country, with MPTC roads using a **RFID-based ETC system provided by Easytrip** and SGC-related concessions using **Autosweep RFID stickers**
 - MPTC and Egis Easytrip Services established a joint venture for ETC provision in Philippines
- In 2017, the **Department of Transportation (DOTr)** and the **Toll Regulatory Board** pursued talks with the operators for an interoperable ETC solution, hoping to increase the use of ETC payments, which is still very low
- Phase 1 of the DOTx interoperability project was implemented in March 2018 with Autosweep RFID stickers made active on MPTC roads
 - However, users will need **two accounts** while using the same RFID tag
- The second phase of DOTx interoperability project will allow Easytrip tags to be used on SMC roads - due to finish before end 2018
- Alongside interoperability measures, the operators are pushing for ETC acceleration, for example by increasing the number of ETC exclusive toll lanes
 - ETC exclusive lanes on NLEX, one of MPTC's largest toll road, grew from 15 to 27 between 2017-2018

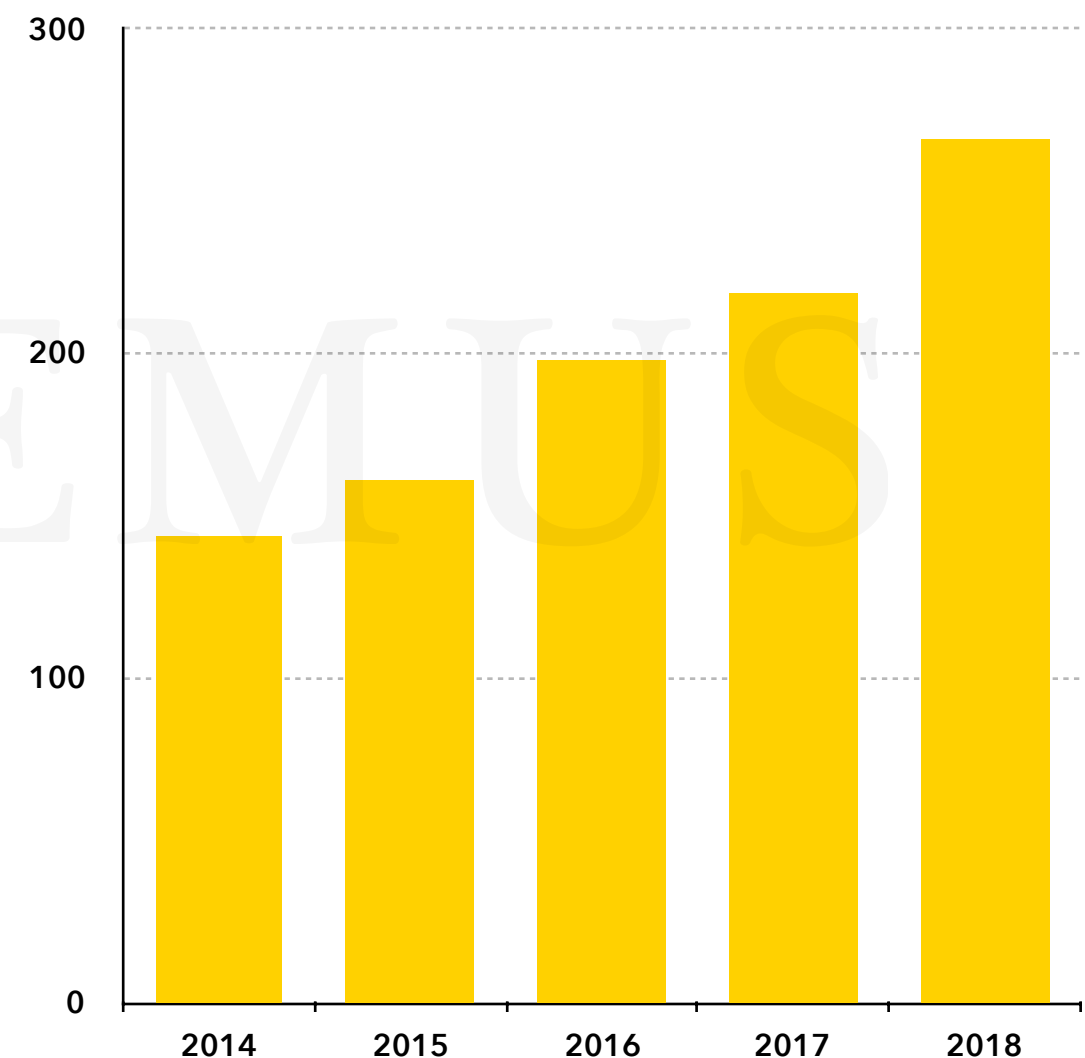
Tolling revenues of MPTC and SMC continue to grow with extended network size and increased traffic

