

Thank you for inviting me to speak to you today

And thank you Dr. **Malmqvist** for laying out **what is at stake** and what should form our motivations for acting to reduce the impacts stemming from our mobility.

The International Transport Forum is an **intergovernmental body** and **think-tank** working for our 59 member transport ministries around the world and they come to us to discuss and to seek advice on how best to tackle the many challenges they face.

We do so by providing evidence-based guidance and we help our members adopt strategic and robust principles to guide policy in support of their constituents... of

people, you and I. Of current and future generations.

Recently, our countries have been coming to us with an increasing sense of urgency. They are increasingly being challenged by the scale and pace of changes within and outside of the transport sector.

We are indeed seeing rapid changes around the world when it comes to how we are, and how we might, move about our cities and our countrysides...

And considerable attention has focused on the potential for electric mobility and the potential contribution of alternative, non-fossil fuels, to improve outcomes for people and the cities and regions where they live..

This is of course why we are here today – contributing to that important discussion.

One key thing that keeps coming to the forefront of our discussions and work with countries and industry is the word “uncertainty”.

This uncertainty is at the forefront of the minds of those who care about cities and regions and who are charged with delivering high quality access within them ... as well as within the industry that builds and sells the vehicles that citizens want and use, sometimes to excess.

I don't know what the future holds, the future is by its very nature unknowable, at

least in its detail, but we can look to the present for signals that will help us navigate what is an essentially uncertain future.

And so I come to you today to talk about this uncertainty and how to take it into account in your work.

I'll do so by talking about something crucial and yet that is often overlooked in many technology and policy discussions – --- and that is about how to anticipate and prepare for the future obsolescence of technologies not yet deployed.

Everything becomes obsolete at some point – and nothing more so than technology and technological systems.

We in this room have gone through many innovation cycles that have marginalized and/or laid by the wayside systems once thought inalterable.

Secretarial pools, typists, vacuum tube transmission of mail – even mail itself! Landline phones, travel agencies, and in the future taxis? Drivers?

And some technologies once thought obsolete – electric vehicles and bicycles come to mind – have a way of coming back into relevance.

So it is worth thinking about how future-proof our decisions, plans and investments are to developments that are only just yet at the margin of our collective perception but may come one day to dominate.

To frame that thinking, I'd like to talk about two things:

Revolutions and convergence

By revolutions, I mean the **structural and societal revolutions** and that have had an impact on the way in which we move around

Human transport activity has undergone three major structural revolutions related to sources of energy.

We have gone from **millennia of grass-fed animal power**, to **hundreds** of years of **coal-powered steam traction** to **dozens of decades of oil-powered combustion** vehicles.

According to the author David Sweeny, these revolutions share three things in common:

they inevitably have a **social dimension**.

New technology always has

transformational effects upon society.

Second, they **tend to be rapid**. And third, in **many cases they are viral**, spreading spontaneously through a susceptible social grouping.

Is electrification of transport (or more precisely, the re-electrification of transport) the fourth revolution?

Just 10 short years ago, the global electric car fleet was comprised of fewer than 2000 modern cars. Concerns about range, cost

and recharging points kept that number down

But in a decade range anxiety has receded as battery technology has improved, consumer confidence has increased and, though costs remain a concern, the global electric car fleet has grown to approximately 2 million cars today and this growth is accelerating.

This growth is outstanding and has been spearheaded by policies in many regions represented today ...

But the re-electrification of transport is not in itself a revolution. It is a change in the way in which we deliver power to essentially the same transport system we have today.

My own feeling is that globally, the point isn't that we need more electric cars, we probably just need fewer cars, period.

And a business plan predicated on selling a car to every household in the world that will be able to afford one is likely untenable given the extreme constraints density and development of growth regions in the world will place on available street space.

The future global growth market for electric cars is likely not *only*, or not even *necessarily*, to replace a 4-wheeled large car running on fossil fuel with a 4-wheeled large car running on stored battery power and electric motors.

