# TAKING ACTION ON CLIMATE CHANGE

## NESTE OUTLOOK FOR OUR CHANGING MARKETS

NESTE

# OUTLOOK

## FOR OUR CHANGING MARKETS

# We are in the business of fighting climate change

We at Neste foresee a period, during which the energy sector will witness significant changes. The greatest driver for this change is climate change, which will require unprecedented global effort to tackle. The Paris Agreement on climate highlighted the fact that every country will have to take concrete action to mitigate climate change. Though, crude oil demand continues to grow globally as the standards of living rise in particular in the large Asian economies, the rate of that growth will inevitably start flattening.

While we believe that countries and regulators remain the key driver of the fight against climate change, there is already a shift underway that increases the role of cities, progressive companies and individual consumers in the effort.

As concern for the environment increases, we cannot afford to put all our eggs in one basket. We need to support environmentally friendly solutions on all fronts. The transformation has already started with increasingly cheap renewable power, which is paving the way for the mass adoption of electric vehicles in transport.

Diesel engines in passenger cars have rightly been criticized for their emissions. However, it is a fact that approximately 70 percent of all diesel is used by heavy-duty vehicles, and the demand continues to increase with growing freight volumes. At the same time, air and sea traffic that attract significant volumes are only beginning to open up to low-emission solutions and renewable fuels. We see renewable diesel remaining a competitive solution for decarbonizing transport, particularly so within heavy duty and aviation, where other cost-efficient low-carbon solutions are lacking.

Of course, renewable fuels are also facing challenges. At present, there simply is not enough waste or sustainably collectable biomass so that they could supply all the transport demand in the world.

Beyond transport, the chemical sector represents the fastest growing use area for oil products, which is particularly pronounced for plastics. The market craves for solutions that decouple material use from fossil feedstocks and bring new circular economy concepts and solutions to the market.

In Europe we will see a steepening decline in fossil fuel demand in transport. At the same time we will likely see new business models emerge with emphasis on changing concept of mobility and services.

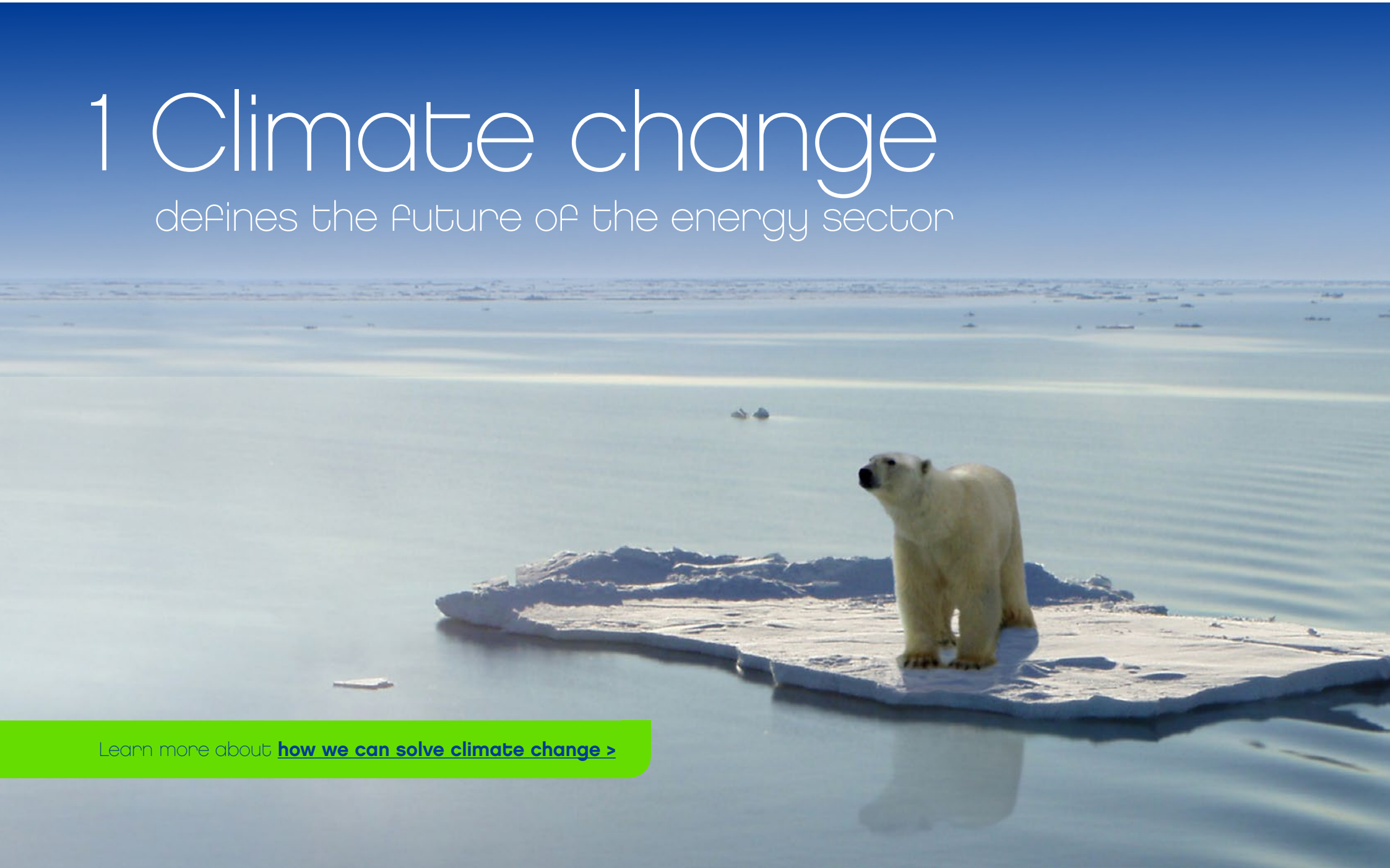
This publication does not aim to provide an exhaustive view to changes in energy and transport markets, but rather focus on a selection of drivers that are closely linked to Neste's strategic choices. While our aim has been to take firm views on those drivers, there is obviously no ultimate truth on how these play out. Amid the ever changing market, it is best to stay alert and ready to question the view of the future.

– Matti Lievonen,
President & CEO, Neste

**"My personal outlook and recommendation: Some companies will end up in a difficult situation when they notice that the low-carbon future can result in cannibalizing their current products. Yet operational management and Board members must have the courage to leave businesses that might be profitable right now, but whose sustainability will be questioned the day after tomorrow."**

# 1 Climate change

## defines the future of the energy sector



Learn more about **how we can solve climate change >**

# On a personal note:

"Climate change is a reality and for the first time in history we see real international commitment to tackle it. While President Trump annouced the US withdrawal from the Paris climate accord, China and the EU are taking the lead. Also, many cities are setting themselves even more ambitious targets.

At the same time, progressive companies and private customers are increasingly valuing low-carbon propositons.

**In my private life I am trying my best to reduce my carbon footprint by making conscious and climate smart decisions."**

– Johan Lunabba,
Director, Sustainability, Neste

# Global commitment formed in Paris holds firm for tackling climate change

**"A new climate era has begun, and the EU and China are ready to lead the way"**

– Miguel Canete,
EU Climate Commissioner

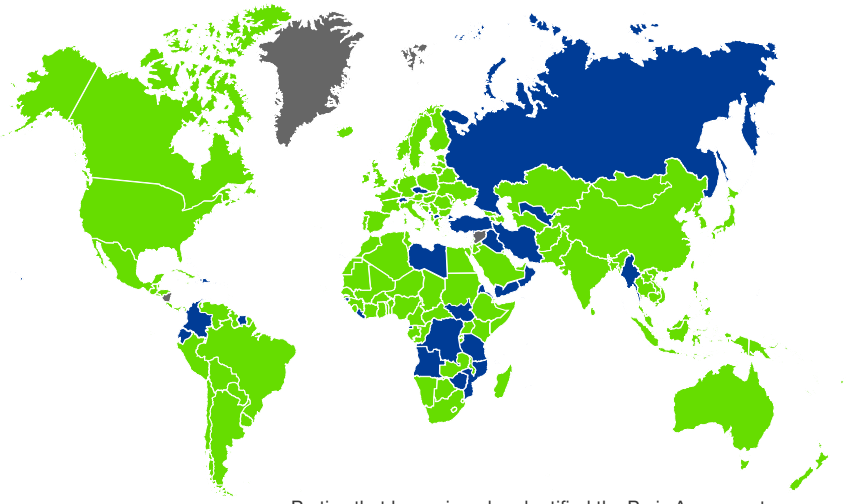
**"No matter how other countries' policies on climate change change, as a responsible large developing country, China's resolve, aims and policy moves in dealing with climate change will not change"**

– Lu Kang,
Chinese Foreign Ministry

While President Trump announced the US withdrawal from the Paris climate accord, other countries are strongly backing the Agreement. China and the EU are committed to fill in the gap and lead the global effort to cut $CO_2$ emmissions. In addition, many international corporations have publicly announced their support for the Agreement.