Concession comparison - Main toll roads

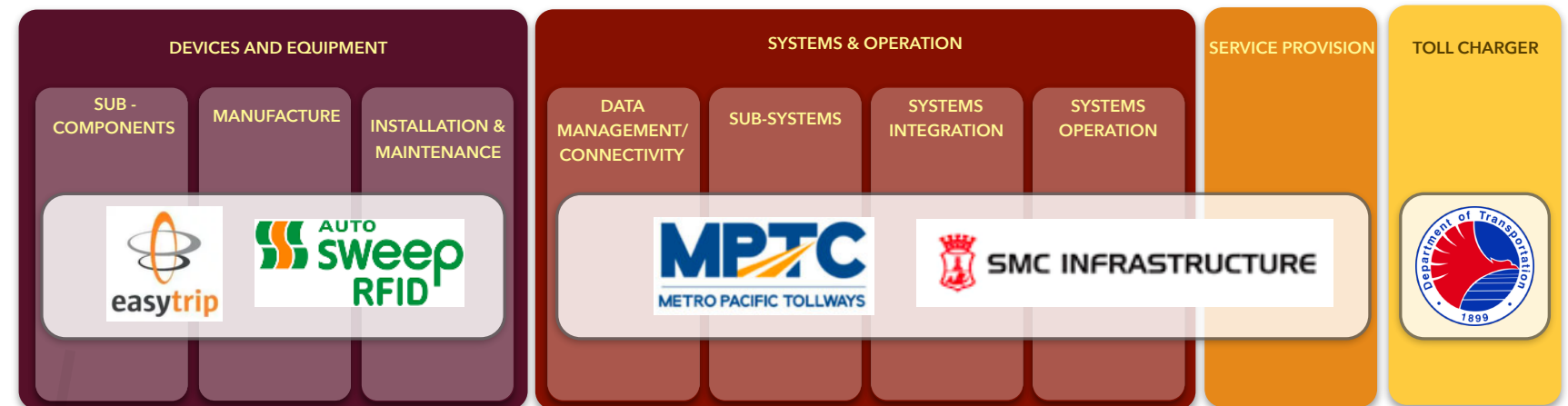
Concession	Holding company	Network length (km)
NLEX	MPTC	95
SCTEX	MPTC	94
CAVITEX	MPTC	14
SLEX	SMC	36
STAR	SMC	40
TPLEX	SMC	88.9
SKYWAY	SMC	35

- SMC's toll revenues amounted to €311 million* in 2017 compared to revenues of €270 million for MPTC in calendar year 2017/18
- Both companies witnessed a strong growth in toll revenues driven by increased traffic of over 10% on average

MPTC's toll revenues 2014-2018 (€ million)



The two operators in Philippines both use RFID but from different providers



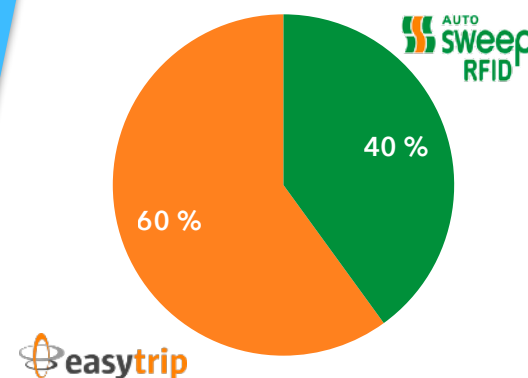
- **Launch date:** 2014/2015
- **Device:** RFID
- **Scope:** All vehicles
- **Total tolls collected:** €700 million (mostly non-electronic)

Device provision

Operators

Number of TSPs* (2017)

Main suppliers (est.):



Concession holders part of the 2 conglomerates: Metro Pacific Tollways and San Miguel Corporation.

