

The Age of Mobility

MODERATOR

Klaus Schierhackl, ASFINAG

PANELISTS

Simon Coutel, VINCI Autoroutes

Mike Heiligenstein, Central Texas Regional Mobility Authority

Josef Czako, Kapsch TrafficCom


Gian Gherardo Calini, GSS Agency

The Age of Mobility: A Comparison of Customer Expectations in Europe and North America

Klaus Schierhackl, CEO ASFINAG

October, 20th 2014

Starting Points



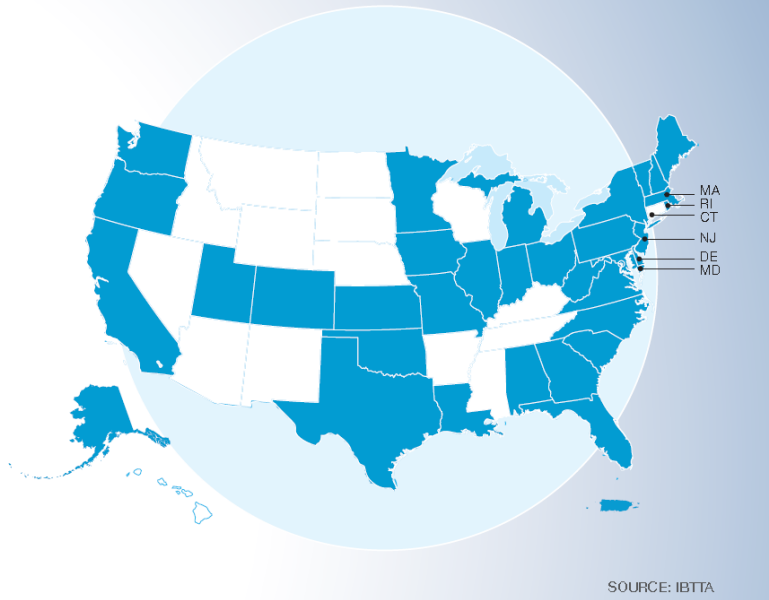
	North America	Europe
Area	24,709,000 km ² 9,540,000 sq mi	10,180,000 km ² 3,930,000 sq mi
Population	565,265,000	742,452,000
Population Density	22.9/km ² about 59.3/sq mi	72.9/km ² about 188 / sq mi
GDP per capita (nominal) continent	32,077 US\$	25,434 US\$

Source: [http://en.wikipedia.org/wiki/List_of_continents_by_GDP_\(nominal\)](http://en.wikipedia.org/wiki/List_of_continents_by_GDP_(nominal))

By the relevant numbers

STATES WITH TOLL ROADS

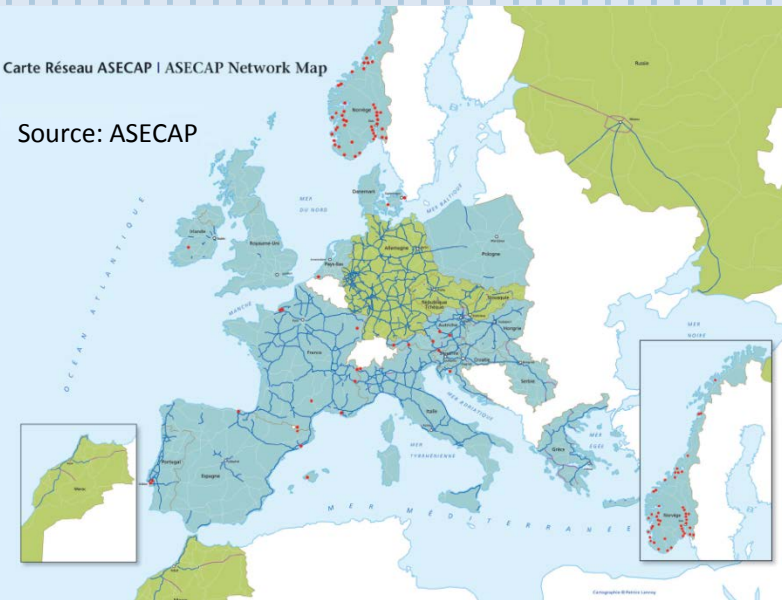
Thirty-four states and Puerto Rico have toll roads and crossings...



	European Union (28 countries)
Highway network	about 47.000 km
Passenger Cars	about 473 per 1000 inhabitants

Carte Réseau ASECAP | ASECAP Network Map

Source: ASECAP



	United States (50 states)
Highway network	about 275,360 km
Passenger Cars	about 440 per 1000 inhabitants

Changes in customer expectations From road user to customer



© Kazanov - Fotolia.com

#5930541



- Customers perceive themselves more as “consumers of services” than simply “users of infrastructure”.
 - “We pay the toll and expect highest quality of service.”

Acceleration in the social environment



- Everything moves faster, so do our customers:
 - Customers expect answers within a very short time.
 - E-mail traffic does not respect weekends and holidays.
 - “We want 24/7 service at minimal processing time.”

Receiving correct information is not enough



- “We want very specific and up-to-date information available for pick-up 24/7”.
- As technologies develop, so do our customer’s skills to use them.
- Expectations shift from “being serviced” to a self-service approach

The customer is king / queen more than ever



- Customers want to be respected and cherished as partners and humans with opinions and experiences.
- Expectation shifts from “attention on demand” to personal customer care and inclusion in decision making and certain processes – e.g. via personal visits or customer surveys.

On the panel

- **Simon Coutel**, VINCI Autoroutes, VINCI Autoroutes Innovation Lab, services innovation for road users
- **Mike Heiligenstein** Central Texas Regional Mobility Authority, Moving America Forward: Customers and Collaboration
- **Josef Czako**, Kapsch TrafficCom, Mobility Pricing – A Paradigm Shift to Improve Congestion, Environment, Road Safety, and Financing
- **Gian Gherardo Calini** European Global Satellite Systems Navigation Agency, European GNSS: Galileo and EGNOS for next generation Road Charging

SIMON COUTEL

VINCI Autoroutes Lab



VINCI AUTOROUTES KEY FIGURES



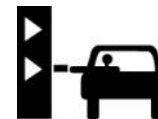
4,400 Km
Highway network



444
Resting areas



45,995
Annually
driven km



2,175,000
Daily trips



2,000,000
Toll pass
equipped
customers

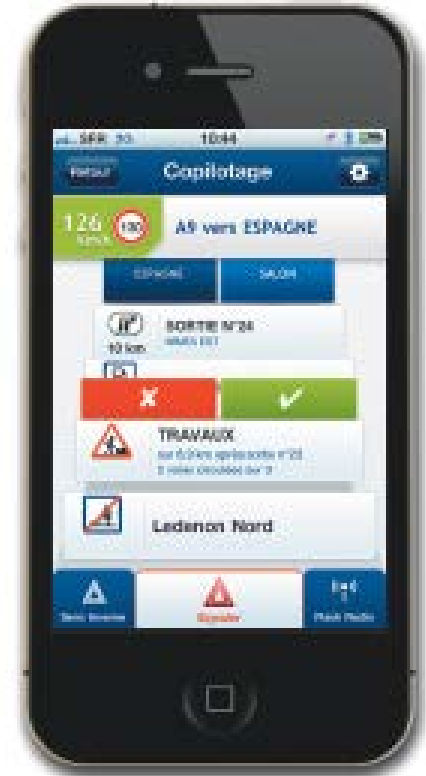
REAL TIME TRAFFIC INFORMATION SERVICES

Objective to assist customers before & during their trips

VINCI-Autoroutes.com : traffic information, services on resting areas, etc.

Radio VINCI Autoroutes : only one frequency on the whole network

3605 : only one phone number for customers assistance operating 24h/24



VINCI Autoroutes : over 450 000 delivering real time geolocalized road

Road information



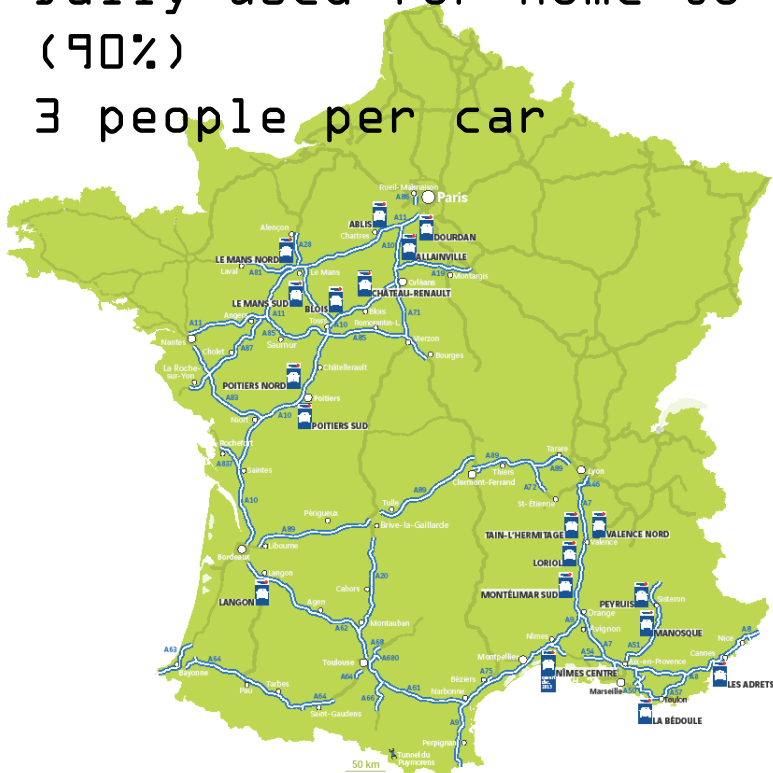
push



all

SATISFYING NOWADAYS CUSTOMERS EXPECTATIONS

20 carpooling parkings = more than
 1.500 places
 Daily used for home-to-work trips
 (90%)
 3 people per car



ANTICIPATE CUSTOMERS EXPECTATIONS

VINCI Autoroutes Innovation Lab

Anticipate customers expectations and identify promising innovative services



Bla Bla Car

New expectations :

Seamless connectivity

Personnalized services

New mobilities :
carpooling, carsharing
New means- :etc.

Social networks

Crowdsourcing



ANTICIPATE CUSTOMERS EXPECTATIONS

VINCI Autoroutes Innovation Lab

Our ambition

Imagine with innovative partners & test with our customers new services
in fields of connected mobility, safe & friendly journey

Our partners :

Employees, Collectivities, Innovative companies and ... Startups

Our method : Win/Win collaboration with Startups

- Transforming highway network into a living lab
- Imaging with Startups innovative services to be tested on more than 4,000 km highway network with more than 2,000,000 daily customers

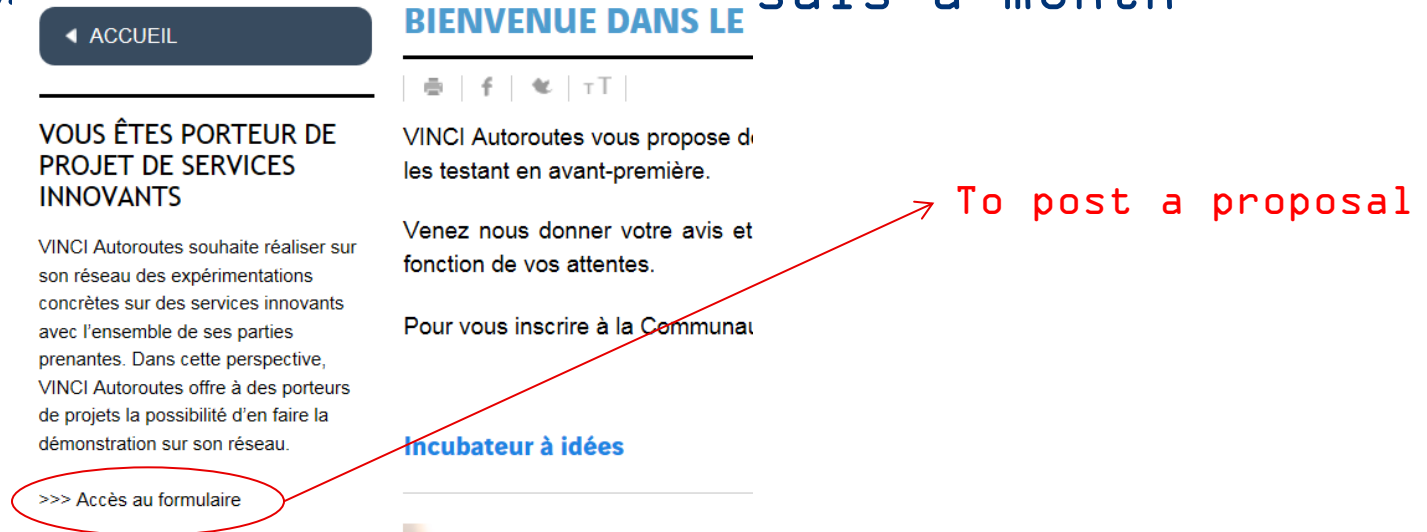
As a results :





- Identifying innovative services matching with customers expectations
- Helping startups to develop themselves by sharing marketing feedbacks , providing them with business development supports **AND first business case references**

ANTICIPATE CUSTOMERS EXPECTATIONS

Open innovation approach to identify innovative partners

« Idea box » to 10 proposals a month



[← ACCUEIL](#)
BIENVENUE DANS LE
 |  |  |  |  |

VOUS ÊTES PORTEUR DE PROJET DE SERVICES INNOVANTS
 VINCI Autoroutes souhaite réaliser sur son réseau des expérimentations concrètes sur des services innovants avec l'ensemble de ses parties prenantes. Dans cette perspective, VINCI Autoroutes offre à des porteurs de projets la possibilité d'en faire la démonstration sur son réseau.