Countries will now need to further increase their emissions reduction targets in order to limit global warming to "well below 2°C". This will shape the future of the energy sector, and boost the role of renewable energy across sectors. New opportunities will emerge for companies willing to contribute to the required emissions reduction.

**See the current ratification status of the Paris agreement >**




## Paris Agreement ratification

**195** countries signed the agreement

**158** countries ratified

**86%** of global emissions covered[1]

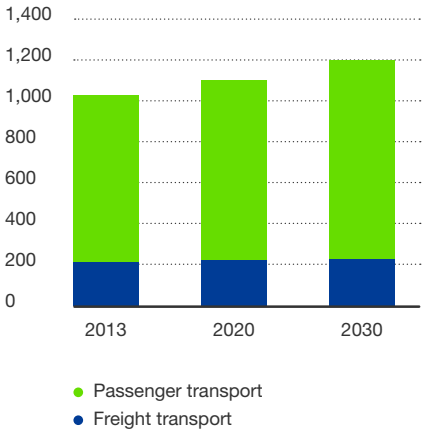
NOTE: 1) Without the US 68% of global emissions would be covered

SOURCE: climateanalytics.org/hot-topics/ratification-tracker.html

**"I am convinced that together, cities, businesses and citizens will save the planet. Their alliance is critical. We know there is no alternative. We know that if we don't act now, our citizens will never forgive us."**

– Anne Hidalgo, Mayor of Paris

**Urban transport energy demand (Mtoe)**




# Cities take a major role in the battle against $CO_2$ and air pollution

60% of the world's population will live in cities in 2030. Urban transport demand is going to increase substantially, adding to emissions from buildings, industry and other sources. Recognizing these challenges, more than 7,000 cities around the world have already set themselves climate targets, often going well beyond federal policy targets.

The adoption of congestion charges, introduction of environmental zones, as well as the ban of old diesel vehicles are all measures cities are taking to combat air pollution. Paris, Mexico City, Madrid and others have also announced to ban all diesel vehicles (light- and heavy-duty) from 2025 onwards. New diesel engines with improved exhaust treatment will address some of those issues.

As cities look for solutions to cut $CO_2$ emissions, opportunities for renewable fuels emerge.

**Selected cities' $CO_2$ emission reduction targets**

**-20% $CO_2$ emission by 2020**

EU Covenant of Mayors (6,200 cities)

**Carbon neutral by 2030**

Oslo, Norway

**-80% $CO_2$ emission by 2050**

New York City, US
San Francisco, US
Washington DC, US
Vancouver, CAN
London, UK

**Carbon neutral by 2050**

Helsinki, Finland
Stockholm, Sweden

NOTE: Mtoe = million tons oil equivalent

SOURCE: www.c40.org; JRC (2016), Covenant of Mayors; Neste based on IEA data from the Energy Technology Perspectives 2016 © OECD/IEA 2016. Licence: www.iea.org/t&c; as modified by Neste

# Deep Dive:
## Californian cities are front runners in adopting renewable diesel

Several cities in California have emerged as progressive actors in cutting emissions. Neste, together with local distribution partners, has been successful in supplying renewable diesel to several of them. The value proposition of reducing emissions through seamless fuel switching in the existing fleet is one of the key arguments for city authorities. And unlike other alternative fuels, there is no ”lock-in” risk, as customers can switch back to fossil diesel if they so wish.

"Migrating to Neste Renewable Diesel provides us immediate huge gains in carbon emissions reduction that we could not otherwise achieve without significantly increased investments in alternative fueled vehicles and infrastructure."

– Keith Leech, Chief, Fleet Division & Parking, Sacramento County

"Ignorance is now the worst obstacle. Renewable diesel is continuously mistaken for biodiesel, which it is not. It is also assumed that migrating to renewable diesel will result in infrastructure-related costs or that it would be more expensive. All these are misunderstandings.“

– Richard Battersby, Fleet Manager for the City of Oakland

“Cities represent an important part of transport fuel consumption, and an attractive customer segment. Seizing the potential requires Neste to build strong partnerships with local distributors, and develop new ways of forging relationships with end-customers.“

– Jeremy Baines, Neste VP Sales North America.

Coca-Cola
"Reduce absolute greenhouse gas emissions from core business operations by 50% by 2020."

SONY
"Long-term vision to reduce environmental footprint to zero, including 90% emissions reduction by 2050."

Lufthansa
"By 2020, reduce specific $CO_2$ emissions by 25% compared to 2006."

DELL
"Reduce greenhouse gas emissions from facilities and logistics operations 50% by 2020."

Pfizer
"Reduce greenhouse gas emissions from operations 20% by 2020 from a 2012 base-year. Long-term goal to achieve a 60 to 80% reduction by 2050."

ExxonMobil
"We're encouraged that the pledges made at last year's Paris Accord create an effective framework for all countries to address rising emissions."

SOURCE: http://sciencebasedtargets.org/case-studies/

# Progressive companies lead the way towards sustainable solutions

Companies around the world, including big fossil fuel corporations, are publicly backing the Paris Agreement. Many of these companies see themselves as active contributors to emissions reduction, and set themselves targets that go beyond policy requirements. Even oil majors such as ExxonMobil are calling on governments to adhere to the Paris Agreement.

This highlights that climate change as a macro trend can no longer be ignored in companies' long-term planning. A lower carbon footprint for services is increasingly seen as an attractive customer offering. Sustainability of business operations is increasingly a license to operate question. Neste can offer solutions for decarbonizing the heavy-duty transport within the supply chain.

**75%** of consumers would purchase more products that are environmentally and socially responsible, if they performed as well as, or better than, products they usually buy

**65%** of consumers feel it is their responsibility to purchase products that are good for the environment and society

**26%** of consumers in developed markets and 60% in developing markets, are willing to pay more for sustainable products

NOTE: Developing markets surveyed are Brazil, China, India. Developed markets are Germany, UK, US.

SOURCE: Globescan (2012), Re:Thinking Consumption. Consumers and the Future of Sustainability.

# Consumers' responsible choices matter

While climate ambitions rise in policy frameworks around the world, private customers are increasingly conscious of making sustainable, low-carbon choices. A powerful, growing market segment is emerging that is willing to pay for sustainable, low-carbon products and services.

These customers represent a growing and potentially attractive interest group for Neste. The results of a survey* conducted by Neste also indicate that consumers are environmentally conscious. Of all respondents, as many as four out of five find it very important to reduce transportation-induced greenhouse gas emissions. What is especially significant is that almost half (45%) of the respondents feel that they can only have little impact on emissions. However, a total of nearly 90% of all respondents find it very or fairly important that renewable raw materials are used in fuel and energy production as much as possible.

**See what one customer thinks about Neste My (in Finnish) >**

* Neste's survey was responded to by 295 members of Neste's motorist panel (total number of members: 1,960; response rate: 15%) on November 4-11, 2016.

NESTE MY Renewable Diesel

# 2 Decarbonizing transport

## requires multiple solutions

Read more about **how we will fuel our cars tomorrow >**

# On a personal note:

**"Transport's share of global $CO_2$ emissions is nearly one quarter. Hence, the role of transport is crucial in responding to climate change.**

**Improved fuel economy, biofuels and electrification are all needed to curb fossil fuel consumption and reduce emissions. Waste-based biofuels remain very cost-efficient in cutting greenhouse gas emissions, especially in heavy-duty transport and aviation. The key to achieving significant emissions reductions is a broad waste and residue feedstock pool for renewable fuels.**

**My teams are located around the world: in Espoo, Geneva, Singapore and Houston. My personal contribution to reducing $CO_2$ emissions, is to maximize the use of video conferencing in order to reduce air travel mileage."**

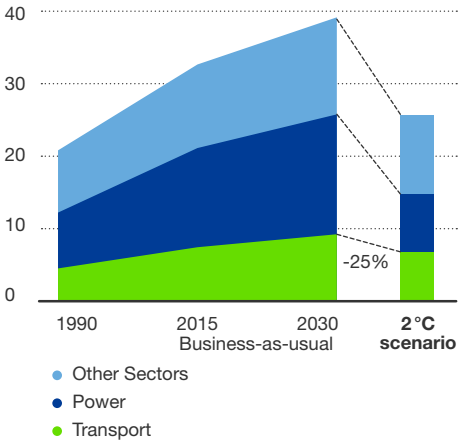
– Kaisa Hietala,
EVP Renewable Products, Neste

# Transport is key in responding to climate change

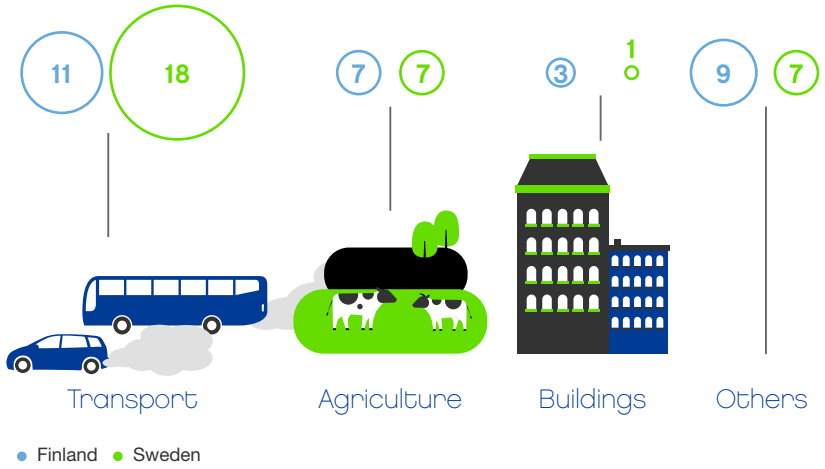
The transport sector is a significant contributor of global $CO_2$ emissions and currently accounts for one quarter of energy-related emissions. In many markets, transport plays an even bigger role.