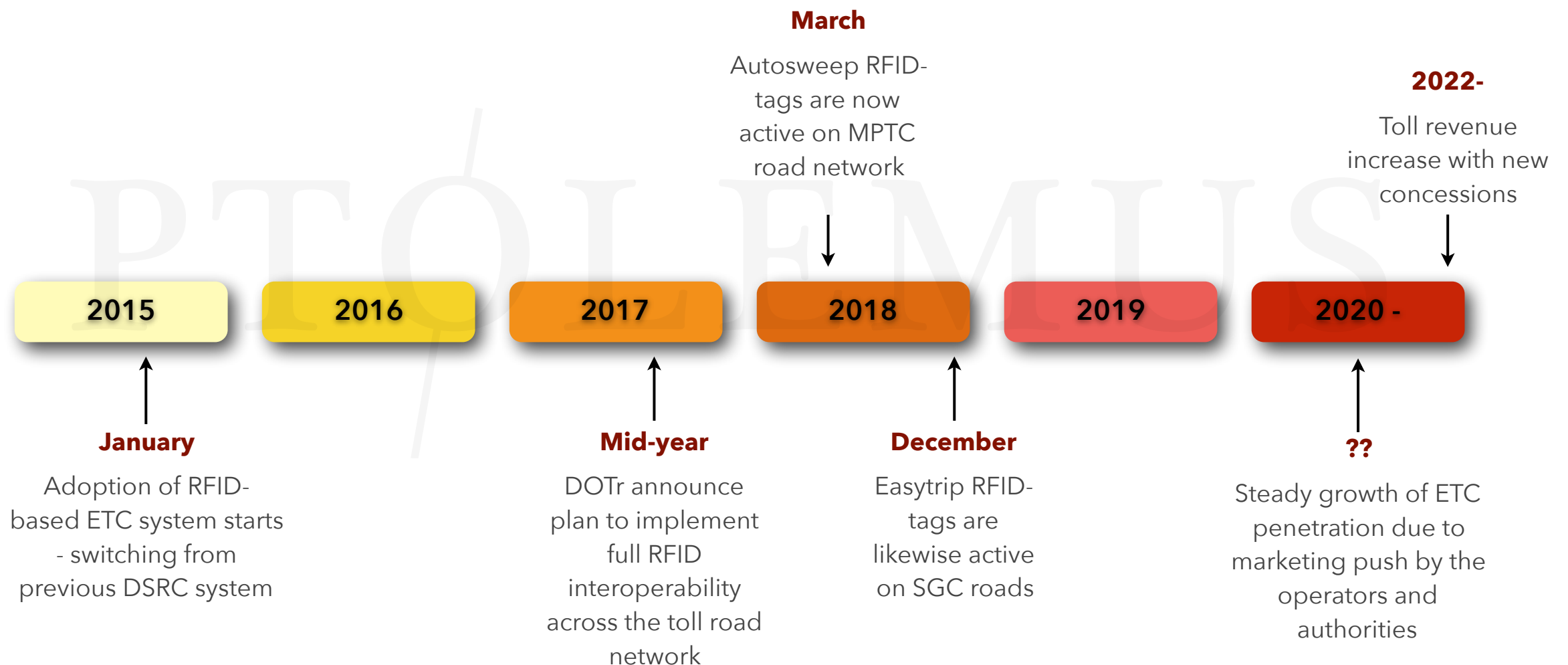
The concessionaires build, maintain and operate the road network under the supervision of the Department of Transportation.

Multiple but all either owned by MPTC or SMC Infrastructure.