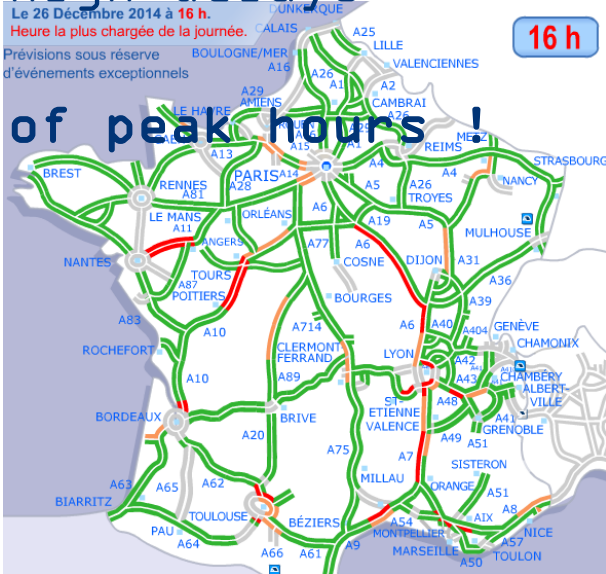
VINCI Autoroutes vous propose de les tester en avant-première.
 Venez nous donner votre avis et fonction de vos attentes.
 Pour vous inscrire à la Communauté

[Incubateur à idées](#)
[>>> Accès au formulaire](#) → **To post a proposal**

« Innovation call » to 5,000 startups in France → CiteGreen

SHIFT OUR TRIPS OUT OF PEAK HOURS / WITH STARTUP CITEGREEN

On holidays, all departures on the same time cause high delays



→ shift your trips out
Shift your trips out of peak hours
and win gifts



2 months test this summer
13 000 participating users
to be generalized

→ Successful test

26 000 shifted trips



FLASH & TAKE OFF / WITH STARTUP IREALITE

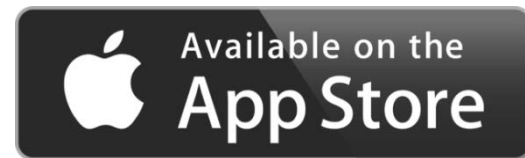
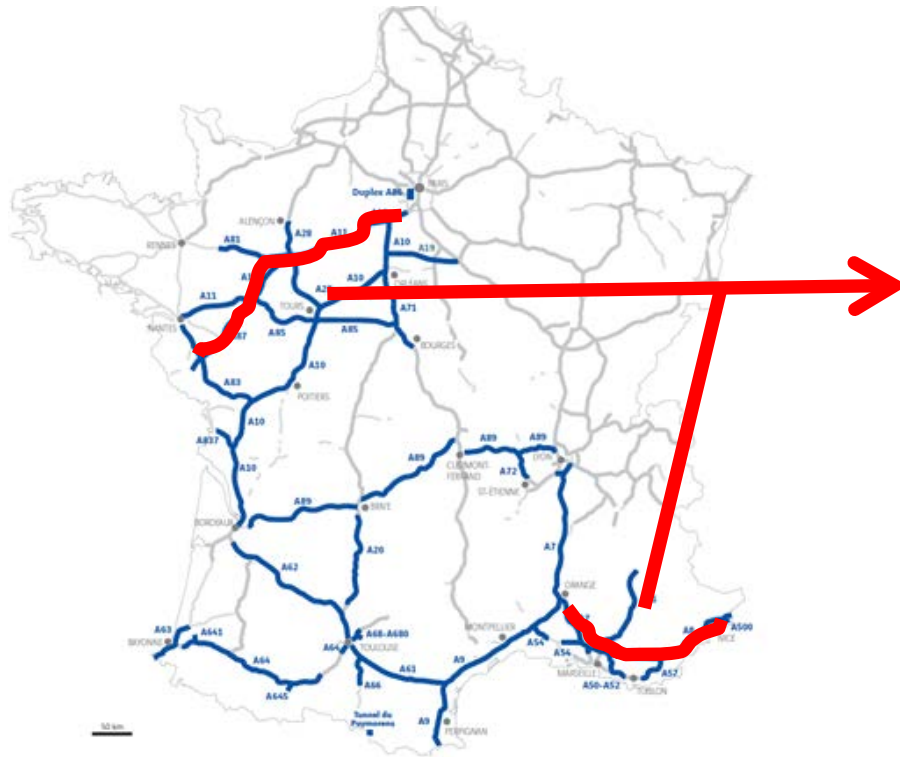
Drowsiness is the first cause of accidents on highways
→ Have a resting break every



Cannes - France

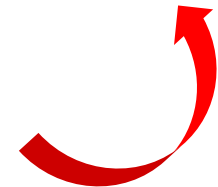
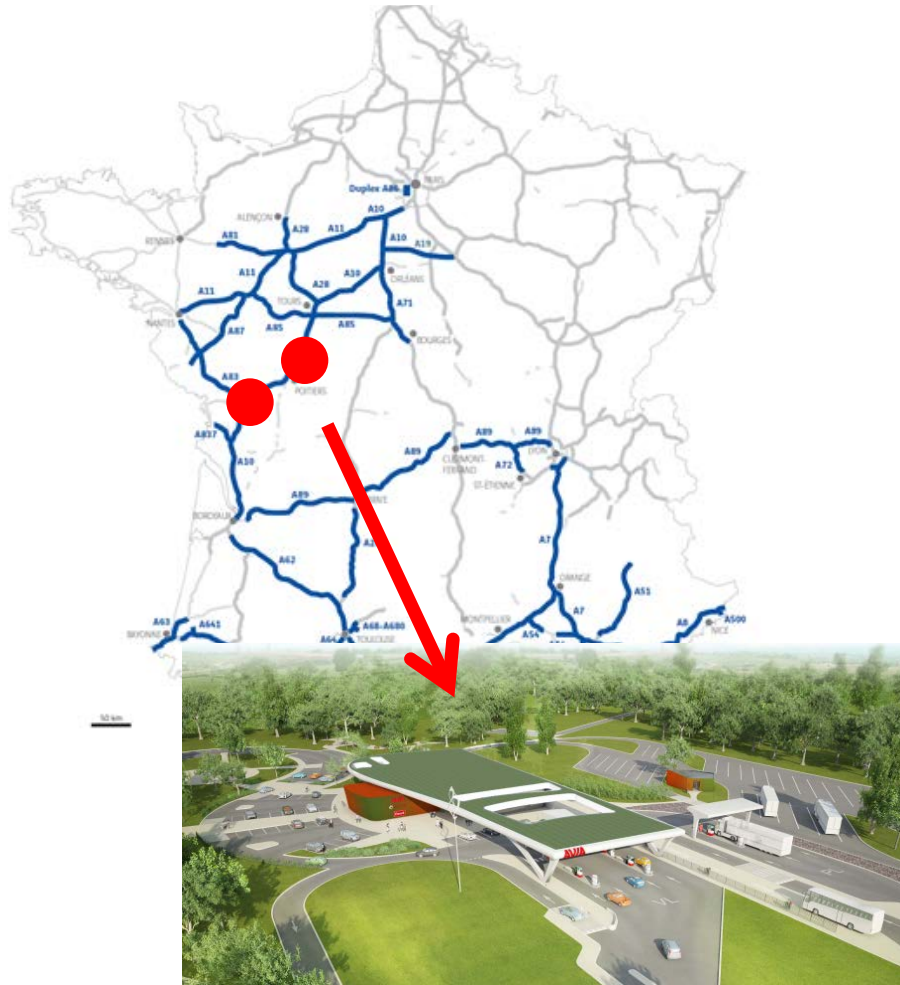


PANORAMA 360 / WITH STARTUP IREALITE





FLASH & TAKE OFF / WITH STARTUP IREALITE





**Flashez...
...Décollez !**
Découvrez les territoires
que vous traversez !



ANTICIPATE CUSTOMERS EXPECTATIONS

How identify new trends and new concepts of services?

Innovation as usual → trends watch and internal brainstorming

Disruptive Innovation approach → Hackathon

HACKATHON

HACKATHON



10 000 €
de prizepool



48H to enhance **daily mobility**

May, 16-18th 2014
Bordeaux, France

HACKATHON



Results :

50 participating people :
students, young professional,
startup

10 projects of digital
services

3 winners

coached by VINCI Autoroutes
Lab up to Demosntration and

**N00R : a start-up created thanks
to the contest !**

MOBILITY MATE APPLICATION / WITH STARTUP N00R

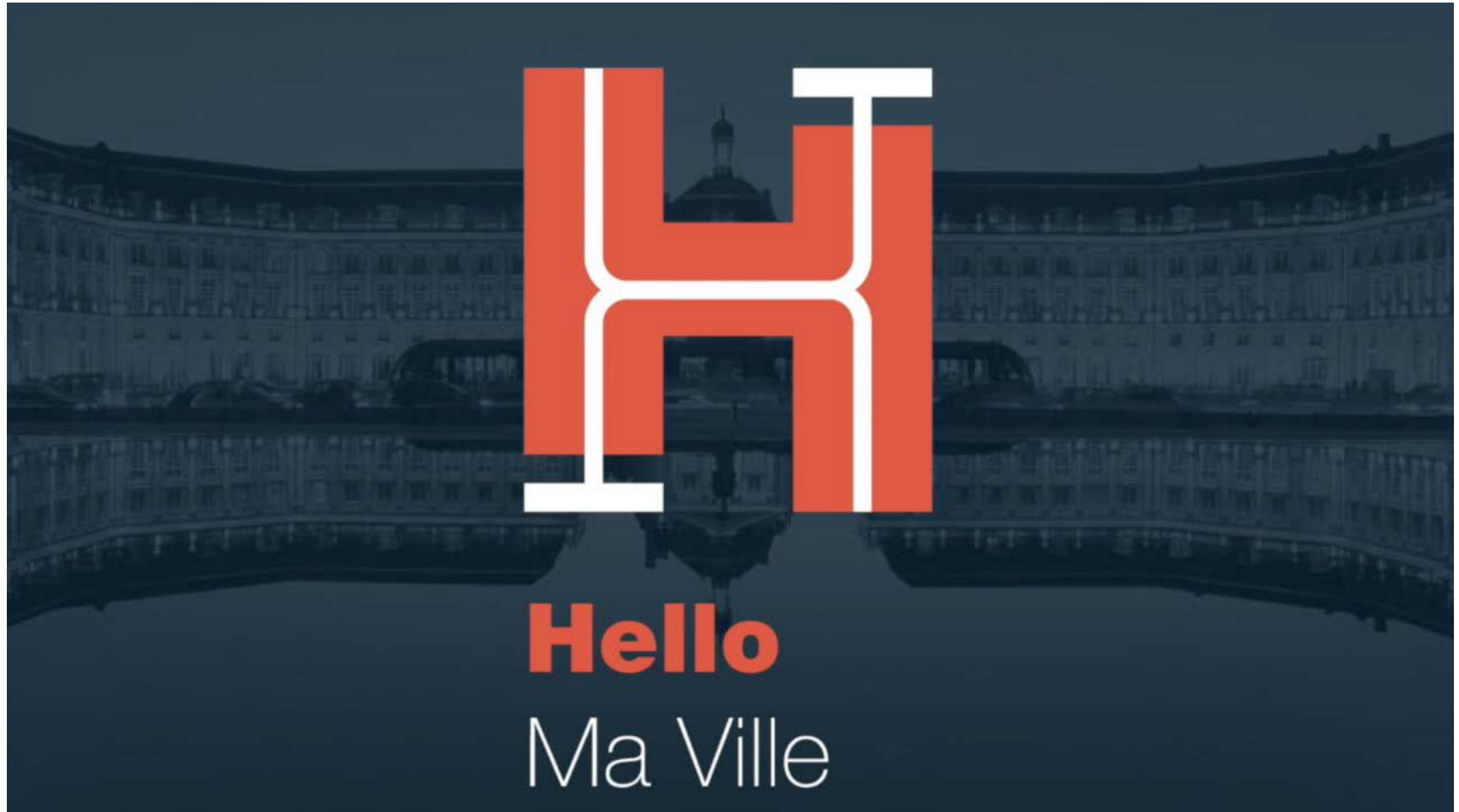
N00R : A startup with a very promising sustainable mobility



Be aware the way you move to improve your mobility

- Log your trips
- See your good or bad choices
- Access to a huge mobility offer
- **Be rewarded for your sustainable actions**

MOBILITY MATE APPLICATION / WITH STARTUP NOOR



CONCLUSION

Win/Win collaborations between Big companies and Startups
 Lessons learned of one open innovation year

Startup

- Focused on an forthcoming customers expectations
- Able to draft prototypes of services and deploy shortly innovative services in real condition



Win/Win collaboration feedback and transforming daily used first business case reference Living lab enabling to imagine than financial support at first stage result to identify new services matching customers expectations

Thank you for your attention

Simon Coutel

Innovation & Digital services manager

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MIKE HEILIGENSTEIN



CENTRAL TEXAS
Regional Mobility Authority

Moving America Forward: Customers and Collaboration

Mike Heiligenstein

Central Texas Regional Mobility Authority Executive Director
& IBTTA President

IBTTA
TOLLING. MOVING SMARTER.

What do Customers Expect?

- Reliability
- Safety
- Connectivity – Expanding story (Illinois Tollway Pilot)
- Stress-free experience
- Fair pricing





What do Customers Think?



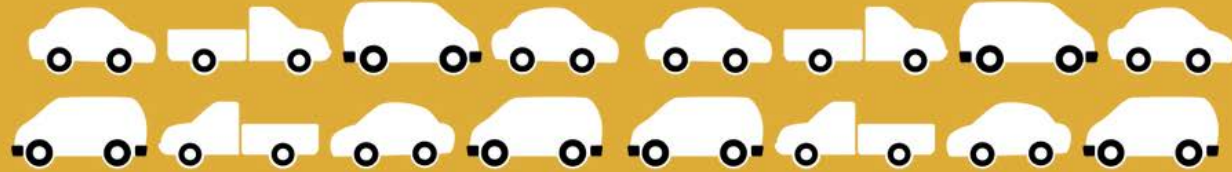
Texas Transportation Poll



**Texans really depend on
their cars and trucks.**

9 of 10
own or lease a personal vehicle.