In California, transportation causes 40% of energy-related greenhouse gas emissions. In Finland (37%) and Sweden (54%) transport is a key contributor to emissions outside the EU Emissions Trading Scheme (ETS). On average, transport accounts for one third of non-ETS emissions across the EU. As the ambition for greenhouse gas reduction is set ever higher, transport also needs to play an important role in contributing to the effort.

**Global energy-related $CO_2$ emissions in IEA Current Policies Scenario and 450 Scenario**

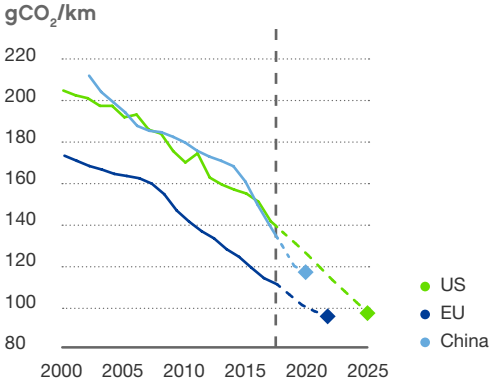



**Non-ETS greenhouse gas emissions by sector (Mt $CO_2$)**



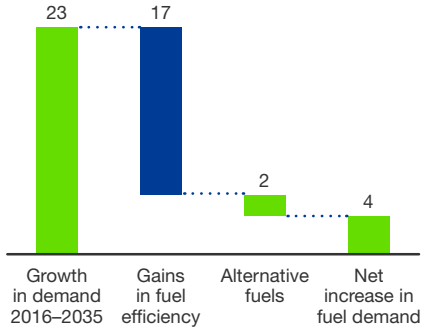

NOTE: IEA 450 Scenario draws pathway towards 2ºC emission trajectory, Current Policies Scenario depicts business-as-usual
SOURCE: Based on IEA data from the World Energy Outlook 2016 © OECD/IEA 2016. Licence: www.iea.org/t&c; as modified by Neste; Eurostat

### Vehicle $CO_2$ and fuel economy historic performance and future targets for passenger cars




SOURCE: ICCT (2015)

### Impact of different drivers on global light-duty liquid fuel demand (Mbbl/day)




NOTE: Mbbl = million barrels. Alternative fuels includes natural gas and electricity.
SOURCE: Neste based on BP (2017), The Outlook for Energy

## Fuel economy is the most powerful tool for reducing emissions, but it's not enough alone

Fuel efficiency is the cheapest and most significant tool for emissions reductions in transport. Oil savings from light-duty fuel economy regulation alone were 2.3 million barrels per day in 2015 according to the International Energy Agency. Almost all key markets around the world including China, the US and the EU, have adopted vehicle fuel economy regulations. Globally, 75% of cars, and 12% of trucks are already subject to standards.

As fuel economy standards cover vehicles, and not fuels, renewable fuels cannot be used to achieve vehicle $CO_2$ targets. Electric vehicles on the other hand, help OEMs reach their targets as electricity is counted as emissions free.

As pressure to cut transport emissions increases, fuel economy regulation is going to tighten, and increasingly also cover trucks. The EU is currently discussing the schedule for introduction of such standards. Even in the absence of regulation, OEMs are already working on fuel economy improvements, motivated by customer benefits in the form of fuel cost savings.

# Electric vehicles will increasingly decarbonize the passenger car segment as renewable power surges

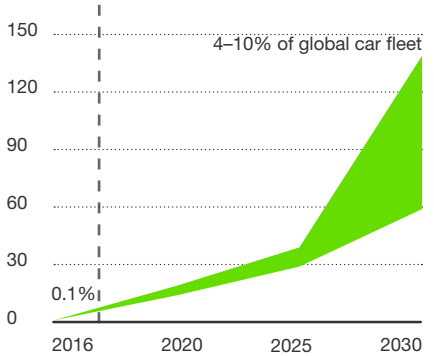
Driven by vehicle $CO_2$ and fuel economy regulations, all major OEMs have either started serial production of plug-in hybrid or battery electric vehicles or are starting in the near future. In addition, air quality concerns are an important local driver for electric vehicle incentive schemes, in particular in China.

Electric vehicles only account for 1% of new passenger car sales today, but their market share is set to grow rapidly. As battery costs continue to decline electric vehicles could account for up to 10% of the world passenger car fleet by 2030, displacing some 1.5 mbpd of fossil fuel demand.

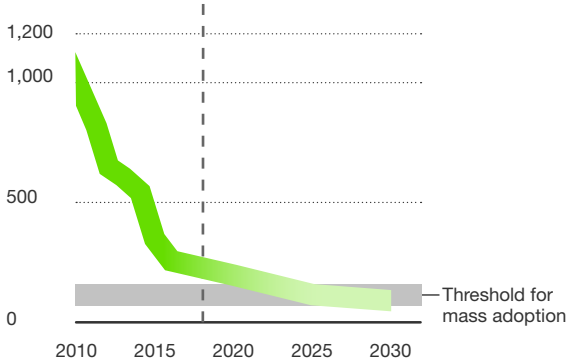
At the same time, investments in renewable electricity capacity have skyrocketed and could account for as much as 70% of total power investments towards 2030. This will gradually reduce the $CO_2$-intensity of electricity around the world, and will thus make electric vehicles an increasingly cost-efficient tool for reducing $CO_2$ in light-duty transport.

Electric powertrains also start to make inroads in other light- and medium-duty transport applications, in particular in cities. In heavy-duty transport, the role of electricity is limited due to cost and range limitations, however.

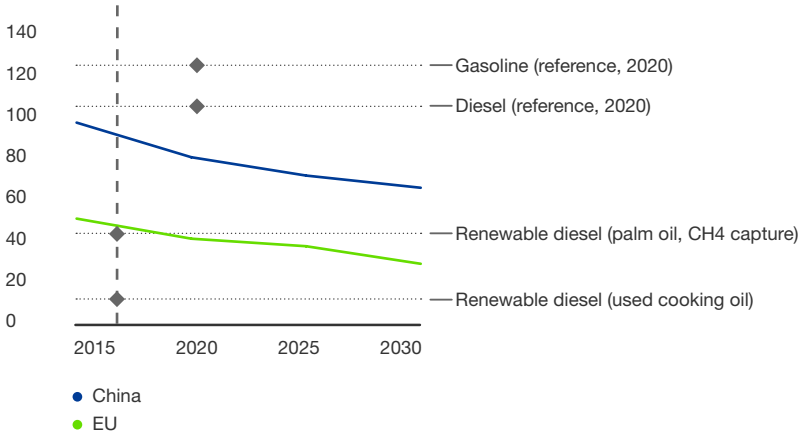
## Projected development of global electric vehicle fleet (million cars)




## Battery cost developments and projections (USD/kWh)




## Well-to-wheel $CO_2$ emissions of electric vehicles with respective electricity mix in EU and China ($gCO_2$/km)




NOTES: EV fleet data include plug-in hybrid and battery electric vehicles. WTW data assessed based on standard VW Golf size car, refer to 2020 powertrain performance. In case of EV, a 35 kWh short-range vehicles is used to calculate values.

SOURCE: Neste analysis based on IEA data from the World Energy Outlook 2016 © OECD/IEA 2016. Licence: www.iea.org/t&c; as modified by Neste; ExxonMobil (2016); BNEF (2016), JEC (2014), Roland Berger (2015)

# Deep Dive:
## Automotive companies have already placed their bets on electric vehicles

Governmental regulation in the form of fuel economy targets and as well as specific quotas for electric vehicles namely in China, drive automotive companies to add a rapidly increasing number of vehicle models in their offering. Electric vehicle models will be key to ensuring long-term access to the rapidly growing Chinese car market.

In addition, a growing customer segment emerges, helped in part by government incentives and a steadily growing EV model range. While small and unprofitable for now, the potential in this segment is vast as vehicle costs further decline.