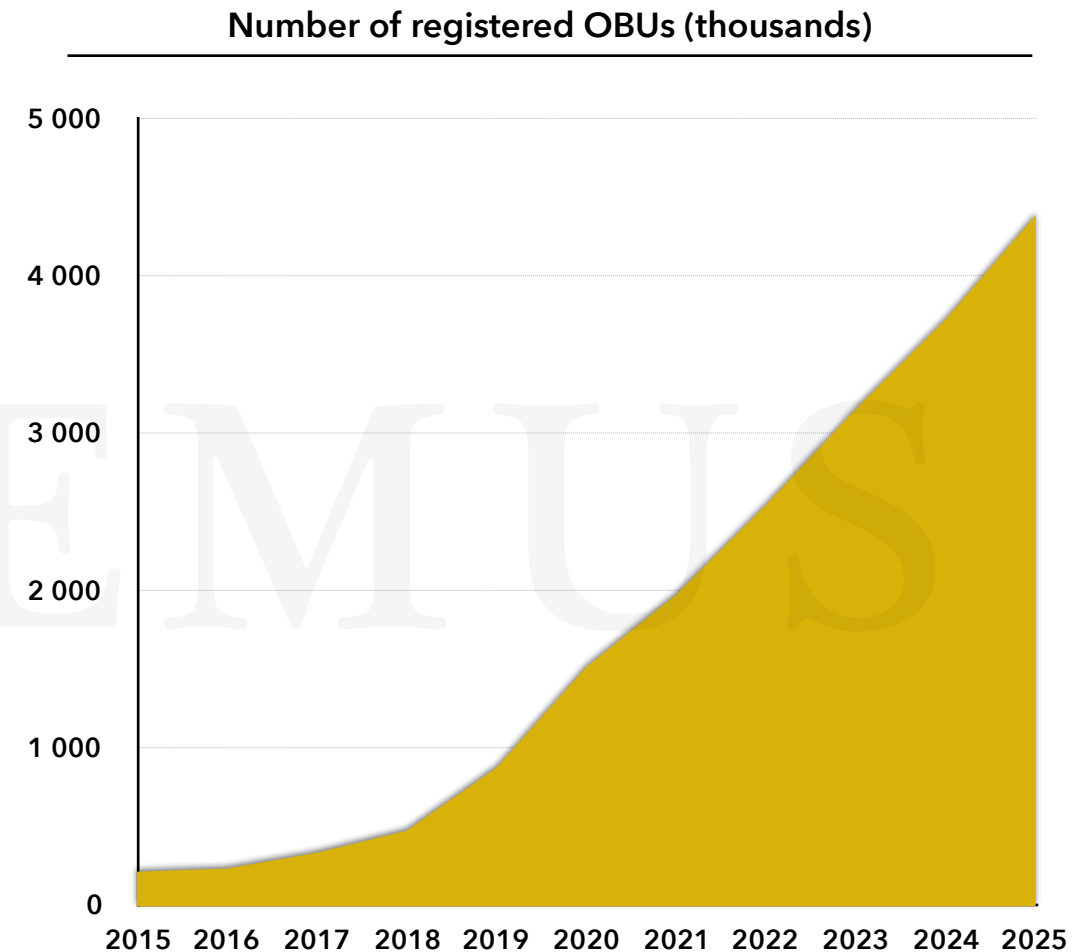
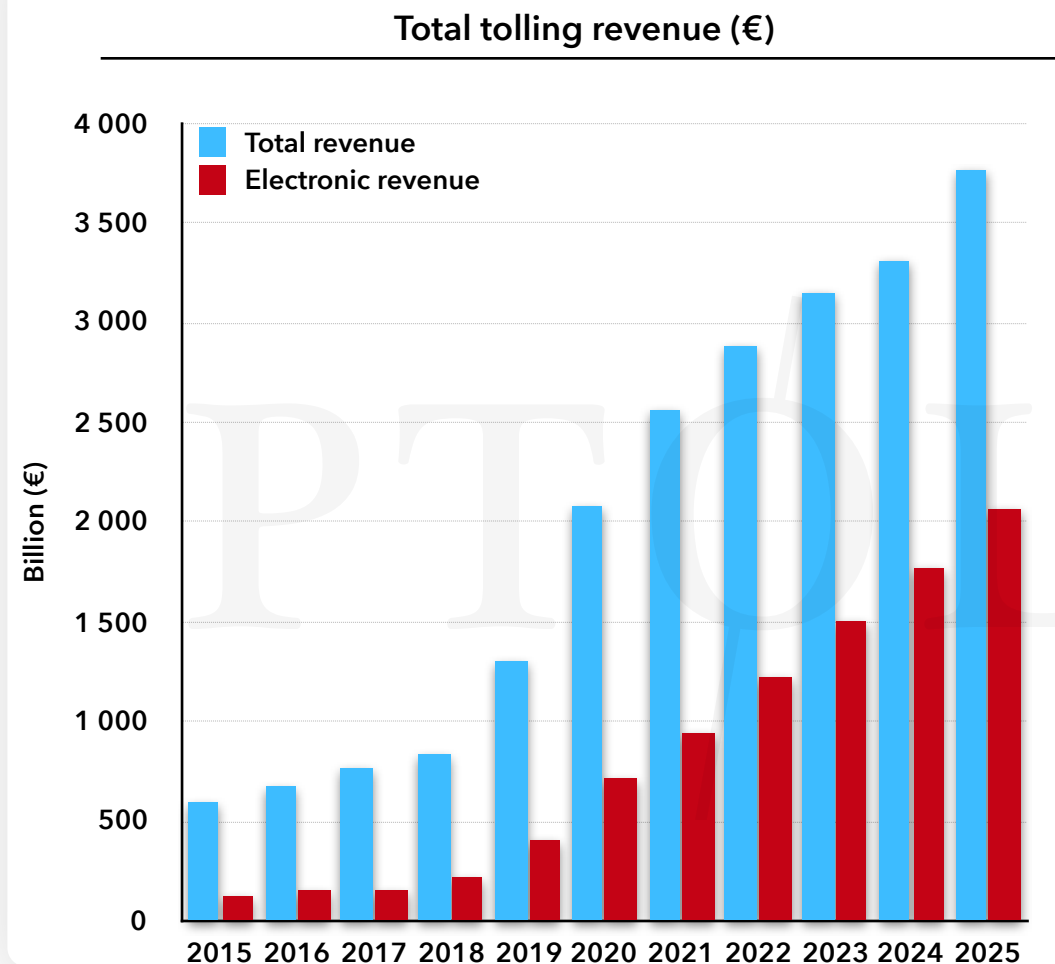
Philippines has an ambitious agenda with the launch of new concessions and national distance-based charging