Texas Transportation Poll



**They're feeling the squeeze of traffic gridlock
and higher gas prices.**



3/4 of Texans

say they're feeling the pain of traffic congestion where they live.

Congestion Trends: Wasted Time Top ten Very Large Urban Areas

Urban Area	Travel Time Index				
	2011	2010	2005	2000	1982
Very Large Average	1.27	1.28	1.33	1.28	1.12
Washington DC-VA-MD	1.32	1.31	1.33	1.30	1.10
New York-Newark NY-NJ-CT	1.33	1.33	1.43	1.33	1.12
Dallas-Fort Worth-Arlington TX	1.26	1.25	1.30	1.22	1.06
Seattle WA	1.26	1.26	1.31	1.29	1.08
Los Angeles-Long Beach-Santa Ana CA	1.37	1.37	1.41	1.38	1.20
Chicago IL-IN	1.25	1.25	1.30	1.22	1.08
Boston MA-NH-RI	1.28	1.28	1.42	1.34	1.12
Atlanta GA	1.24	1.24	1.29	1.26	1.08
Miami FL	1.25	1.25	1.33	1.29	1.10



Congestion Trends: Wasted Time

Top ten Large Urban Areas

Urban Area	Travel Time Index				
	2011	2010	2005	2000	1982
Large Average	1.20	1.20	1.24	1.23	1.08
Austin TX	1.32	1.31	1.35	1.26	1.09
Riverside-San Bernardino CA	1.23	1.23	1.24	1.16	1.01
Portland OR-WA	1.28	1.28	1.30	1.29	1.07
Denver-Aurora CO	1.27	1.27	1.31	1.29	1.08
San Juan PR	1.25	1.25	1.24	1.21	1.07
Baltimore MD	1.23	1.23	1.23	1.17	1.06
Minneapolis-St. Paul MN	1.21	1.21	1.30	1.28	1.05
San Antonio TX	1.19	1.19	1.22	1.19	1.03
Cincinnati OH-KY-IN	1.20	1.20	1.21	1.23	1.05
Las Vegas NV	1.20	1.20	1.24	1.21	1.05



Numbers Worth Noting

**3.25
million**

**Austin's estimated
regional population**
in 2035 (nearly double today)



**45–60
minutes**

Average commute,
downtown Austin to
Round Rock



**\$10
billion**

**Lost time/wasted
fuel in Texas due to
congestion annually**



**6
hours**

Congested hours
from US 183 to SH 71
along I-35 in Austin
(10.2-mile segment)



**86
percent**

**Local percentage
of traffic along**
I-35



Texas Transportation Poll

From a list of 15 different ways to improve transportation in the state,



better traffic
signal timing



clearing accidents
more quickly

were the most popular ideas ...

Texas Transportation Poll

From that same list of 15 different ways to improve transportation in the state,



building more
toll roads

was the least popular idea.

Texas Transportation Poll

What were the other 14?

1. Timing traffic signals more effectively
2. Doing a better job of managing accidents
3. Adding more lanes to state-maintained roads
4. Telecommuting or working flexible hours
5. Additional public transportation service
6. Dedicating more money to maintain the current system
7. Investing more to connect rural areas to urban areas
8. Carpooling
9. Encouraging private business to invest in transportation
10. Encouraging shippers to change travel patterns
11. Encouraging use of non-personal auto modes of transportation
12. Encouraging transit oriented development
13. Providing more carpool lanes
14. Investing more in the shipment of goods and services
15. **Building more toll roads**

Texas Transportation Poll

Congestion in my region affects the price of

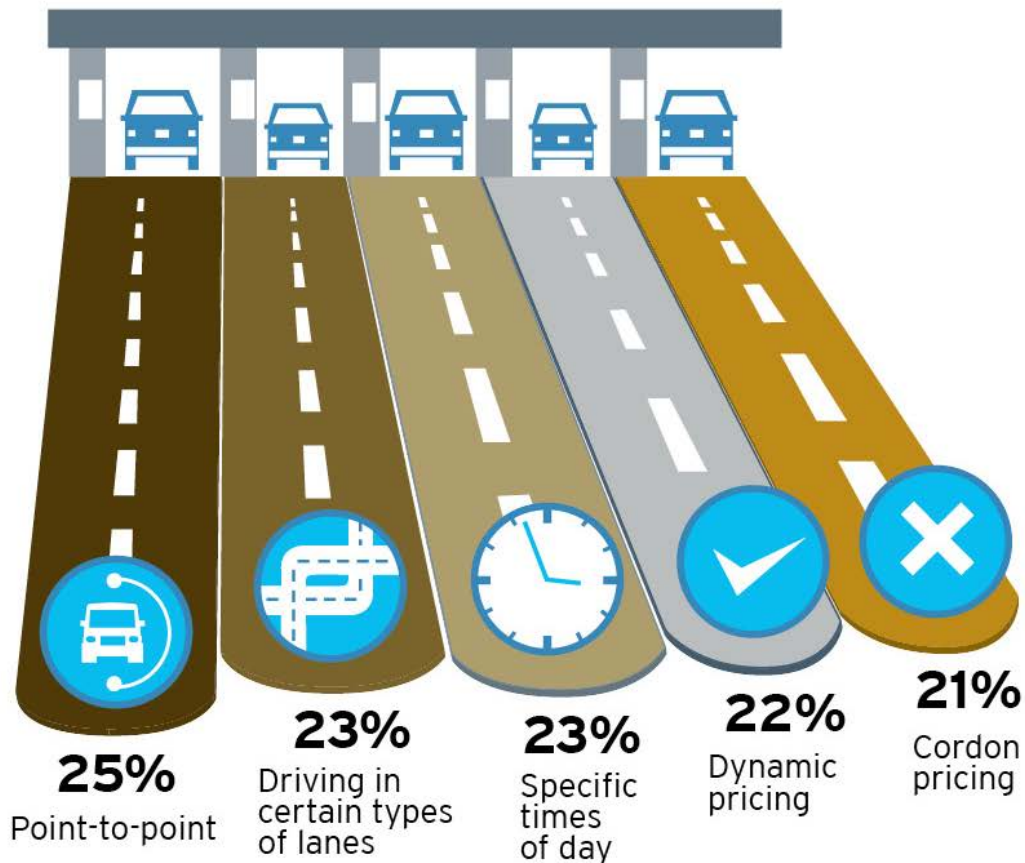


goods & services

40% agreed with that statement.

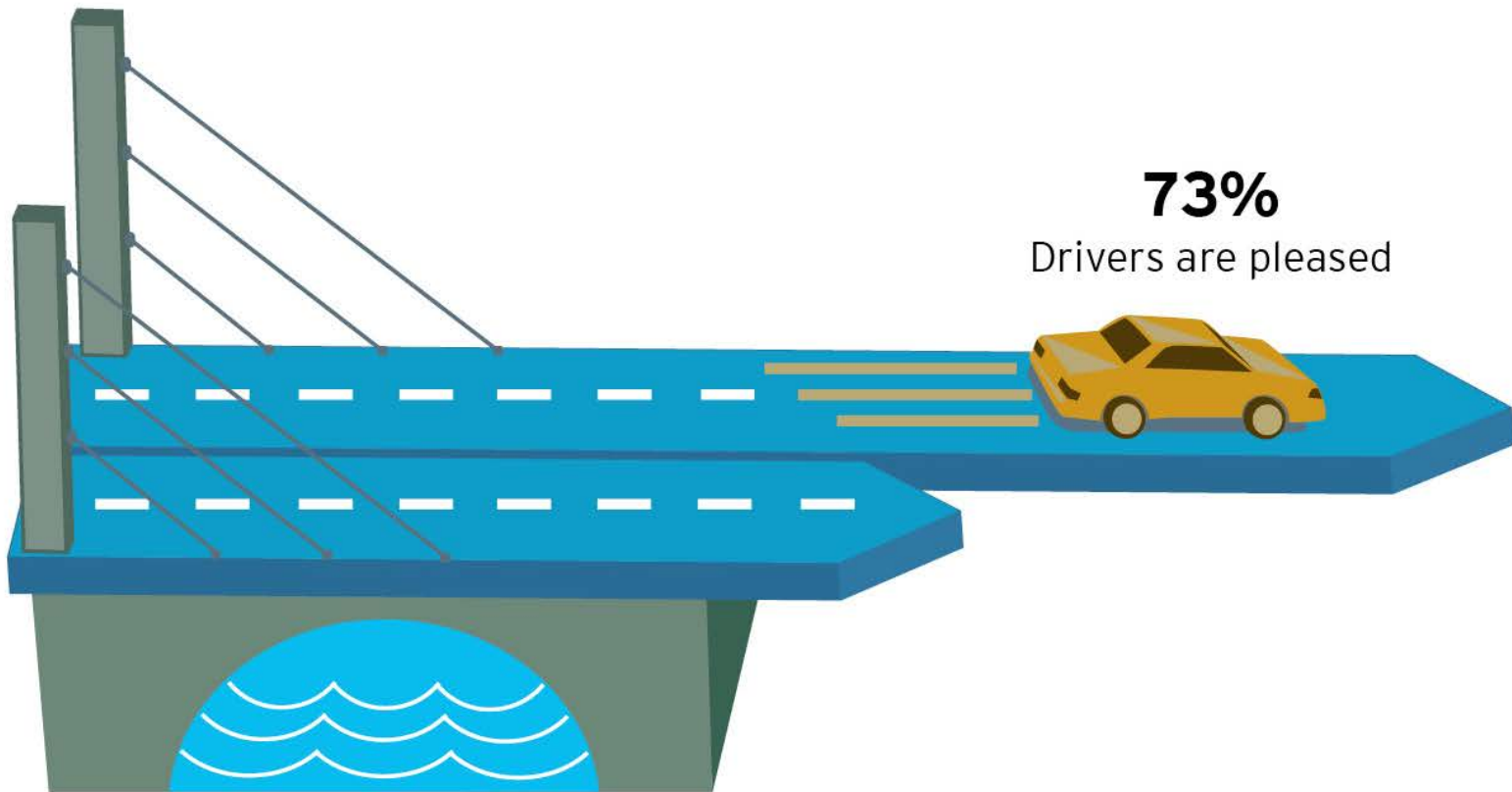
HNTB Survey

Which of the following, if any, do you think are fair ways to toll?
Select all that apply?



HNTB Survey

Texans are pleased with the value they receive for the toll paid.



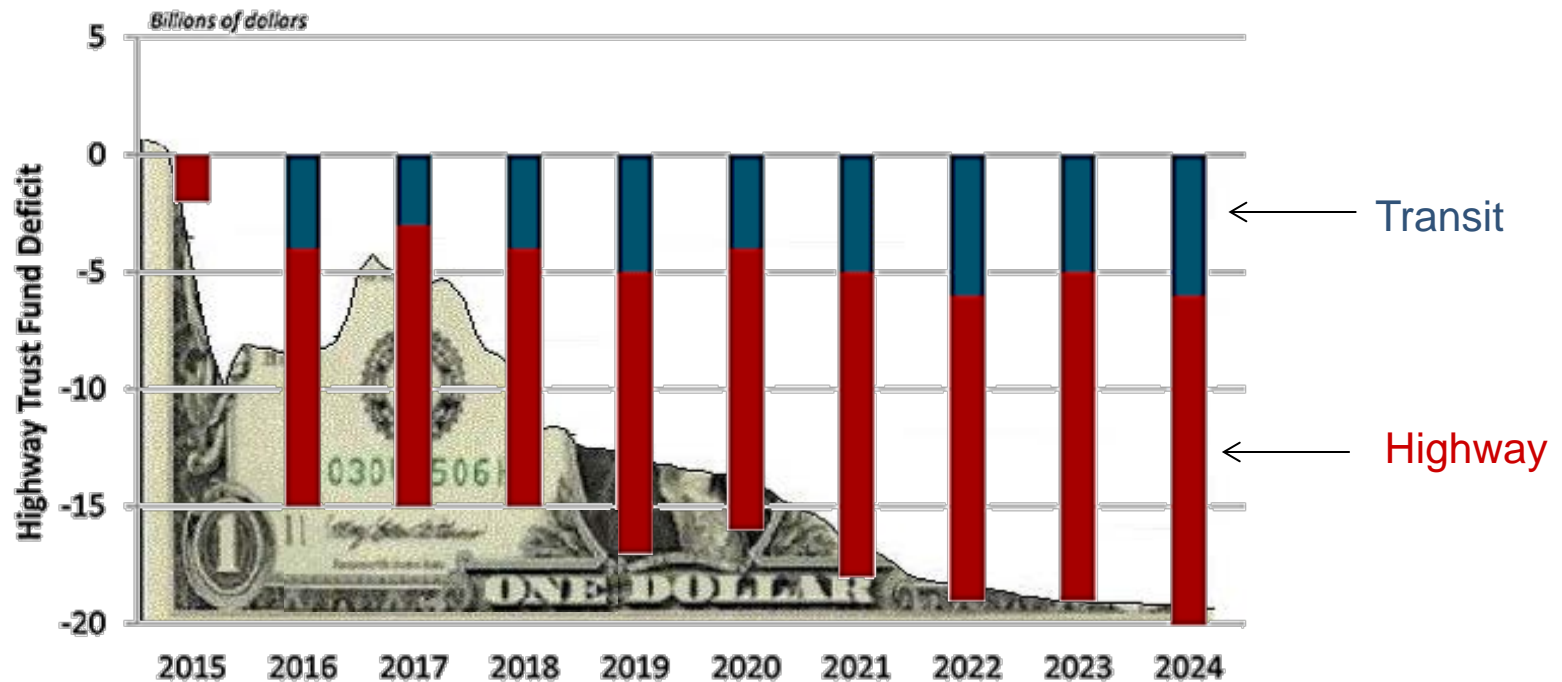
Collaboration: Working Together with our Peers