### General Motors
**10 new electric car models to the Chinese market by 2020.**

### Volkswagen
**13 models in China by 2020, 3 million EV sales by 2025, all of the group's 300 models available as electric version by 2030.**


### Ford
**70% of models in China electric from 2025 onwards.**


### Tesla
**aims to go from 76,000 vehicles in 2016 to 500,000 per year in 2019. Model 3 starting at USD 35,000 per vehicle.**


### Volvo
**By 2019 every new model that Volvo sells will contain a mild hybrid or electric engine.**

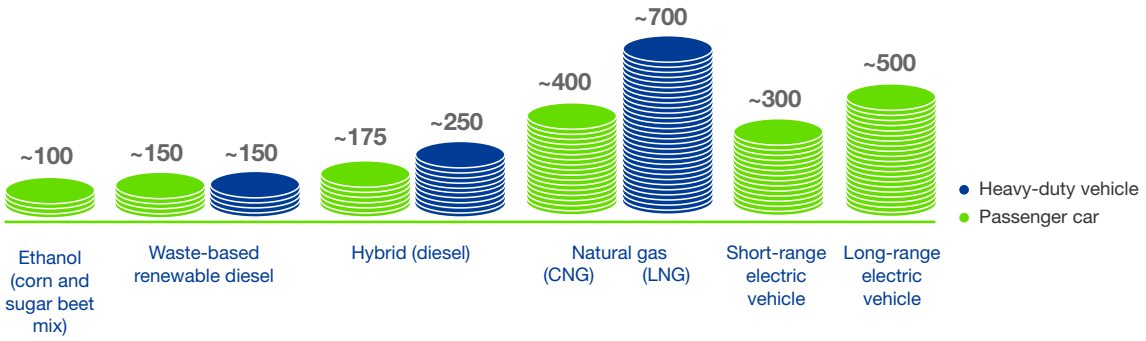
### Mercedes
**15–25% of global sales will be electric by 2025.**

# Renewable diesel from waste feedstock is one of the most cost-competitive solutions in reducing $CO_2$ emissions

Cost efficiency for reducing $CO_2$ emissions varies between different solutions. Renewable diesel made from waste feedstock is one of the most cost-efficient ways to cut emissions in both light- and heavy-duty transport. This is due to the high greenhouse gas savings on the one hand. In addition, the "drop-in" characteristics of renewable diesel, virtually eliminate the need for investments in fuel distribution infrastructure or the vehicles itself.

Electric vehicles running on renewable electricity will eventually become an increasingly cost-efficient way to decarbonize light- and medium-duty vehicles, as their cost declines and power mix becomes more sustainable.

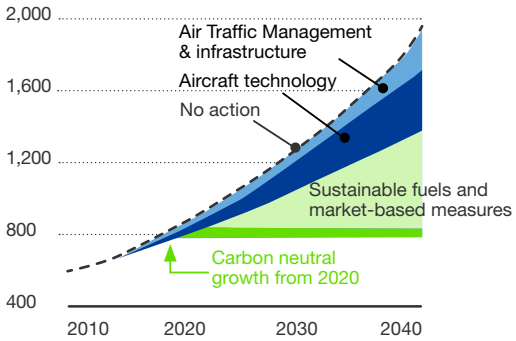
**Average cost to society (EUR) to reduce 1 ton of $CO_2$ emissions in passenger cars and heavy duty vehicles in 2030**




NOTES: CNG = compressed natural gas; LNG = liquefied natural gas. Data shown here reflect the median of the cost range and refer to situation in 2030. Oil price range of 70-113 USD/bbl. Expected 2030 cost for alternative powertrains. Includes required investments into infrastructure. EU average projected power mix (IEA).

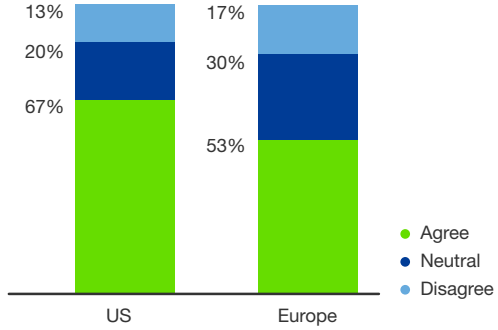
SOURCE: Neste based on Roland Berger, Integrated Fuels and Vehicles Roadmap to 2030

### Levers for greenhouse gas emission reductions in aviation (Mt $CO_2$)




### Passengers' concern of the environmental impacts of air travel

SURVEY QUESTION: "I am concerned about harmful emissions from my air travel and their impact on the environment"




SOURCE: IATA; WoodMackenzie; Neste assigned market research on passenger perception and willingness to pay for renewable jet fuel.

# Renewable jet fuel is needed to offset growth in $CO_2$ emissions in aviation

The global jet fuel demand is expected to grow by 60-100 Mt/a, or 20–30%, to 2030. The aviation industry's $CO_2$ emissions will therefore increase proportionately unless managed. With a global industry commitment to cap aviation's $CO_2$ emissions at 2020 levels, opportunities for renewable jet fuel emerge. Carbon neutral growth in the EU and US alone translates to more than 10 Mt renewable jet fuel demand in 2025.

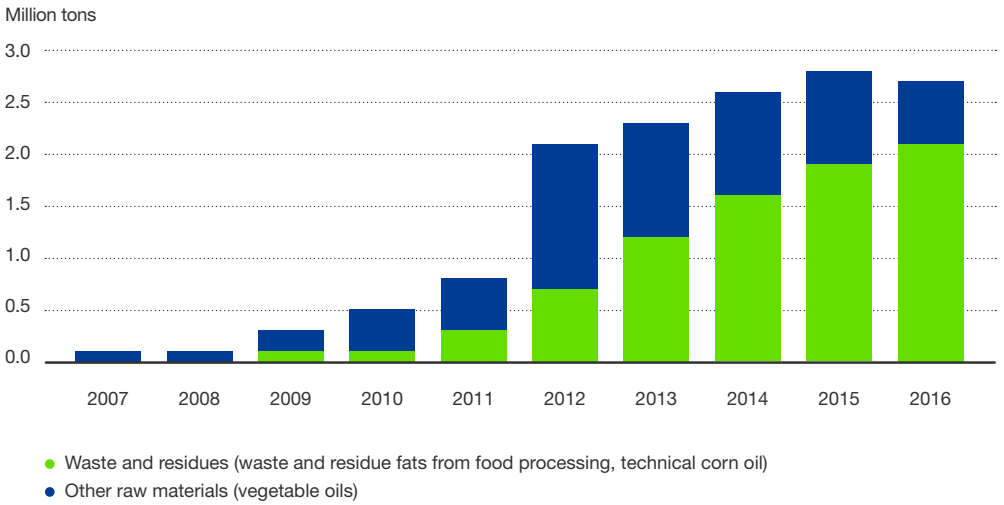
However, fast growth in renewable jet fuel volumes remain challenging, as fuel production costs are still substantially higher than those of fossil jet fuel. A funding gap will remain even in markets where regulation already today supports the use of renewable jet fuel. A significant share of passengers would be willing to pay a modest premium for lowering emissions of their air travel. This suggests that low blends (e.g. 2–5%) of renewable jet fuel may be the most feasible way for early adoption.

Several major airlines (e.g., KLM, United Airlines) and airports (e.g., Los Angeles, Stockholm, Oslo) have taken the lead and are introducing renewable jet fuel in their operations.

# Broad waste and residue feedstock mix is needed to achieve high carbon emission reductions from renewable fuels

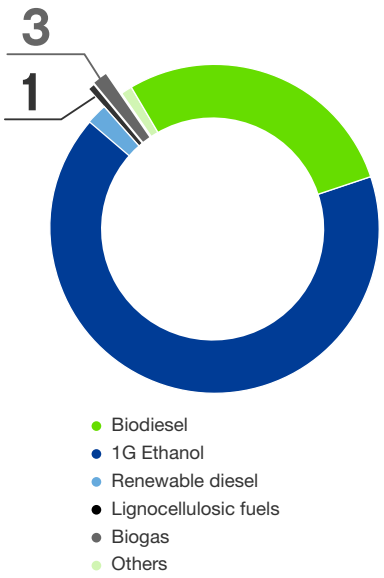
Waste and residue feedstocks hold the potential to substantial reduction of GHG emissions through use of renewable fuels in the transport sector. Particularly in light of ongoing discussions regarding the role of crop feedstock in the EU, wastes and residues are gaining importance for the production of biodiesel and renewable diesel. The acceptance of a broad range of waste and residue feedstocks will allow for mobilization of the full potential of these feedstocks, and ensure for cost-efficient carbon emission reductions across different transport segments.