Philippines tolling timeline



ETC revenue growth will accelerate due to authorities' push for interoperability

Total volumes and revenues in Philippines

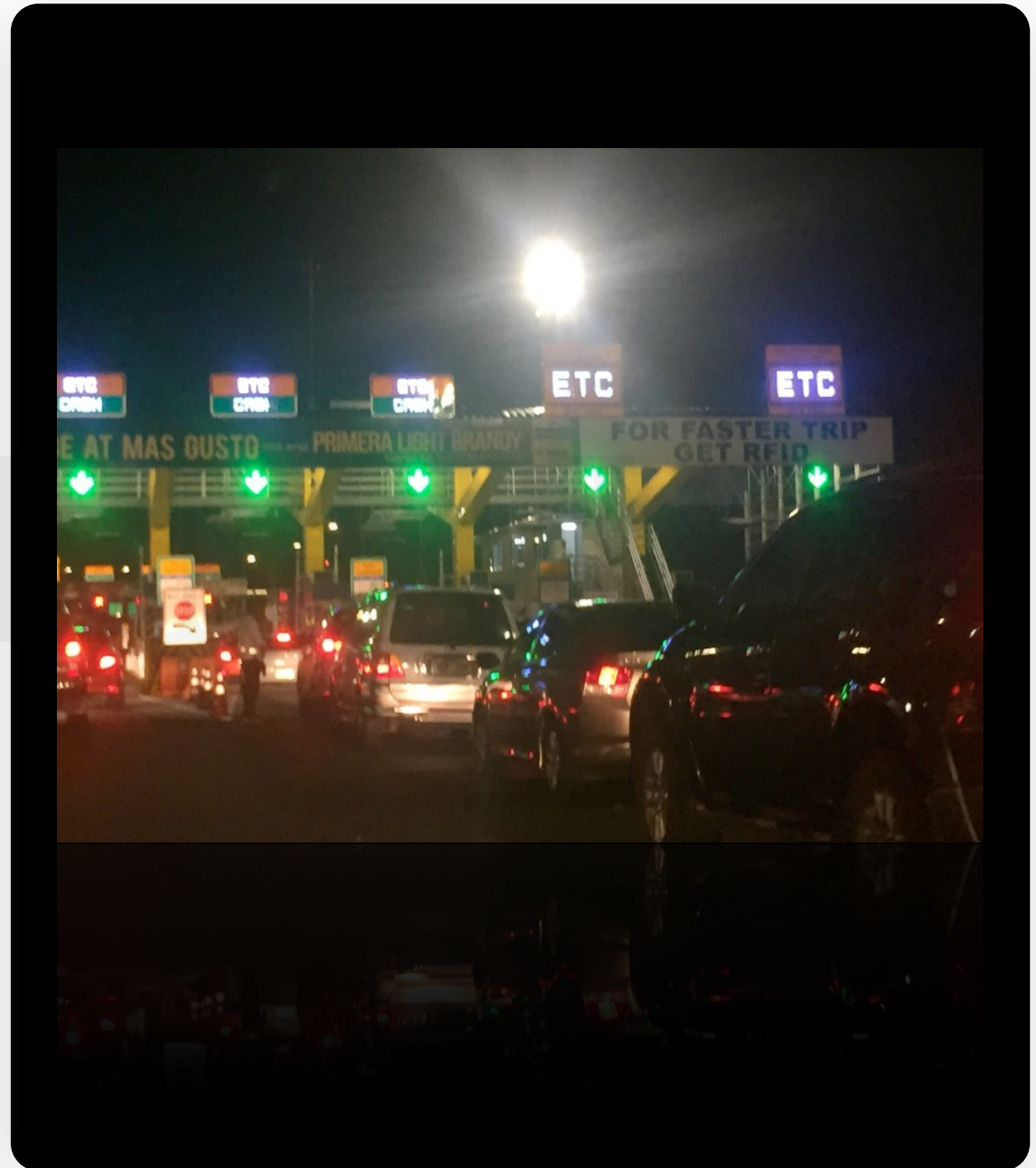


- In 2017, it was announced that more than \$11 billion would be invested in new toll roads in the period to 2025, which we expect to raise the total tolled network from approximately 500 km to over 2,000 km with new lanes first coming on stream in 2019