Local, State and Federal Cooperation is American Culture



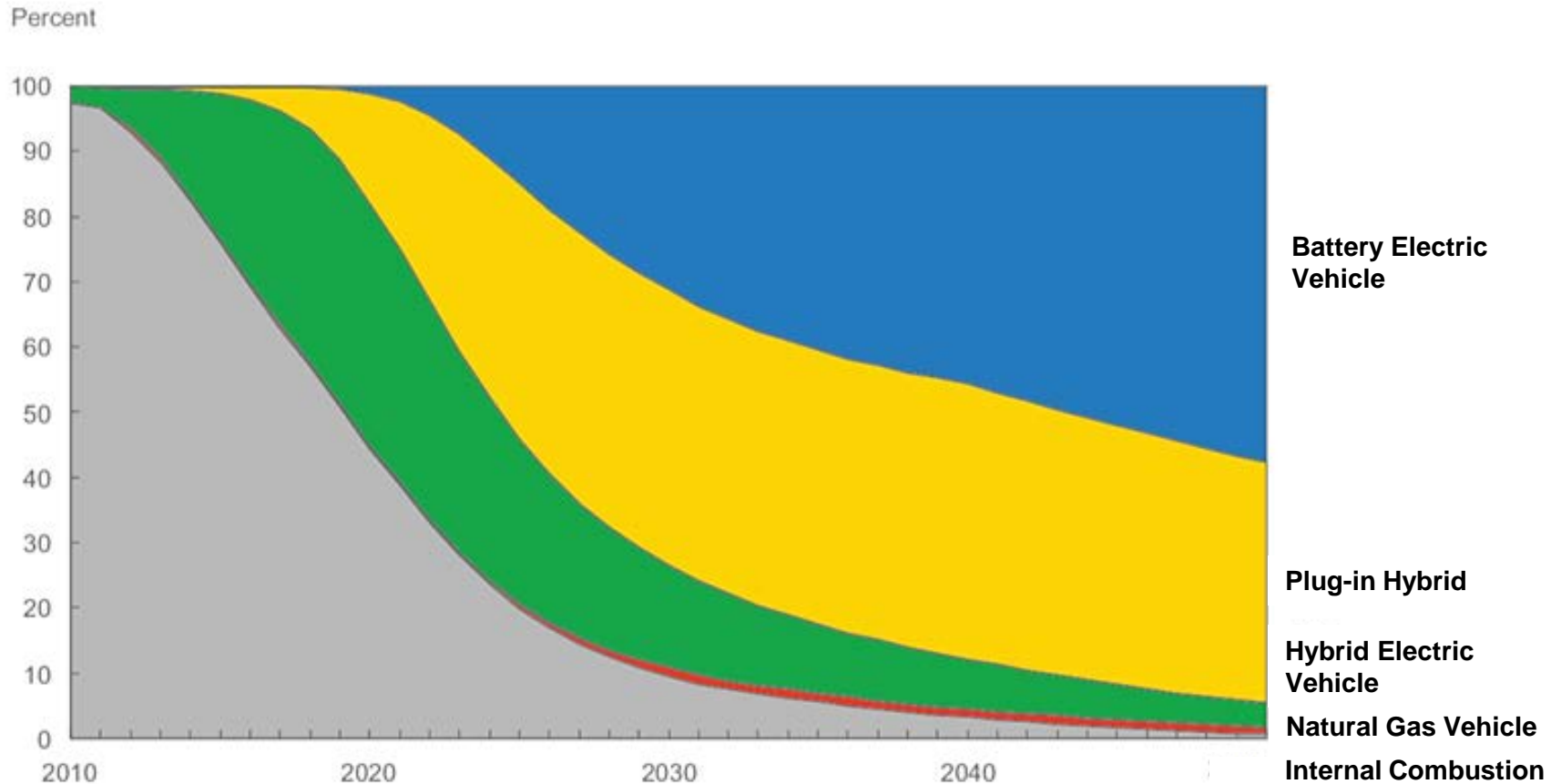
Dwindling Federal Highway Trust Fund

From 2015 to 2024, the transit and highway accounts are projected to face a total shortfall between dedicated receipts and spending of **\$157 billion**. Debate still exists over transit vs. highway funds.



SOURCE: Congressional Budget Office, *An Update to the Budget and Economic Outlook: 2014 to 2024*, August 2014. Compiled by PGPF.

Transportation Forecasts: Mix of Vehicles



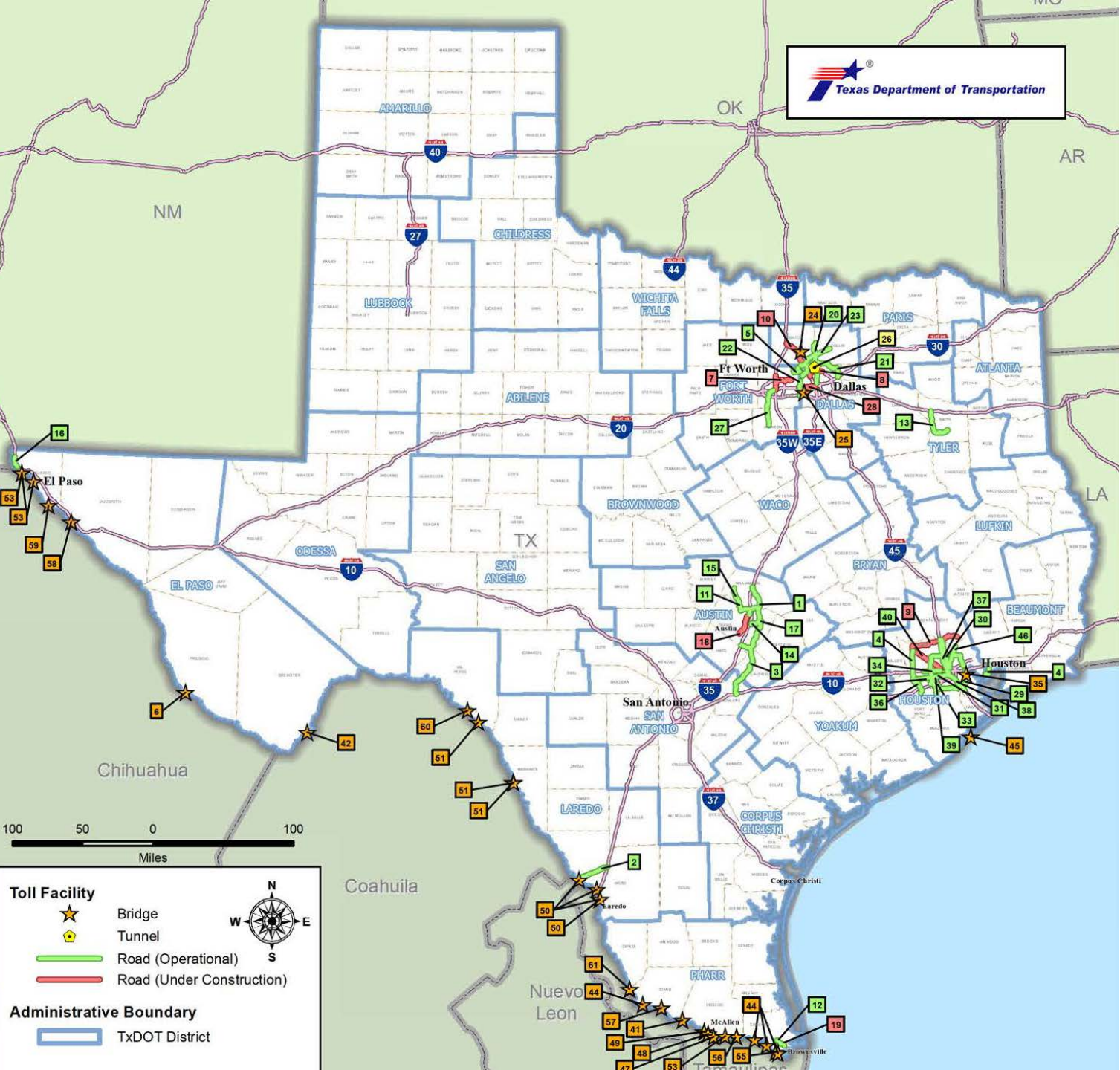
- Varying predictions
- Range of technology

Source: National Renewable Energy Laboratory

Tolled Expressways Offer Options



Texas Toll Roads and Bridges



290E Toll/Manor Expressway



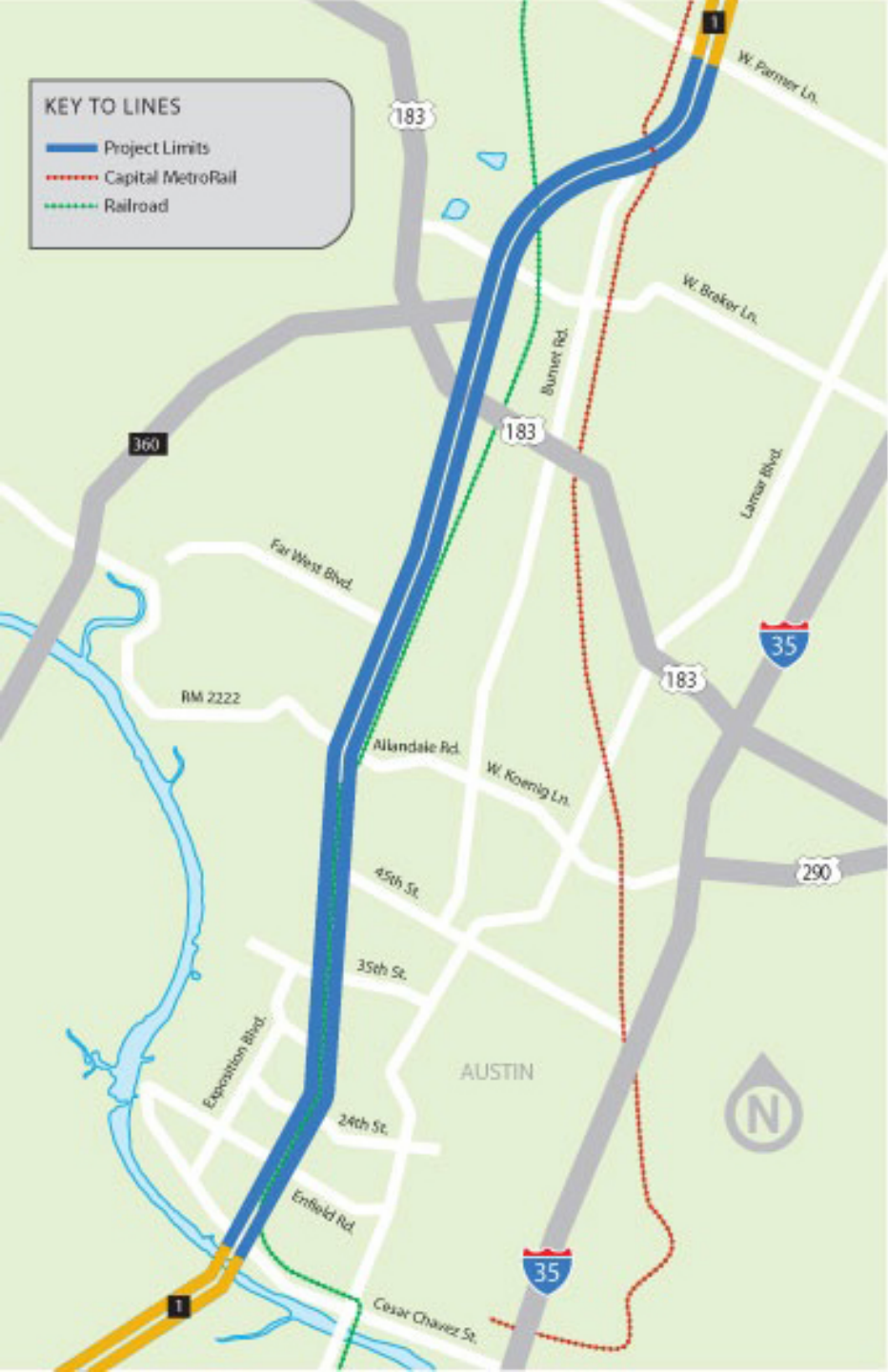
290E Toll/Manor Expressway



Managed Lanes Improvement Project

KEY TO LINES

- Project Limits
- - - Capital MetroRail
- · - · - Railroad



- Constructing one tolled Managed Lane in each direction on an 11-mile stretch in core of Austin, Texas

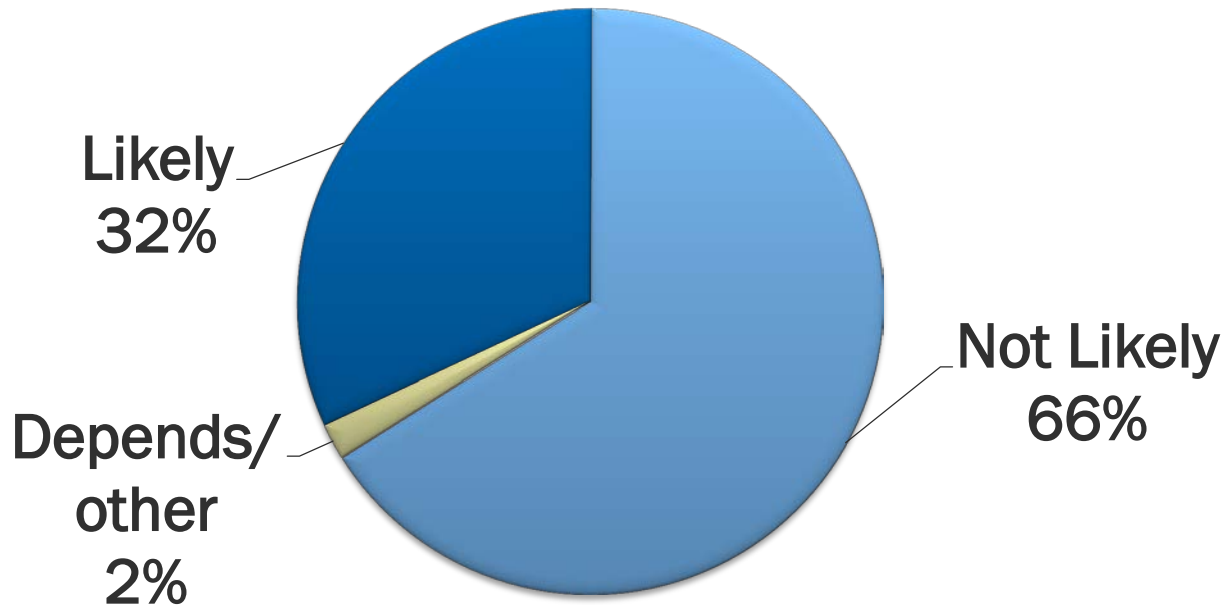


◀◀ MOPAC
IMPROVEMENT
PROJECT ▶▶

MoPac Improvement Project Video

Likelihood of Using Express Lane for \$2.25 toll (11.2 miles)

Which best describes how likely you would be to use the Express Lanes at rush hour for a toll of \$2.25?