**A broad feedstock mix has been key for Neste to substantially expand its use of waste and residue feedstocks (Mt)**

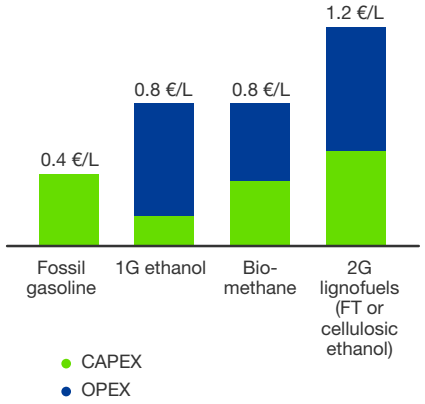



SOURCE: Neste

### Current global production capacities of biofuels (Mt/a)




### Production costs (gasoline litre equivalent)




# Biomethane and lignocellulosic fuels commercial scale-up still faces challenges

Biomethane can be a cost-efficient solution for reducing $CO_2$ in transport, including in buses, utility vehicles and trucks. It will play a growing role in some key markets, namely California and Sweden. Biomethane will remain a solution for specific markets, however, as feedstocks are scattered and suitable distribution and vehicle infrastructure is lacking in most markets around the world.

Commercialization of lignocellulosic biofuels technologies (e.g. cellulosic ethanol, Fischer-Tropsch or pyrolysis) has been slow, despite potentially large feedstock availability and a low carbon content. Both technical and economic challenges persist, and limit the commercial uptake of these technologies.

NOTE: 1G = 1st Generation, 2G = 2nd generation. Biogas is currently mainly used for power and heat production.

SOURCE: Stratas Advisors, Global biofuels capacity,
Ingvar Ländälv, SGAB Cost of Biofuels 2017
VTT, Tieliikenteen 40 %:n hiilidioksidipäästöjen vähentäminen vuoteen 2030

# 3 Renewable fuels

## play an important role, defined by tightening sustainability requirements and competition

# On a personal note:

**"Renewable fuel demand in Europe will be impacted by the new EU RED II policy framework. In its current form, RED II would limit the role of crop-based fuels and also impact the overall contribution of renewable fuels to reduce transport sector $CO_2$ emissions. And while key markets in Northern Europe and North America remain committed to renewable fuels they, too, will raise the bar for sustainability.**

**As renewable diesel capacity expands, enhancing the availability of sustainable feedstock will become a key priority for long-term success in the renewable diesel market.**

**As an Ecologist by training, I appreciate the role of solid sustainability criteria in preserving natural resources. A pro-active role in further developing those, will also provide a competitive advantage."**

– Anselm Eisentraut,
Strategy, Head of Market Intelligence, Neste

# The proposed Renewable Energy Directive II, could constrain emission reduction potential of renewable fuels in transport towards 2030

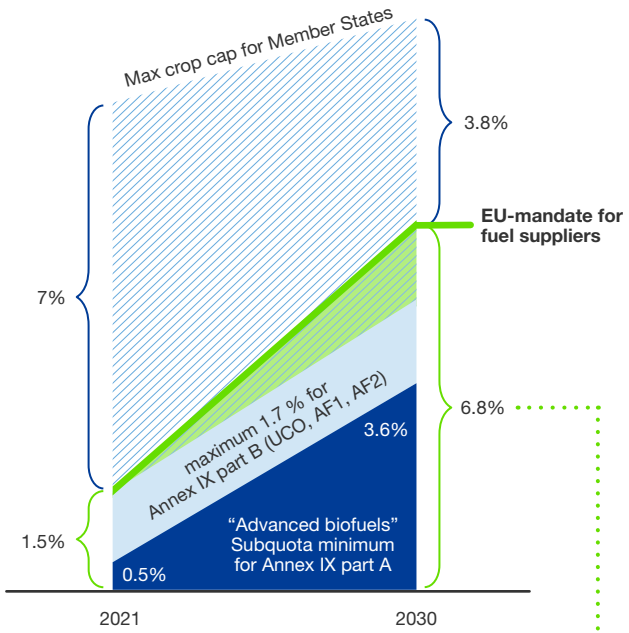
The Renewable Energy Directive II will become the EU's binding policy framework for renewable fuels from 2021 to 2030. Rather than increasing the overall requirement for renewable fuels, the current proposal envisions a declining cap for crop-based biofuels and limits the use of animal fats[1] and used cooking oil. Instead the directive aims at increasing the role of lignocellulosic fuels, even though a significant breakthrough in the development of these technologies currently seems far. The directive proposal, therefore, would not provide sufficient means for Member States to reach their greenhouse gas reduction targets in transport.

Independent of the final shape of RED II, the importance to enhance the technological and commercial ability to use more waste feedstocks increases. The development of new markets where renewable diesel can deliver value to customers increases. In addition, markets likely to set higher targets than those in RED II, such as Sweden, Finland and Norway, will play an increasing role for renewable diesel demand.

**Read more about the RED II proposal >**

NOTES: 1) Cap of 1.7% includes animal fats category I & II. Category III is not covered by RED II EU-level fuel suppliers mandate
The eligible feedstock decreases from 2021 to 2030 due to decreasing crop cap. Other Neste feedstocks include: PFAD, Cat III animal fat and technical corn oil, for which total global availability is 8Mt, of which 3-5Mt assumed available supply for European biofuels.
2) Includes animal fat category 3, PFAD and technical corn oil
3) Includes e.g., animal fat categories 1 & 2, used cooking oil, and palm effluent sludge

**Proposed Renewable Energy Directive II renewable fuel blending obligations and crop cap**




Counted for mandate:
- advanced biofuels, biofuels and biogas produced from feedstock listed in Annex IX
- renewable electricity supplied to road vehicles
- power-to-gas and power-to-liquid
- waste-based fossil fuels supplied to all transport sectors

NOTE: UCO = used cooking oil; AF 1&2 = animal fat category 1 and 2 Annex IX of the Directive (EU) 2015/ 1513 lists specific feedstocks, originally with the intention to allow Member States to count their contribution twice against the targets under the Renewable Energy Directive.
SOURCE: European Comission

# Nordic countries and North America remain committed to emission reduction and renewable fuels

Many markets in Europe and North America see an important role for biofuels in their ambitious decarbonization plans for transport. Renewable diesel in particular plays a large role in decarbonizing heavy-duty transport operations. The Nordic countries are eying ambitious climate targets that will require a renewable fuel share significantly beyond minimum requirements under the current EU Renewable Energy Directive II proposal.

Also in North America, California and other West Coast states are planning to ramp up their low-carbon fuel ambitions. California plans a further tightening of carbon intensity reduction targets of the Low Carbon Fuel Standard, from -10% in 2020 to -18% in 2030. The new standard should be adopted by January 2019. In addition, Canada is planning to introduce a federal Clean Fuels Standard that should drive demand for renewable fuels.

## Nordic countries' 2030 renewable fuel targets

30% renewable fuels

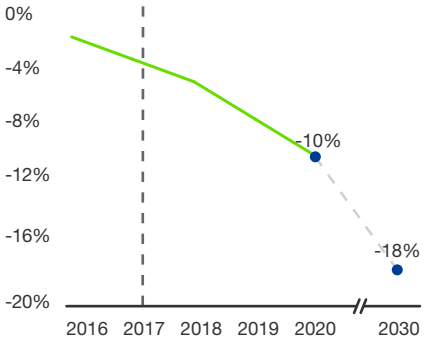
-70% $CO_2$ reductions;
30-40% renewable fuels

40% renewable fuels*

* Norway's 40% target is preliminary and discussions on the actual 2030 target are currently ongoing.

SOURCE: Neste based on countries draft policies

## California LCFS carbon intensity reduction targets to 2020, and draft 2030 target

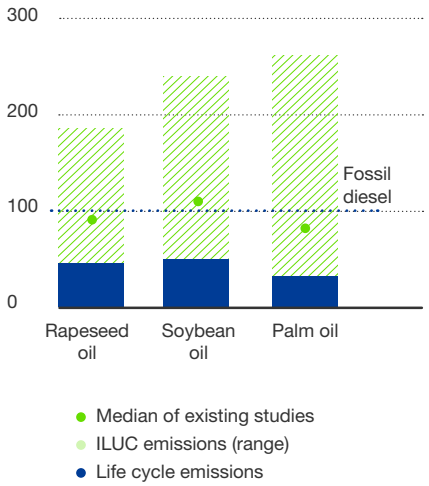


# Biofuel feedstocks are increasingly under discussion, highlighting the role of waste and residue feedstocks

Crop-based feedstocks, in particular palm oil, continue to be criticized by non-governmental organizations, civil society and policy makers across Europe. However, there is no scientific consensus on the actual level of emissions caused by indirect land-use change, but rather a broad range of estimates (figure on the right). Direct or indirect land-use change, i.e. deforestation, is one of the key points of criticism. The proposed declining cap for crop based biofuels under the Renewable Energy Directive II underlines that renewable fuels based on vegetable oils will have a limited role to play in the long run. In line with this, waste and residue based biofuels raise in importance.

Sustainability discussions also increasingly focus on waste feedstocks. Continuous work on the transparency of the supply chain for these feedstocks is therefore key to retain access to key markets. Taking action now to address these challenges will provide a competitive advantage in the long-run.