That isn't even the current market for electric vehicles since, compared to the 2 million electric cars on our streets, there are upwards of 250 million small, urban-range, 2- and 3-wheeled electric vehicles in use. That is a telling finding revealing the first and greatest global market for electromobility at present ... and it isn't the market we are discussing here today.

So perhaps we are entering the fourth **transport revolution – but electrification, and even automated driving are only one part of it**

I say that because the **real breakthrough** we are seeing in electromobility and in automated driving is not so much **the way in which power is delivered to the motor or in the act of driving** itself, but rather

the **high-speed real-time collection, parsing, processing, and responding** to data about the fuelling and driving environment.

Automated driving and electromobility are both part of a **larger change in society** harnessing **efficiency gains** through new and better uses of **purposefully sourced and ambient** data.

Vehicle automation and vehicle drivetrains is just **one part of the technology kit** that will build the 21st century.

Everything is changing -- personal computers, mobile telephones, and the Internet—**have converged** with each other and are **now blending with machines that**

sense and manipulate the physical environment. These machines include not just **electric and/or automated vehicles** but also **drones, personal care robots, 3D printers, distributed sensor networks,** and many others. And they are all increasingly **linked by tera- peta- and exa-bytes** of data.

And they are **overwhelmingly anchored** by **personal, portable and ubiquitous computing.**

And what we can clearly see is a **tendency for the convergence of technologies, transport modes and use cases** on an unparalleled scale ... leading to changes **analogous,** to what changed with the **cheap production of electricity.**

This convergence involves **new mobility services** that allow for **seamless car-based transport** without **requiring the purchase of a vehicle**, It also involves **legacy services** applying the **same tools** to **increase mobility options** for citizens

It is a result of a **generation of global digital natives** that are **increasingly more willing to interact with app-based services**, than with legacy cars, electric or fossil-fuelled, cars or **with traditional forms of public transport**.

Electric, automated, but first and foremost connected,

the future will come much faster than we expect

and it will be accompanied by a convergence that we barely suspect.

Mobility in our cities helps deliver high quality access that drives prosperity, equity and creativity.

It has been delivered by a largely unchanged set of options (walking, cycling, cars and public transport) that we are all familiar with and that many seek to balance in a more sustainable way

But recently and sometimes unexpectedly, these options have been multiplied and the

mobility landscape in cities has become more diversified. Ride services, car and bicycle sharing on-demand micro-transit and many other digitally-enabled services are popping up across our cities and regions and challenging existing regulatory frameworks.

Because perhaps the more important meta-trend for the 21st century – the fourth transport revolution -- is the data-led convergence of all of these modes into a continuum of mobility services available to citizens.

So what now?

In response, I suggest we ask ourselves another essential question

Perhaps the most useful question we can ask ourselves is

What is it we should think about when we think about electric and potentially automated driving?

First, let's not think about electric and automated driving.

Let's think about the cities and regions where this driving will take place

Because in talking about the potential for electric vehicles to reduce the environmental impact of our mobility and the obvious safety and convenience improvements that automated vehicles may

potentially bring; we have had a tendency to unconsciously shift our thinking away from the cities we have

To a vision for cities that is more aligned with a smart city narrative in which electric and automated vehicles are one part of a connected, more efficient world that

....resolves the inherent messiness of our travel choices and traffic chaos with a better, less chaotic, decisions managed by algorithms and machines and not by humans

But an aseptic, efficient, machine city is not aligned with what we know has been

the engine of human ingenuity and prosperity.

And despite well-laid plans, the wealth, creation and strength of cities have always emerged from the messy margins of the planned city,

from the inherent chaos that leads to serendipitous encounters of people, ideas and opportunity

And this is will in turn depend on the place we accord to people, not machines, in our cities

So let us think about what we want from electric and possibly automated driving in our cities

One place to start is that cars – electric, fossil-fuelled and/or automated – are spectacularly underused assets. They provide useful work for less than 1 hour a day on average. That we put up with such inefficiency shows just how much we value the convenience they provide.