If 32% of all MoPac drivers used the Express Lanes their capacity would be exceeded.



CENTRAL TEXAS
Regional Mobility Authority

IBTTA
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JOSEF CZAKO

Mobility Pricing – A Paradigm Shift to improve congestion, environment, road safety and financing.

Josef A. Czako

IBTTA Global Summit, Prague, 19-21 October 2014

Kapsch TrafficCom AG

IBTTA

TOLLING. MOVING SMARTER.



Agenda

- Overview Kapsch TrafficCom
- Areas of Action to secure Sustainable Mobility
- Mobility Pricing – A Paradigm Shift
- Benefits, Roadmap and Recommendations for Mobility Pricing

Kapsch TrafficCom Solution Portfolio

<p>ETC Road User Charging</p> 	<p>ETC Urban Access & Parking</p> 	<p>ITS Road Safety Enforcement</p> 	<p>ITS Commercial Vehicle Operations</p> 	<p>ITS Electronic Vehicle Registration</p> 	<p>ITS Traffic Management</p> 	<p>ITS V2X Cooperative Systems</p> 
Free-Flow Satellite Tolling	Urban Road User Charging	Red Light Enforcement	Electronic Clearance	Vehicle Registration	Highway Traffic Management	In-vehicle Components
Free-Flow Terrestrial Tolling	Limited Access Zone	Speed Enforcement	Electronic Screening	Vehicle Compliance	Tunnel Traffic Management	Roadside Stations
Plaza Tolling	Low Emission Zone	Section Speed Enforcement	Electronic Inspection	Vehicle Monitoring	Bridge Traffic Management	
Mobility Pricing	Dynamic Parking	Weight Enforcement (Weigh-In-Motion)			Managed Lanes	
		Lane Enforcement				
		Traffic Surveillance				

Kapsch TrafficCom at a Glance.



- Comprehensive portfolio in the field of Intelligent Transportation Systems (ITS)
- Multi-Lane/Free-Flow & ORT Tolling Schemes as core competence



- KTC covers the entire value chain as a One-Stop-Shop with consulting, development, installation, commercial and technical operations, and maintenance



- Global presence: subsidiaries and representative offices in 33 countries
- >250 Projects in 44 countries



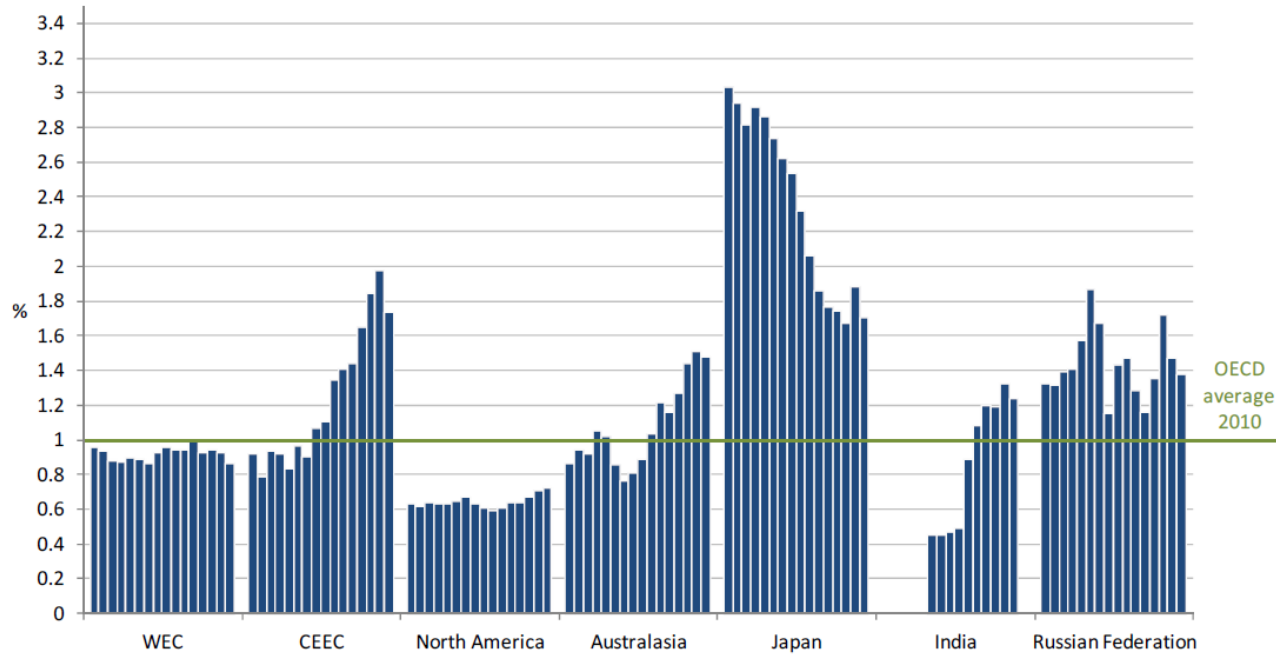
- Broad technological base for individual solutions
- Eight research and development centers on three continents

Areas of Action to Secure Sustainable Mobility.



Areas of Action - Financing

Investment in inland transport infrastructure by region
1995-2010 (as a percentage of GDP, at current prices)



- Tax financing at its limits
- GDP share remained between 0.8% and 1.0% on average since the 1990s in Western European countries
- North America constant GDP share (0.6%)
→ slight growth in investment as a share of GDP, reaching 0.7% in 2009 and 2010

Source: International Transport Forum at the OECD. **Note:** WECs include Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom. CEECs include Albania, Bulgaria, Croatia, Czech Republic, Estonia, FYROM, Hungary, Latvia, Lithuania, Montenegro, Poland, Romania, Serbia, Slovakia and Slovenia. North America include Canada, Mexico and the United States. Australasia include Australia and New Zealand.

Areas of Action - Congestion

Social Economic Cost of Congestion are continuously CLIMBING ...

The demand for mobility is growing rapidly,
resulting in further increase of passenger trips and freight volumes



Europe:
Annual cost of congestion
€110 Billion

Source: EC, 2012

U.S.:
Congestion cost the
economy about **€95,6
Billion in lost output**

Source: Texas A&M University, 2011

Areas of Action – Road Safety

NUMBER OF PEOPLE THAT DIED IN ROAD CRASHES IN 2013



Europe:
5.5 people per 100.000
inhabitants are dying on
roads.

U.S.:
11.4 people per 100.000
inhabitants are dying on
roads.

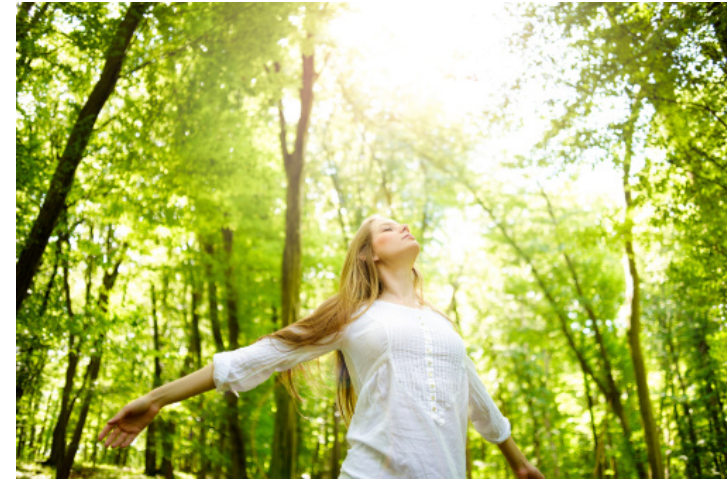
Note: The „best“ Country is Sweden:
3 road deaths per 100.000 inhabitants per year

Source: The Economist, 2014

Areas of Action – Health & Environment

- **More than two million deaths** occur globally each year as a direct result of **human-caused outdoor air pollution**
- The study also shows that changing climate has a minimal effect and only accounts for a small proportion of current deaths related to air pollution

Source: Environmental Research Letters, 2013



Areas of Action - Summary

1. For increase of sustainability and efficiency, appropriate financing of transport infrastructure is needed.
2. Road capacity is limited, for both, within Cities and Interurban traffic. Demand and capacity needs to be managed.
3. Accident and fatality rates are unacceptable high.
4. External costs of traffic are only partly considered (CO₂, pollution, noise, or accidents).
5. **THE RESULT: Huge losses in GDP !**



Area of Action:
Mobility Pricing
A Paradigm Shift for Sustainable Mobility.

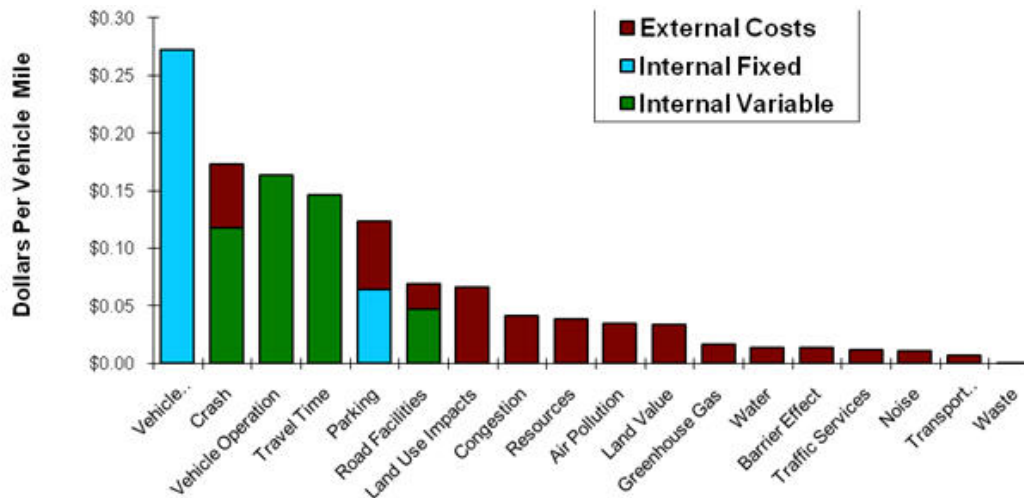


Mobility Pricing focuses on Sustainable Mobility



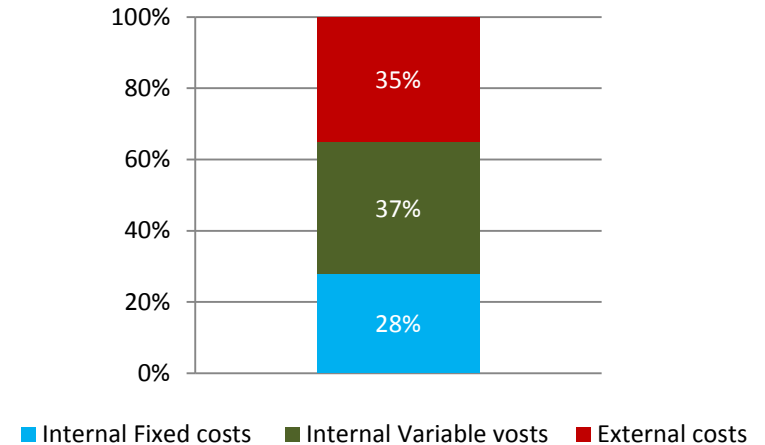
Cost (internal and external) of Transport.

Cost ranked by magnitude:



This figure shows costs per vehicle-mile for an average North American automobile.