**EU default life-cycle emissions and potential ILUC-related emissions for vegetable oil feedstocks**




NOTE: ILUC = Indirect land-use change

SOURCE: Neste analysis based on Ahlgren & Di Lucia (2014); Ecofys (2016). GHG emissions for biofuels reflect default values in the EU Fuel Quality Directive; ILUC emissions stem from a range of different modelling exercises.

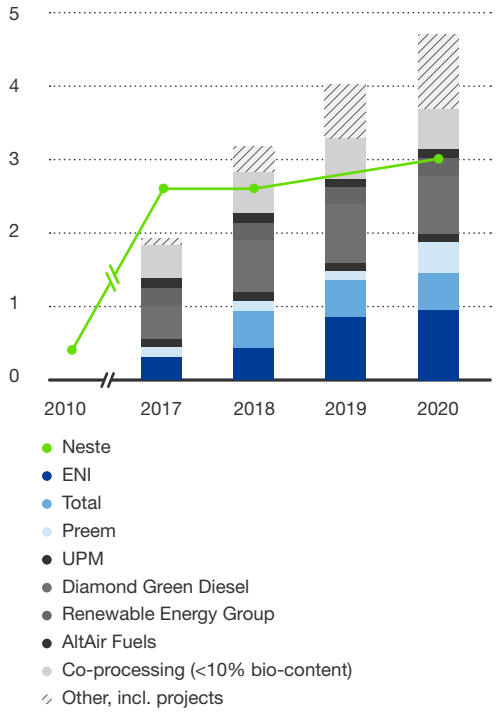

# Renewable diesel competition will increase

Renewable diesel competition is growing on both sides of the Atlantic. An additional 2 Mt of capacity will be added by 2020. Neste, as a market leader, will therefore face increasing competition in the coming years.

Drivers to enter renewable diesel production differ by stakeholder. Opportunistic oil companies co-process palm oil in their diesel desulphurization unit, without major investment, mainly to meet their own blending obligation. Other oil companies' retrofits are driven by the need to close unprofitable crude oil refineries without laying off staff. Long-term biofuel targets in Italy and France helped create confidence, too. However, the proposed RED II framework should make new retrofit projects in Europe less attractive, as palm oil is often used as main feedstock. Last, companies with dedicated renewable diesel plants see renewable diesel as attractive and profitable growth opportunity and thus have further growth ambitions.

New capacity will inevitably increase renewable diesel volumes in the markets. The industry's expansion plans also mean increasing demand for waste and residue feedstocks. As palm oil is increasingly under attack as feedstock in the EU, producers are aiming to diversify their feedstock mix.

**Renewable diesel nameplate capacity by company (Mt/a)**




NOTE: Co-processing includes Preem, Repsol, Cepsa and Galp. Other producers and projects: Andeavor, Ryze Renewables, Sinopec, UrbanX,

SOURCE: Company announcements

# 4 Circular economy

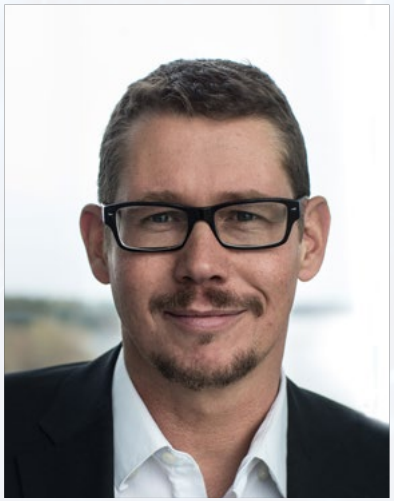
## moving ahead in the chemical markets

Learn about **the Ellen MacArthur Foundation's view on circular economy >**

# On a personal note:

**"Chemistry, and especially plastics, played a key role in enabling global living standard growth in the 20th century. However, the negative sides of this success story are becoming more obvious.**

**Rapidly increasing resource consumption and waste generation require actions that transform the way the economy is driven: away from a linear thinking towards a circular way of acting and designing. Global brands like IKEA are leading the way. Neste as one of the biggest handlers of sustainable carbon globally can play an important role in this mandatory transition.**



**Personally, I am thrilled by the opportunity to be part of Neste's contribution to this change. We have understood very well what acting sustainably means and we believe we can convince our value chain partners to join us in that. My motto: Let's move forward by going in circles."**

– Dr. Lars Boerger,
Head of Product Marketing,
Emerging Business Unit, Neste

# Chemicals, especially plastics, see significant growth while creating major negative externalities in $CO_2$ emissions and waste

The chemicals sector will see significant growth driven by growth in population, global economy, and resource intensity. Up to 65% of global liquids demand growth to 2035 is expected to come from chemicals[1]. Within chemicals, especially plastics will see rapid growth.

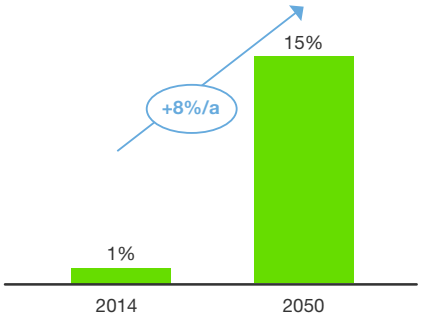
Plastics have many benefits, delivering high performance with low cost. However, the negative externalities in greenhouse gas emissions and waste are becoming painfully apparent. The cost of these externalities is estimated at USD 40 billion from packaging alone, exceeding the industry's profit pool[2].

Each year at least

**8 Mt**

**of plastics leak into the ocean** – equivalent of dumping one garbage truck into the ocean every minute, growing to **4 trucks per minute by 2050**

**Plastics' share of carbon budget**




**Ratio of plastics to fish in the ocean by weight**


NOTES: 1) McKinsey Energy Insights
2) United Nations Environment Programme (UNEP), 2014 – conservative assessment of natural capital intensity through quantifying plastics use and valuing the impact by sector

SOURCE: World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company, The New Plastics Economy – Rethinking the future of plastics (2016)

# Plastics' waste and resource use issues call for circular economy

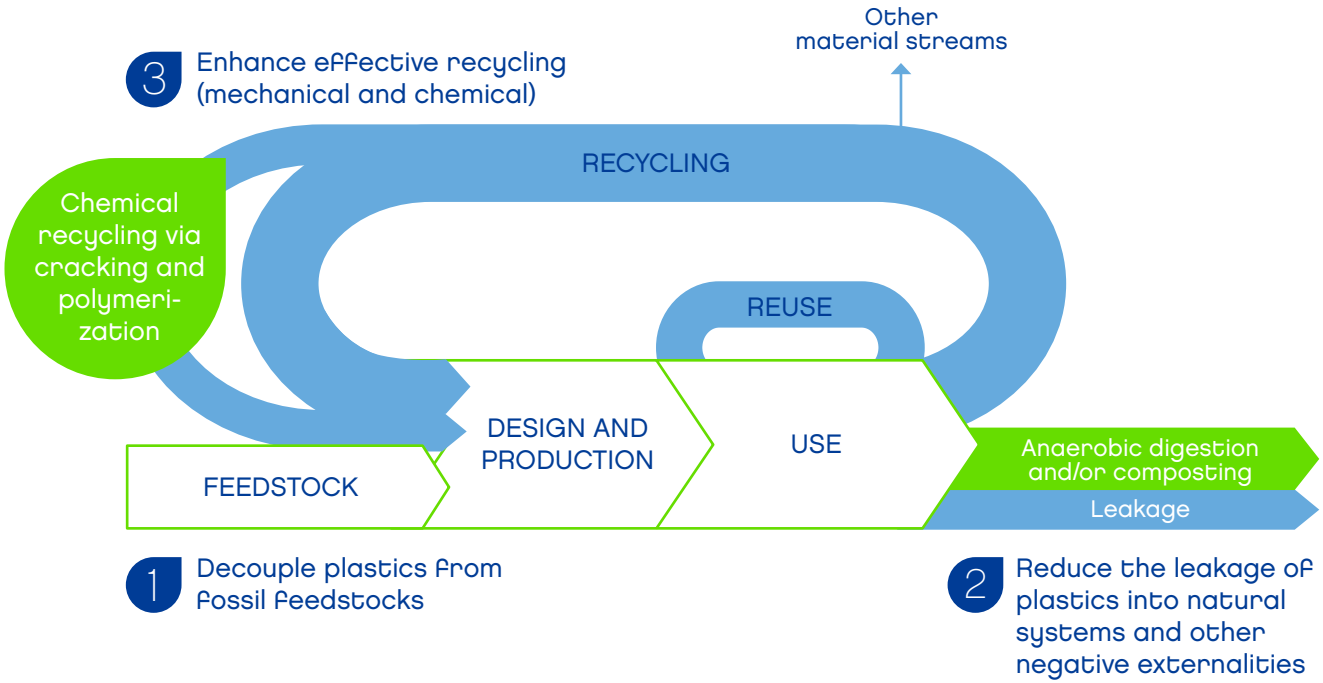
The vision of the new plastics economy is that instead of becoming waste, plastics will re-enter the economy as valuable technical or biological nutrients.