- Penetration of ETC is still low in the Philippines but we expect use to grow rapidly over the coming years due to a swathe of financial and service based incentives, in addition to a substantial growth in the overall network

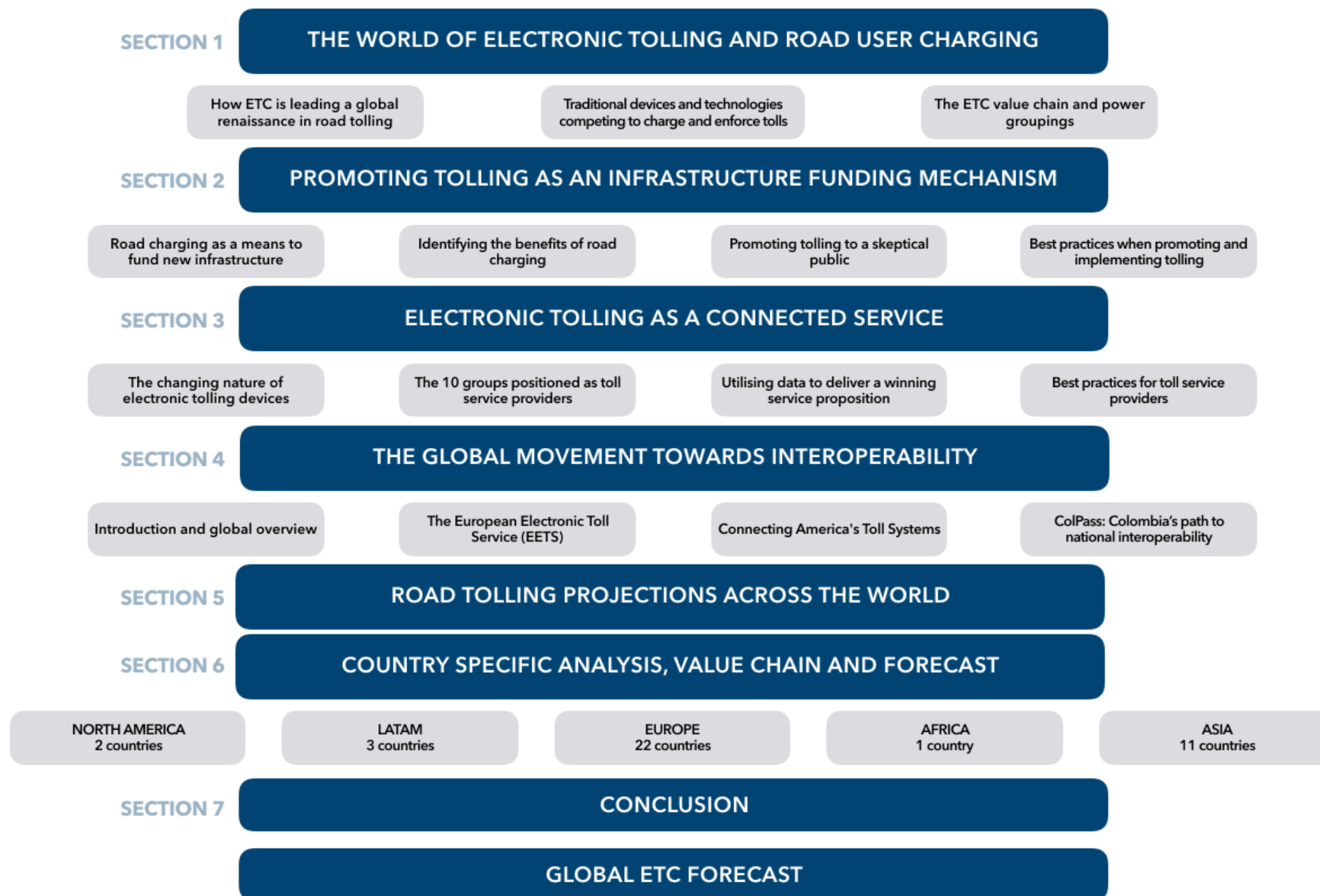
Manila is exploring road pricing as an option to fight congestion