What if we shared that capacity more?

What if we were to guide the deployment of electric – possibly automated vehicles -- in a shared fleet of on-demand cars and minibuses replacing every car and bus trip

but operating alongside high-frequency rail services, walking and, where applicable cycling.

We used to think this may be a relatively far-fetched idea. But our conversations with industry and public announcements from companies such as Google's self-driving entity – Waymo --, rideservices such as Lyft, Uber, Didi Chuxing, Ola, Grab, established players such as Ford, GM, Renault-Nissan, and countless others show that while we are thinking about deploying shared used vehicle fleets alongside heavy public transport, these companies are preparing commercial product roll-outs.

What might be the impact of these fleets?

We are undertaking detailed modeling in numerous cities around the world

investigating how shared fleets could deliver all of the trips taking place in those cities on a typical weekday.

We didn't do this work to show what was likely, but rather to show the scale and scope of changes that occur if we follow a pathway for new mobility service deployment that does not simply seek to replace individually owned cars with individually owned electric cars or individually owned automated cars

And what we found is that an optimized shared mobility system comprised of on-demand cars and minibuses could deliver the same number and quality of trips as today

But with only 3% of the current car fleet... that is more than 9 out of 10 cars could be

removed from our streets and we would still have essentially the same mobility performance

Though there are much fewer vehicles, each vehicle is driven much more than today

This shift would remove 95% of all parking needs in the city, including all surface parking

Freeing up 20% more street kerb-to-kerb space

Re-allocating unused parking space...

Opens up new possibilities in the city...

To give more space to people...

And more space to walking, cycling and last-kilometre goods delivery.

At the same time, we saw a drastic reduction in both vehicle kilometres travelled – more than a third less at peak hours

And up to a 40% decrease in CO2 emissions – even assuming current fossil fuel based engines

But because these vehicles are used much more intensely at present, we see an opportunity for rapid penetration of clean technologies like electric drivetrains,

especially as centralized fleet operators
deploy these services

We also looked at the impacts of such a
system on access and equity

We looked at how many jobs (and
education facilities and healthcare
opportunities) people could reach by public
transport or shared mobility fleet in 30
minutes travel from each 200m by 200m
grid cell in the city.

With existing public transport, the highest
levels of public transport accessibility to
jobs are along the metro line – most of the
city has access to less than 50% of all jobs
in 30 minutes – which is a relatively poor
level of access.

With the shared taxis, taxibuses and metro, we see a very different picture. Most of the city now has access to more than 50% of the available jobs.

Compelling changes indeed – but again, only an ideas of the direction in which we could be heading

Whether the destination is a happy or unsustainable one will depend on how well we take into account what people want for their cities and regions.

And we will have to hold true to that direction even as new and unanticipated business models may come to our cities and countries....

Addressing these changes will require a new governance framework for mobility. One that is less focused on technologies, modes and operators and more focused on the outcomes we want for our cities.

This will mean re-assessing the way in which we conceive of public transport and the types of concession rules we put into place

It will also require a much more data-driven regulatory framework than before and one that better integrates a wide range of data coming from the private sector

We will also need to start to understand what the impacts of alternative business models will be on land-use will be and anticipate the way in which we will want to

re-allocate space to different services and uses.

Importantly for this group – and back to the original question I posed at the outset of my talk about preparing for future obsolescence – how well are we preparing the support we provide for electromobility in a world where the growing and eventually possibly dominant model for mobility is one based no longer on individually owned electric or fossil-fuelled cars but on commercially or publicly-deployed shared use on-demand fleets?

I suspect that if our plans are not aligned, nor prepared, for that future, then we will be faced with faster obsolescence of our

investments than we would have expected or preferred.

But this is not the future I see for this group.

So to conclude

As we heard in the opening... we must act now,

....but we must also think ahead....

That is how to be GREAT

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