The negative externalities associated with plastics would be significantly reduced by the new plastics economy. The main ambitions of the new plastics economy include:

1. Decouple plastics from the consumption of fossil-based feedstocks
2. Reduce the leakage of plastics into natural systems (in particular the ocean) and other negative externalities
3. Create an effective after-use plastics economy by enabling effective reuse and recycling

Neste's renewable plastics help to decouple material use from fossil feedstock. Biodegradable products and recycling can represent future opportunities.

**New plastics circular economy**




SOURCE: Neste analysis, adapted from World Economic Forum

# 5 Fossil fuels

## will not disappear, but transformation is inevitable

# On a personal note:

**"Fossil fuels are not about to disappear, and their demand will in fact continue to increase globally towards 2030 and beyond. However, as demand turns to decline in our home markets around the Baltic Sea, Neste and the sector will have to adapt.**

**The coming IMO 2020 change will present an opportunity for well-positioned refiners, but it does not change the longer-term outlook. EU refiners need to take other actions, and co-processing could be one of these.**

**Not all things change, though. We do not expect major changes in the availability of Russian crude to the Baltic Sea area. Our view on vacuum gas oil availability has also not changed, as we see the slow decline continuing.**

**Security of Finland's energy supply is close to my heart and finding signals that show ways to a new energy environment is vital. This will require us to develop new capabilities to address the challenges and opportunities in the decades to come!"**

– Lauri Kärnä,
Senior Advisor, Strategy, Neste

# Long-term pressure on European refining continues, driven by declining demand and increasing competition

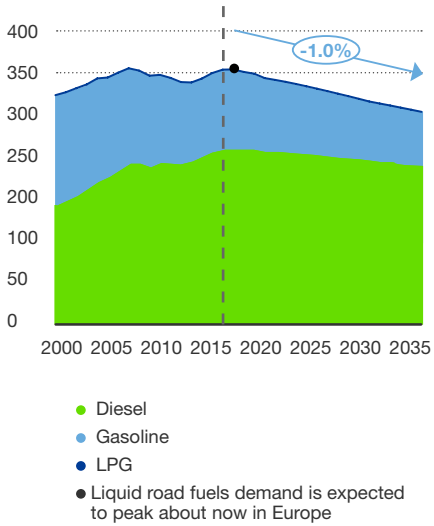
Efficiency improvements and alternative powertrains will set liquid fuels demand on a downward trend. Demand for gasoline and high sulphur fuel oil, in particular, will face continued decline, while heavy-duty vehicles will continue to rely on diesel. This challenges refinery product balances.

Export options of European refineries will be more challenging when the US, traditionally big gasoline importing market, becomes more self-sufficient. This means extending the focus to new markets, such as Latin America and even the Far East.

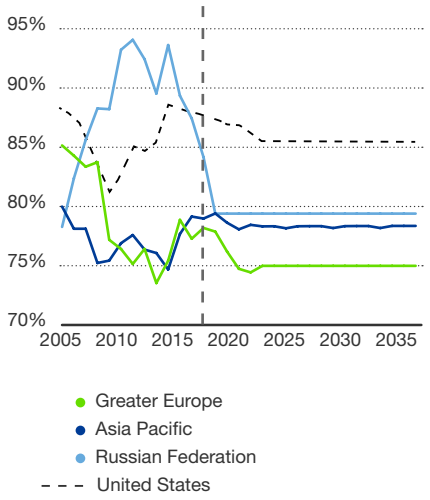
European refineries will face increasing competition from new capacity in the Middle East, increasing US exports, and volumes from Russia building on refinery upgrading programmes. This leads to depressed refinery utilization rates and is likely to lead to capacity rationalization in Europe.

SOURCE: Wood Mackenzie

**European fossil road fuel demand outlook (Mt)**

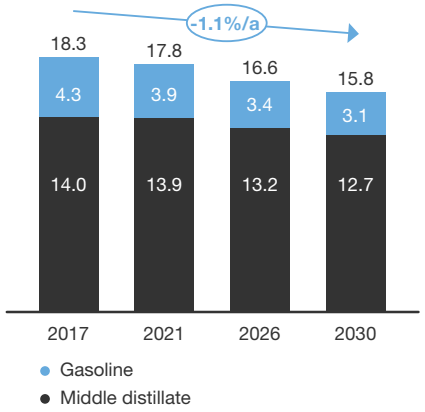



**Refinery utilization rate including known capacity changes**



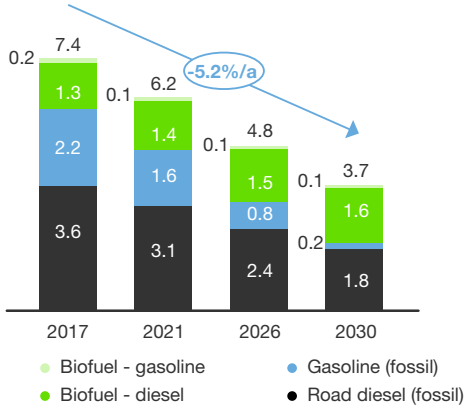


**Gasoline and distillate demand outlook in Finland, Sweden and the Baltic States (Mt/a)**




NOTE: Middle distillate includes road & non-road diesel, jet

**Illustrative fuel demand as envisioned in a Swedish Government scenario (Mt/a)**




SOURCE: Neste insights and WoodMackenzie data; Swedish Government "Bränslebytet"

# Nordic markets will go through transformation earlier than others

Total liquid fuel demand in Finland and Sweden is continuously decreasing, and the Baltic states remain the only home markets for Neste with positive demand growth. High demand for renewable fuels, especially in Finland and Sweden, drives even faster substitution of fossil fuels in these markets.

Finland is targeting a 30% biofuels share by 2030, and Sweden has even more ambitious targets of 30-40% by 2030. These would result in demand drop of ~1Mt in fossil diesel in Finland and ~0.7Mt drop in both diesel and gasoline in Sweden.

These trends could speed up dramatically, if climate ambitions are vigorously pursued. Based on the Swedish government's ambitious climate scenario, fossil fuel demand could almost half by 2030. As a result, exports from Baltic Sea countries will grow and finding good export outlets raises in importance. In addition, refineries will need to find ways to adjust their feeds or capacity to the new realities.

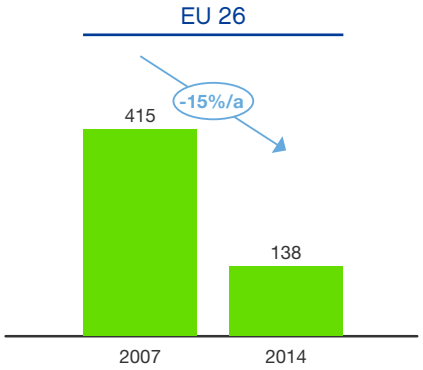
# Regulation and consumers add pressure to reduce environmental impact from refining and fossil products

Emission regulations on European refineries have tightened significantly over the last decade, contributing to a significant emissions drop after 2007–2014 overall. Recent EU BAT (best available technique[1]) round in 2014 was a demonstration of this. This trend of tightening will continue, with the next BAT round scheduled for 2022. In addition, new EU ETS trading system will take effect in 2021 further increasing $CO_2$ cost for refiners. The likely result is significant investment requirements for EU refiners to ensure license to operate.

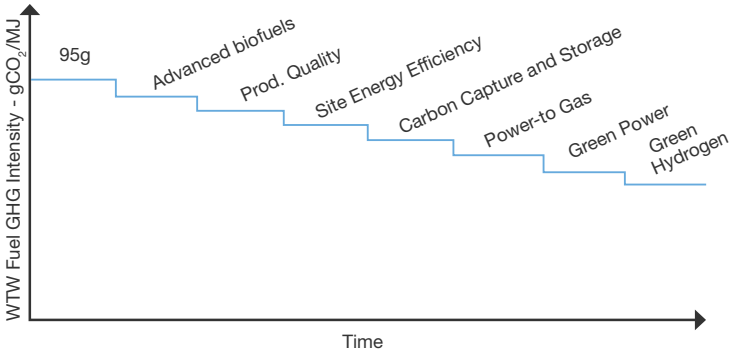
$CO_2$ intensity is increasingly challenged by both regulations and customers, such as corporate fleets. Oil companies are evaluating measures like high octane, carbon capture at site, green power, and green hydrogen to reduce $CO_2$ intensity of fossil fuels as response. Cost effective measures have already been utilized – only expensive measures are remaining.

Pressure from increasing environmental requirements could accelerate EU refining capacity rationalization.