Tolling is and will remain the primary method for road infrastructure funding in Philippines

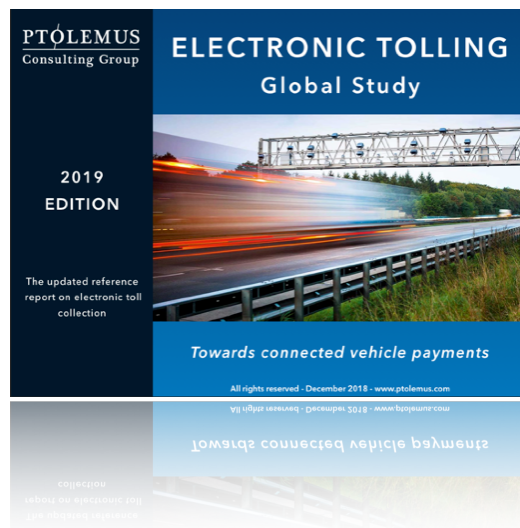
- We expect the use of RFID-based solutions to grow at a fast pace in coming years, due to
 - Interoperability projects laid out by the transportation authorities
 - Marketing efforts by the two main toll operators
- The Metropolitan Manila Development Authority have also explored the possibility of implementing road charging as a solution to the capital's chronic congestion
 - In 2017, the Authority met with officials from Singapore to investigate further the potential introduction of a congestion charge
- In 2017, the infrastructure conglomerate San Miguel Corporation, in partnership with the Philippine National Construction Corporation announced plans to invest approx. €11 billion in expanding new and existing toll roads over following 5 years
 - As the image indicates, RFID is already and will increasingly be promoted as a faster means to pass through toll gates and will support efforts to reduce congestion



The Electronic Tolling Global Study is the go-to report for the whole ecosystem



The study comes with a single, worldwide company licence



*The reference
report on ETC and
road user charging*

	Full Study		Additional market forecast	Additional workshop
	Buy direct (Invoice)	Buy online (Visa or MasterCard)		
Contents	<ul style="list-style-type: none"> • 750-page study with 40 country profiles, including qualitative, competitive and value chain analysis • Service provider best practices • Interoperability models analysis • Smartphone-based tolling model analysis • 12 profiles of EETS service providers 		<ul style="list-style-type: none"> • 1,100-line Excel file with outputs and charts • Estimates of the subscription volumes by technology and vehicle type • Devices sold, total revenues collected and ETC-only revenues 	<ul style="list-style-type: none"> • The full study presented to your board or strategy team • Half-day workshop at your office*
Company-wide licence	€ 5,995 <i>Approx. \$6,445</i>	€ 6,300 <i>Approx. \$7,400</i>	€ 2,000 <i>Approx. \$2,350</i>	€ 2,000 <i>Approx. \$2,350</i>
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Disclosure

The recommendations and opinions expressed in this study reflect PTOLEMUS' independent and objective views. However, PTOLEMUS cannot provide any guarantee as to the accuracy of the information provided or the reliability of its forecasts.

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