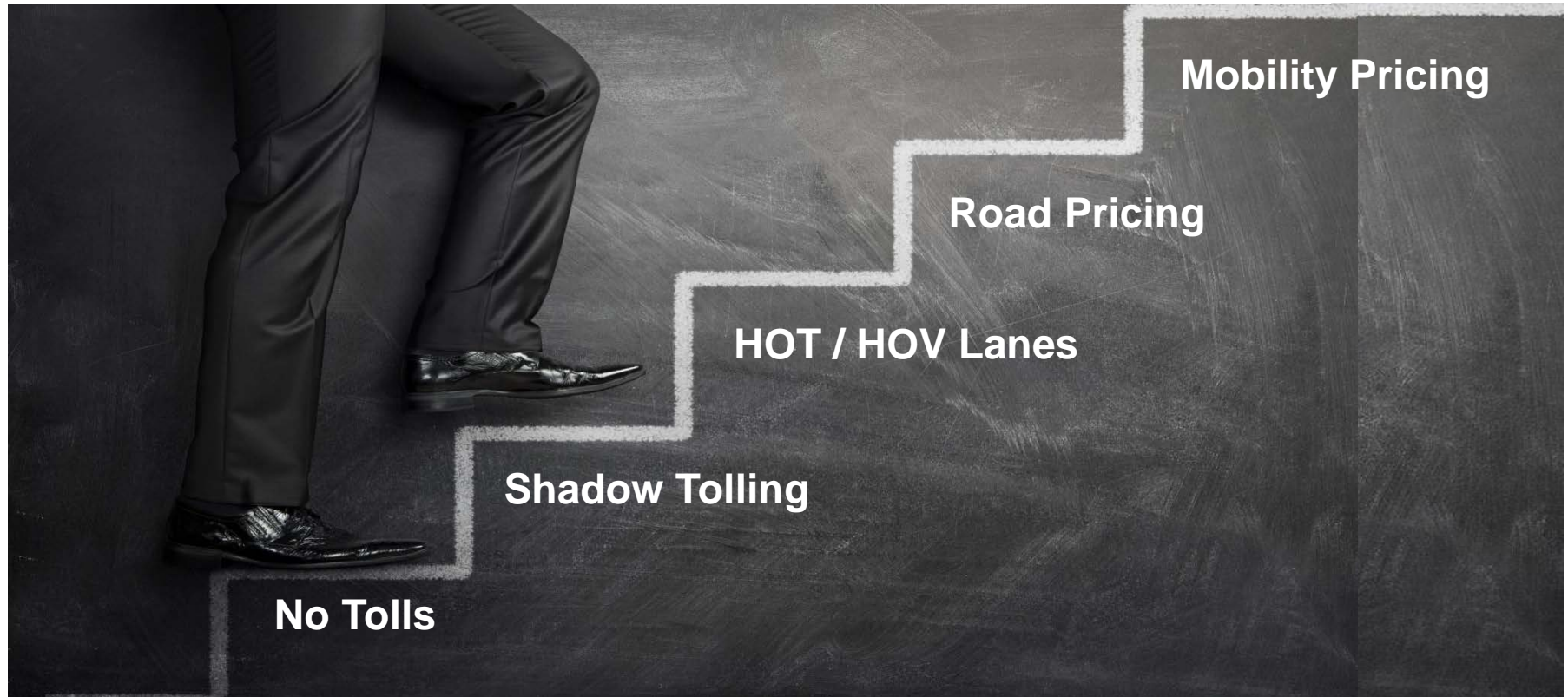
Average car cost distribution:



Source: Transportation Cost Analysis, Litman 2011

External cost, if not internalized with Mobility Pricing, are not taken into account when it comes to mobility decisions!

Mobility Pricing – Far the Best Toll & Charge.



Elements Mobility Pricing. More Sustainable than Road Pricing.



Distance of trip

Red flag icon Green flag icon




Time of the day

Green flag icon



All emissions caused and energy use

Green flag icon



Vehicle emissions class

Red flag icon Green flag icon

Road Pricing Mobility Pricing

Red flag icon Green flag icon




External costs

Green flag icon




Direct Costs for financing of infrastructure

Red flag icon Green flag icon



Amount of persons in vehicle

Green flag icon



Route of trip

Green flag icon

Mobility Pricing

Mobility Pricing – Covers a Trip from Start to End.



Transport Service Providers.

Deliver complete information before, during, and after the journey about my intermodal trip.

All alternatives across all methods of transport are considered.

Prepare transactions of trips made.



Mobility Data.

Processing by operator of all trip data for comprehensive billing.



Coordination in Service Center.

Maintains close customer service and maintains all mobility information.



Billing.

Prepares an individual "Mobility Bill" for the customer, e.g. every week or month. The Mobility Bill shows the mobility pattern in this period with the price to pay for use of infrastructure, involved taxes, distance travelled, time travelled, energy used, congestion times, and external costs caused (CO₂, noise, health). Moreover, the system is developing and suggesting mobility improvements.

Mobility Pricing, international developments.



Finland's future scenario includes to introduce incentives for a change of mobility behavior with new smart devices and services based on a new "Pay as you go" Model. Discussions contain also tax and insurance payments.



Singapore was the first City in the world to manage congestion by implementing the ERP - Electronic Road Pricing - System. The next generation (ERP II) is testing the use of Smart Devices and the use of GNSS (Global Navigation Satellite System).



Switzerland is active in regard of the necessities to increase the Sustainability of Road Transport while also working on a study on Mobility Pricing, to be published by end of 2014.

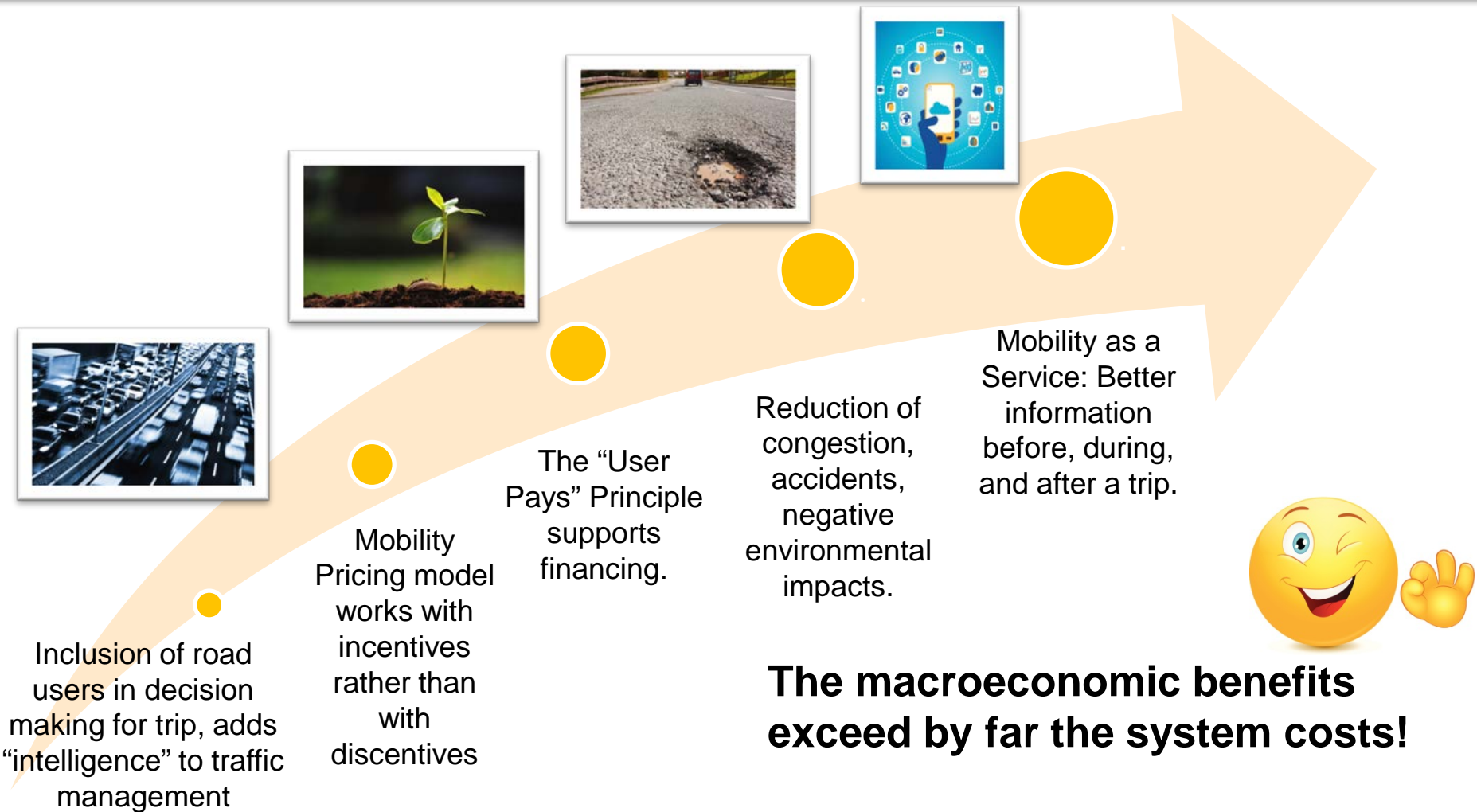


The U.S. State of Oregon is currently testing in the VMT Project the model of charging according to the vehicle miles traveled (VMT), while replacing the gas tax.

Benefits, Roadmap, Recommendations for Mobility Pricing.



Benefits of Mobility Pricing.



Road Map & Recommendations for Mobility Pricing

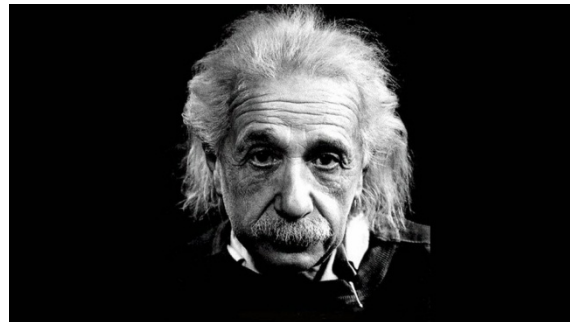


- 1. Identification and description of existing transport problems.**
- 2. Analysis of associated socio-economic losses.**
- 3. Open discussion (objective, non-political, fact based) of potentials with Mobility Pricing with all relevant Stakeholders.**
- 4. Policy development for Mobility Pricing and inclusion into National Transport Policy.**
- 5. Project definition (or extension of existing tolling or charging project).**

THINK !

You can not solve problems with the same methodology which created them.

Albert Einstein



Contact.

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Josef A. Czako

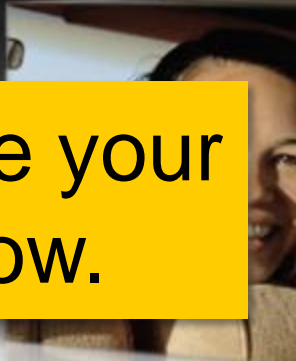
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traffic flow.**



GIAN GHERARDO CALINI

European GNSS: Galileo and EGNOS for next generation Road Charging

20th October 2014 Gian Gherardo Calini

European GNSS Agency (GSA)



European
Global Navigation
Satellite Systems
Agency

IBTTA

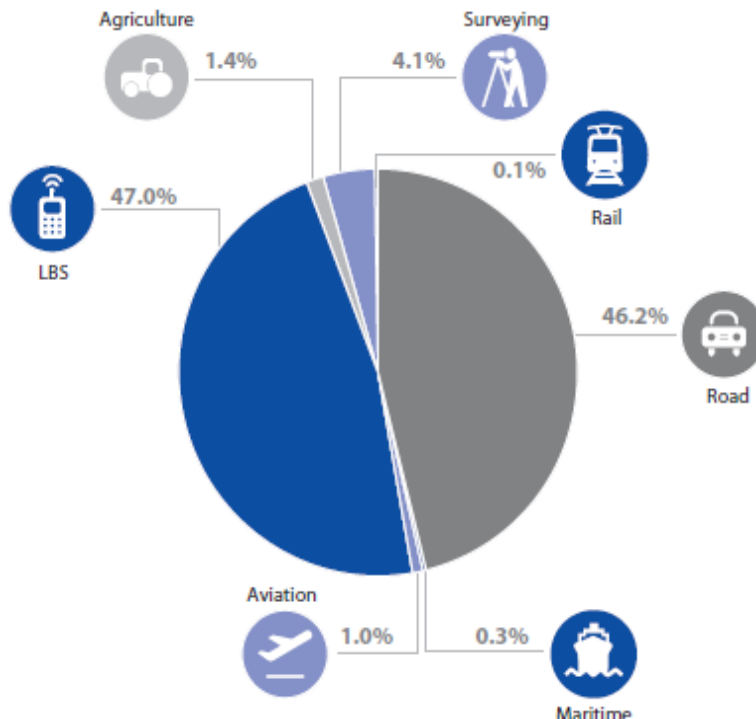
TOLLING. MOVING SMARTER.

GNSS have made a huge impact in our society...

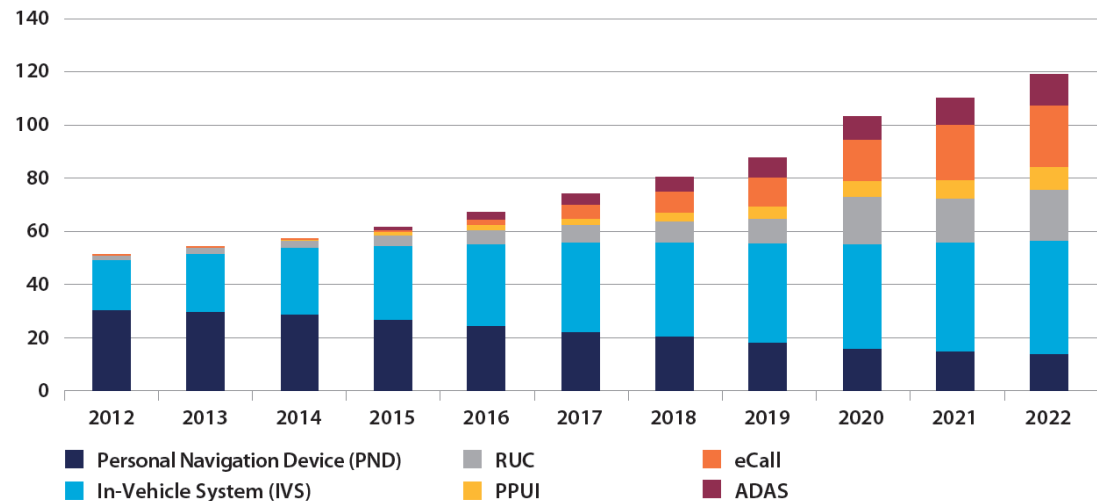


...it is key in Road transportation and its importance will increase over time

Cumulative core revenue by application 2012-2022



Shipments of GNSS devices by Road application



Road User Charging CAGR* = 28.5% until 2022

* CAGR = Compound Annual Growth Rate

Source: http://www.gsa.europa.eu/sites/default/files/GNSS_Market%20Report_2013_web.pdf

GSA aims at achieving European GNSS benefits for users and industry

- Designing and enabling services fully matching **user needs**
- Managing service provision ensuring full **user satisfaction** in the most **cost-efficient** manner
- Engaging market stakeholders, developing applications, **value-added services** and user technology, towards European GNSS full adoption



Galileo has already taken-off



- **6 satellites** have been launched
 - ✓ 4 of them are working and transmitting signal since March 2013
- **24 satellites** are in production:
 - ✓ additional 4 satellites ready for launch at the beginning 2015

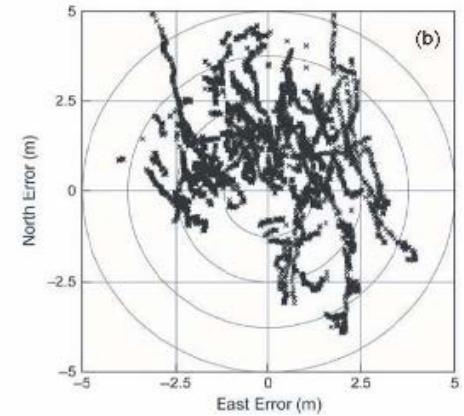


EGNOS, satellite based augmentation system (SBAS), brings value to GPS

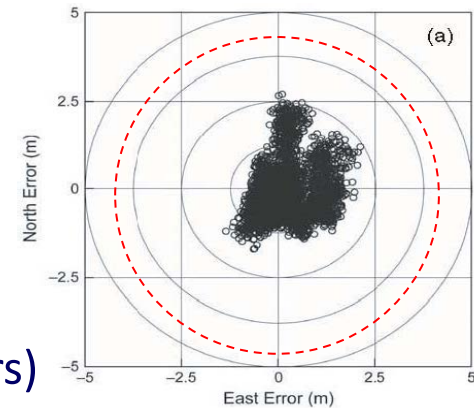


EGNOS makes the difference!

- Satellite Based Augmentation System (SBAS)
- Complementing GPS accuracy (ionosphere and system errors)



GPS



GPS + SBAS



Road users will benefit from Galileo interoperability

 **GPS**



- Global Positioning System, operated and maintained by the **US Department of Defense**

 **GLONASS**



- Globalnaya Navigatsionnaya Sputnikovaya Sistema, operated by the **Russian Government**

 **COMPASS**



- China developed the **Beidou regional** satellite-based navigation system in 2003, to be expanded into a **global** navigation system called **Compass**

 **QZSS**

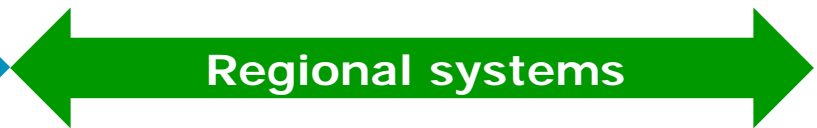


- Quasi-Zenith Satellite System, commissioned by the **Japanese Government in 2002**

 **IRNSS**

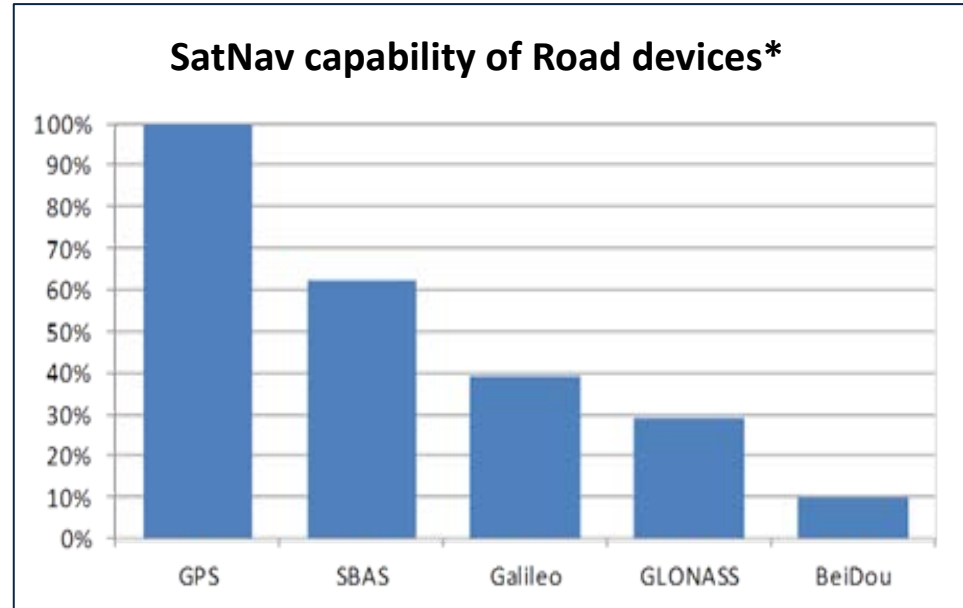


- Indian Regional Navigational Satellite System, approved in 2006, with the intention to be **completed and implemented by 2015**



Global road receiver manufacturers believe in SBAS and multi-constellation

- **SBAS** (e.g. EGNOS) capability is commonplace in today's receivers
 - ✓ Extra accuracy when you need it at no cost
 - ✓ Level of confidence of GPS signal
- **Multi-constellation** (e.g. GPS/Galileo/Glonass) is rapidly becoming the baseline:
 - ✓ Much improved robustness and performance for users



*Source: GSA analysis on GPS World Survey 2013
Percentages based on number of models available, not sales

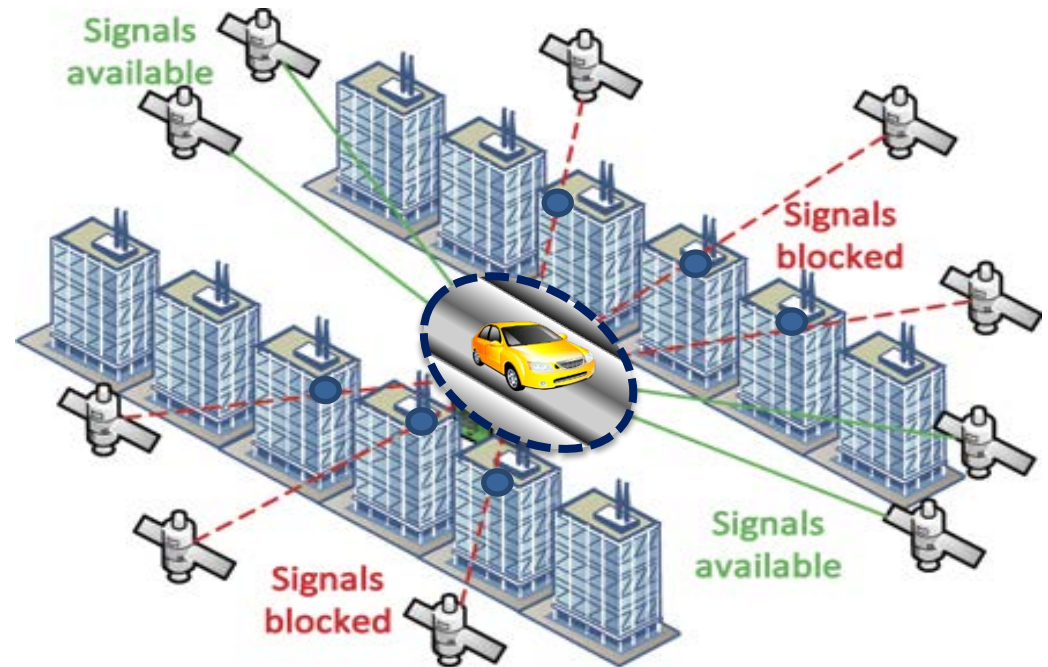
Galileo will contribute to improved accuracy and position robustness against jamming

✓ Multi-constellation:

When buildings block the signal and reduce the number of visible satellites, the availability of more constellations ensures a **much more accurate final position**

✓ Multi-frequency increases

robustness of the position against jammers, because even if a satellite is not available or providing incorrect data, a reasonable accuracy will be achieved



Galileo will be able to provide signal authentication

In addition, **Galileo signal authentication** will provide trustability **against spoofing attempts**

This will facilitate the process for a **legal use of GNSS position** in several regulated road applications:

- ✓ **Payment critical applications**, in which GNSS is used to go from vehicle ownership to usage (e.g. road tolling, congestion charging, pay as you drive, mobility as a service, etc.)
- ✓ **New liability applications** based on GNSS will be supported (e.g.: speed control and enforcement, digital tacograph, accident reconstruction, dangerous goods transportation, etc.)

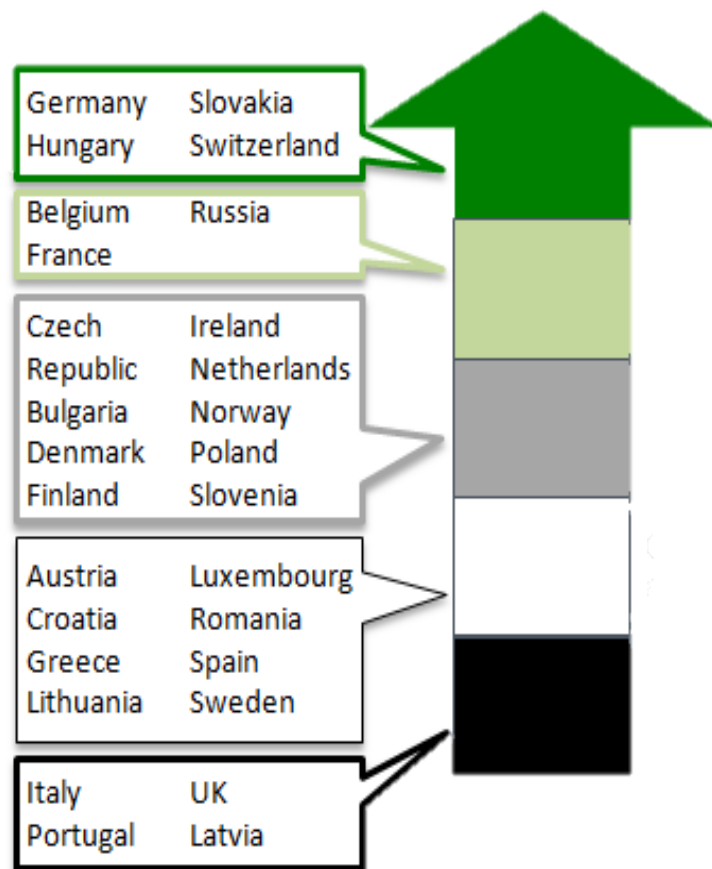
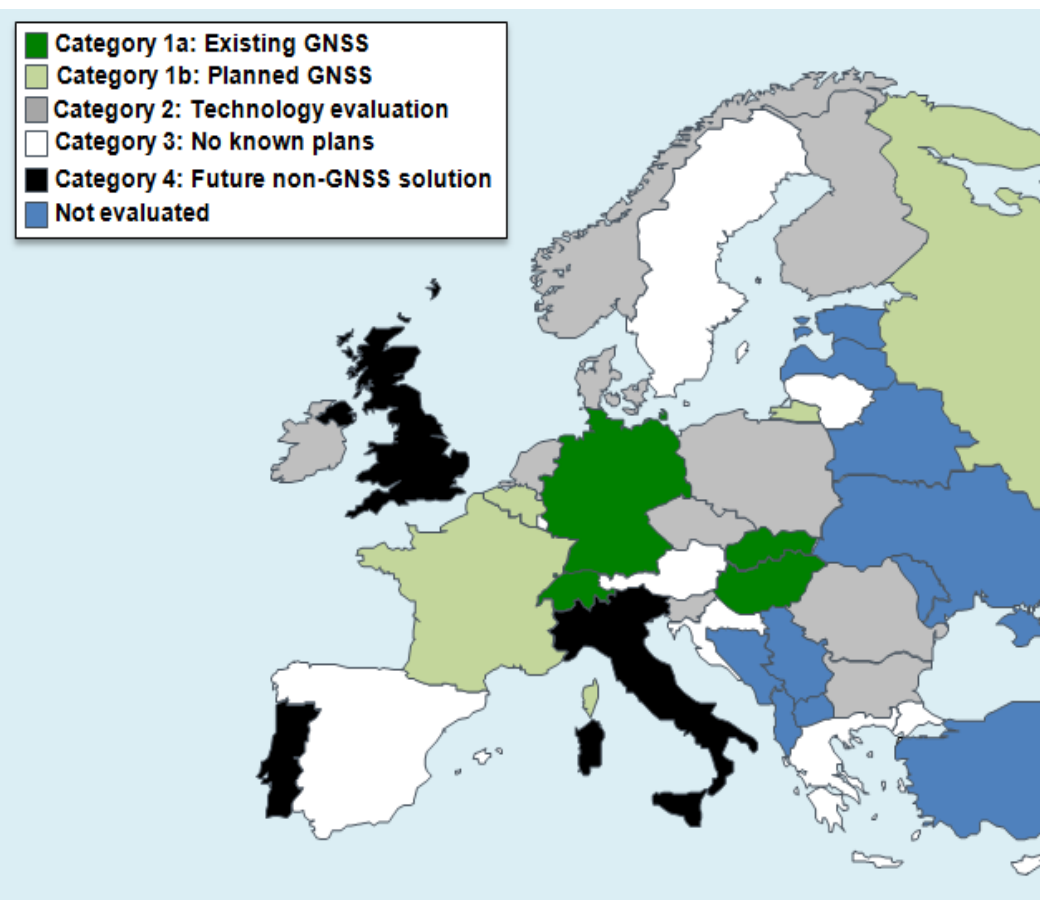


Toll chargers are already benefitting from GNSS

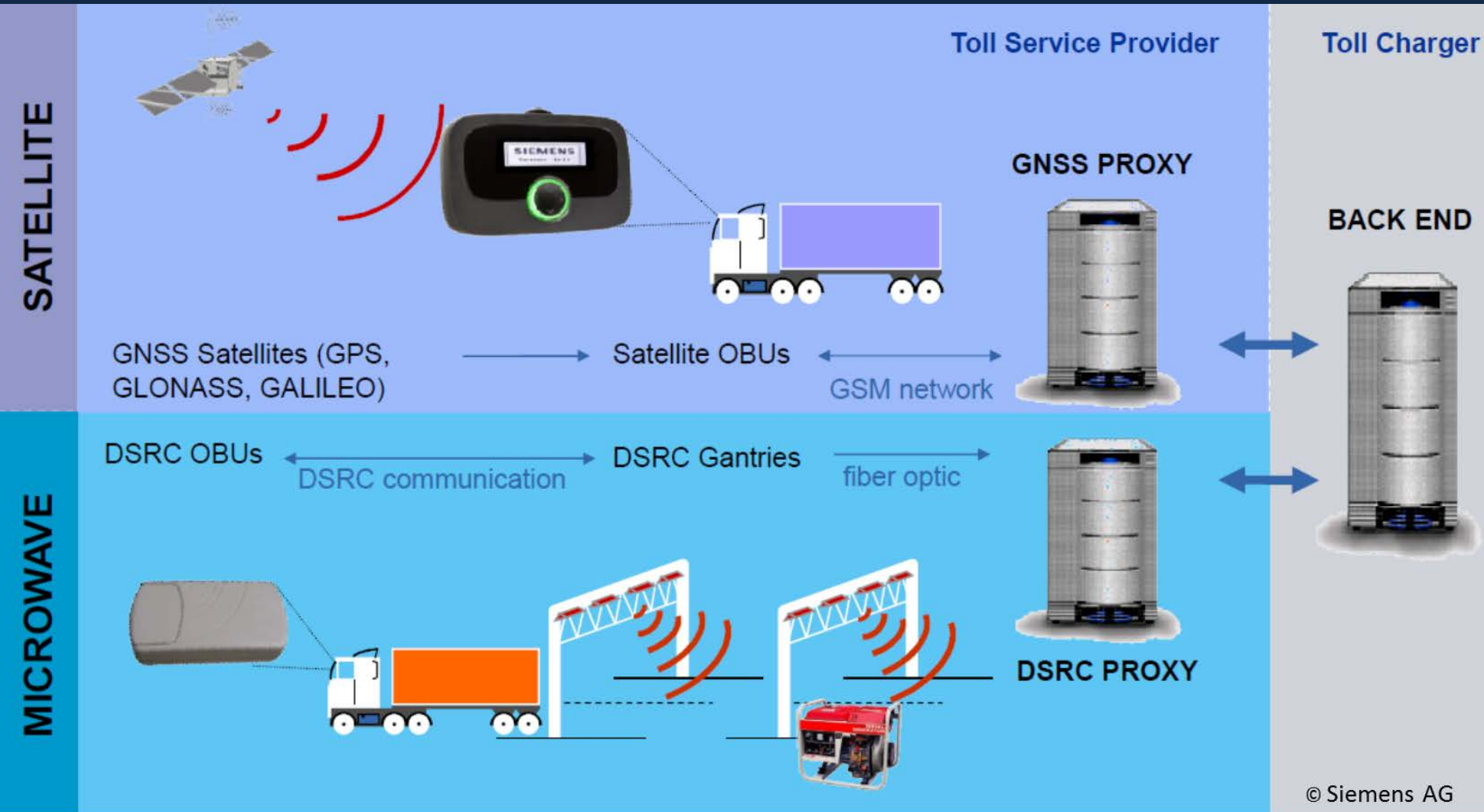
- **Flexibility:** it can be used to charge according to different principles (time, distance, place, vehicle type, level of emissions) and can be adapted to evolving needs
- **Extensibility:** new sections simpler to implement, affecting system back office
- **Revenue potential:** OBUs could be used as a platform for more applications (e.g. fleet management, real time traffic information, etc.)
- **Low transaction costs:** it can be considered as a cost-efficient solution in large and complex new networks, involving different vehicle categories
- **Traffic management:** Policy-makers and road infrastructure operators might exploit the aggregated and anonymous data, to improve policies
- **Environment:** no road-side infrastructures minimizing environmental impact



Europe already understood the benefits of GNSS for tolling



DSRC and GNSS technologies for tolling... can work together



© Siemens AG



SA

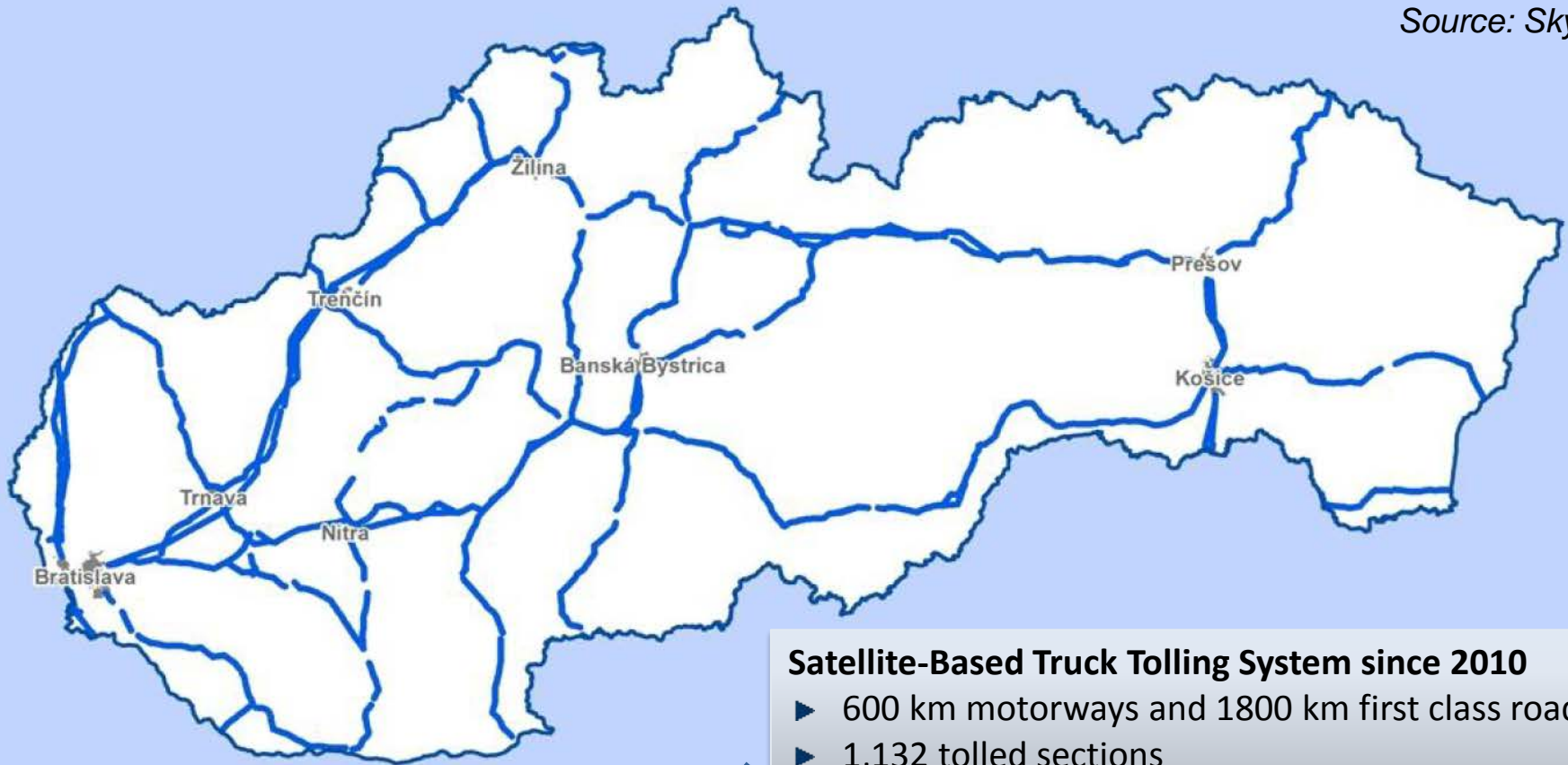
Hybrid GNSS-DSRC On Board Units (OBU)

- Main OBU manufacturers are ready to join the next generation of **fully interoperable hybrid tolling systems**
- **Solutions already in the market** ready to drive with the same OBU in 2 countries, and with 2 different technologies
- New OBUs will be compliant to all currently defined standards of the planned **European Electronic Toll Service**
- To move things forward, the **EC project REETS** (Regional EETS) was established to test the EETS concept in 'regional' tolling clusters that could grow, merge and finally result in the wide scale configuration originally envisioned



Example of GNSS best practice: Slovakia

Source: SkyToll



Satellite-Based Truck Tolling System since 2010

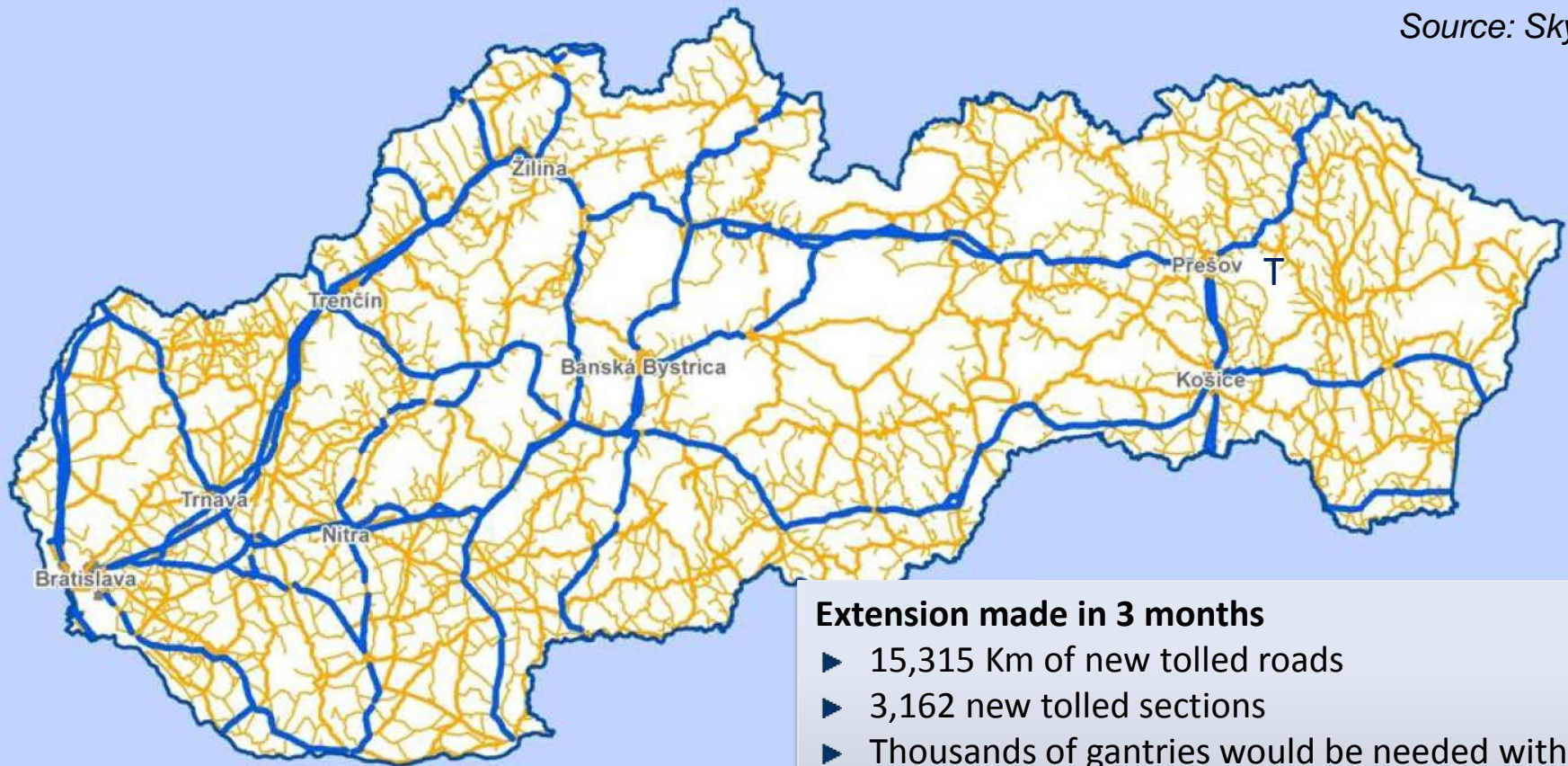
- ▶ 600 km motorways and 1800 km first class roads
- ▶ 1,132 tolled sections
- ▶ More than 30 legislative changes in RUC in 4 years

Lesson learnt:

Fast money back: highest efficiency of toll collection in EU achieved in the first year of operation, even on the low class roads

2014: Rapid Extension in Slovakia using GNSS

Source: SkyToll



Extension made in 3 months

- ▶ 15,315 Km of new tolled roads
- ▶ 3,162 new tolled sections
- ▶ Thousands of gantries would be needed with DSRC technology
- ▶ All motorways, expressways, 1st, 2nd and 3rd class roads in the country covered
- ▶ **Largest extension of RUC network worldwide**
- ▶ **Longest system in Europe**

Lesson learnt:

Prepared for country interoperability:
OBUs including all used technologies for
electronic toll collection in EU

The future is in Asia as well: GNSS for traffic management, monitoring congestion

Singapore's next generation Electronic Road Pricing system for passengers cars



- Motorists will be charged proportionate to the distance travelled along certain **congested roads**
- **Additional services in the OBU:** real-time traffic information and electronic parking fees
- The 18-month system **evaluation test demonstrated feasibility** to develop a GNSS-based road-pricing system
- Contract to be awarded in the second half of 2015. **System to be implemented in 2020**

Thanks

20th October 2014 Gian Gherardo Calini

European GNSS Agency (GSA)



Questions??

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