**EU 26 sulphur emissions from refining sector (SOx kilotonnes)**




**EU oil refiners' association (Concawe) potential measures to reduce $CO_2$ intensity of fuels ($gCO_2/MJ$)**




NOTE: 1) EU regulation on pollution (including e.g. nitrogen oxide emissions, discharges to water. $CO_2$ not included in BAT) prevention and control
SOURCE: Eurostat, Concawe; European Pollutant Release and Transfer Register

# Diesel under fire – the implications of "Diesel-Gate" for passenger cars

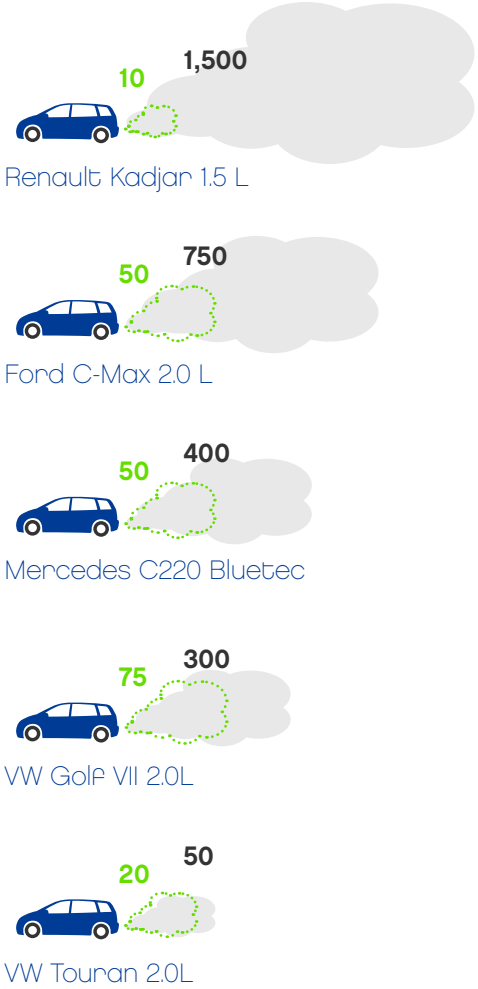
Diesel cars are facing headwinds after Volkswagen's "diesel-gate" revealed manipulated NOx emissions in official engine tests. The scandal hit at a time when air pollution is becoming an increasingly pressing issue to tackle for cities around the world. Some cities, including Paris, Mexico City and Madrid, have even announced bans for diesel vehicles from 2025 onwards.

New real driving emissions tests coming into force in the EU from 2017 onwards, will require further reductions in NOx emissions from diesel engines. This will lead to higher additional costs and will make the technology increasingly uncompetitive in smaller vehicles. UBS therefore forecasted that diesel could "almost disappear" from the global passenger car market by 2025, and the EU market could see strong decline.

While the exact impact of the diesel-gate aftermath cannot be fully predicted yet, it is important to note that criticism is focusing on light-duty vehicles. However, 70% of global diesel demand stems from heavy duty transport and this demand is expected to grow steadily.

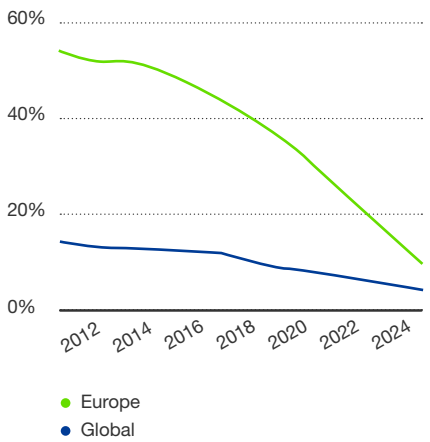
**Read about a Neste expert's point of view on Diesel >**

**NEDC laboratory $NO_x$ emissions test result versus maximum real-world $NO_x$ emissions (mg/km)**




NOTE: NEDC = New European Driving Cycle. Laboratory emission limit is 80 mg/km, meaning that all models shown here met regulation in force.

**UBS view: Diesel share of total new passenger car sales**




**"It's clear that treating exhaust gas fumes will become very costly and elaborate. Against this backdrop, the question will become whether it still makes sense to invest a lot of money in further developing diesel"**

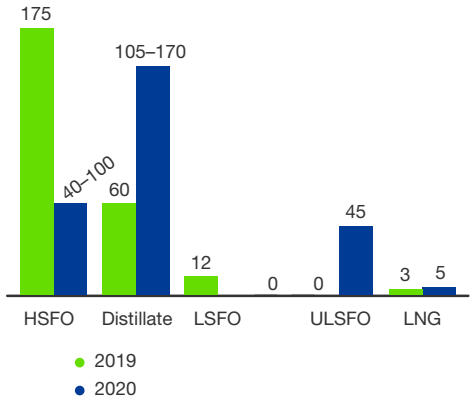
– Matthias Mueller, CEO Volkswagen Group

**"From today's perspective, we will not develop any more new generation diesel engines"**

– Hakan Samuelsson, CEO Volvo Car Group

SOURCE: UBS Global Research – European Refining: The end of diesel in passenger cars; © 2016. All rights reserved to UBS. Reproduced with the permission of UBS. The ICCT, 2017, NOX emissions from heavy-duty and light-duty diesel vehicles in the EU: Comparison of real-world performance and current type-approval requirements

### Global demand by fuel type during transition (Mt/a)




### Key reference margin changes

↑ Middle Distillates spread (vs. residual fuel oil)

↓ REB price (vs. Brent)

# IMO 2020 bunker quality change will benefit well-positioned refiners significantly for a few years

High sulphur residual fuel oil (3% sulphur) is the major product used in marine bunkers, covering 50% of residual fuel oil demand globally. Considering the magnitude, the global IMO 2020 requirement for max 0.5% sulphur has a major impact on both the shipping and refining industries. Current Emission Control Areas (ECA) areas maintain max 0.1% sulphur limit. IMO will decide the final implementation plan by early 2019.

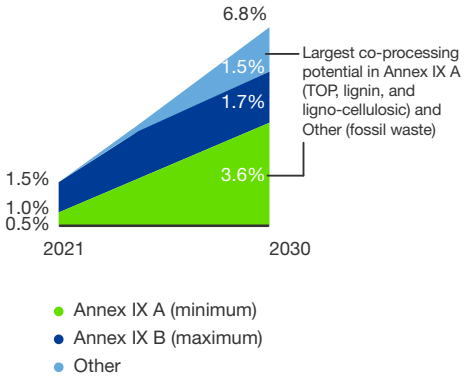
After the change, the main compliant fuel is Middle Distillates, as the availability of compliant 0.5% sulphur residual fuel oil does not meet demand. Also, the number of ships equipped with exhaust gas scrubbers to remove sulphur is low. Significant scrubber penetration will take several years, due to lack of sufficient dry docking capacity. Similarly liquefied natural gas (LNG) will need take time to reach scale as supply infrastructure needs to expand and fleet penetration with new LNG vessels is slow.

The result will be a widened price difference between sweet vs. sour crudes, and Middle Distillates vs. residual fuel oil. This benefits significantly refineries that are able to upgrade sour crudes.

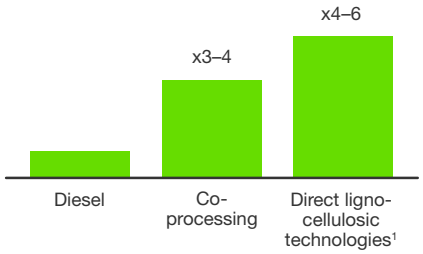
**See Platt's perspective on IMO 2020 >**

SOURCE: Neste analysis based on Wood Mackenzie


**Proposed RED II mandate (% of road and rail energy)**




**Full product cost**




NOTE: 1) includes cellulosic ethanol; hydrothermal liquefaction (HTL) and upgrading; hydropyrolysis; gasification + Fischer-Tropsch synthesis

SOURCE: European Commission, RED II proposal

# Door opening for co-processing in Europe

The recent EU Renewable Energy Directive II (RED II) proposal allows co-processing of biomass as a method to fulfill the biofuels mandate. The proposal includes the subquota (Annex IX A) for advanced biofuels including feedstocks like Tall Oil Pitch (TOP), lignin and ligno-cellulosic based feeds. The proposal also acknowledges fossil waste (Other) as a possible tool for decarbonizing transport, but gives no further details.

Co-processing creates an opportunity to improve longer-term competitiveness in the challenging EU refining sector. Co-processing is potentially also a capex efficient way to produce advanced biofuels resulting in lower product cost than direct ligno-cellulosic technologies. Crucial for success in co-processing is access to feedstock and technical development (especially liquefaction of solid feeds) with the right partners. An additional challenge could be the actual biocontent in the final product, as bio-feedstock is distributed to multiple products.

# 6 New business models

## emerge from digitalization, convenience and services

# On a personal note:

"New technologies and digitalization will challenge established business models. Autonomous vehicles and new mobility concepts could impact fuel demand, and will certainly change the customer base.

Digitalization will further speed up the development of new business models and competition between ecosystems – both in- and outside of traditional fuel retail. At the same time, convenience gains importance for consumers and the role of services increasingly defines companies' success.

I think as a consumer it is not enough to only shift to more sustainable products and services. The aim also needs to be to reduce overall consumption. I am trying to consume less by buying second hand clothes and by better planning grocery shopping in order to reduce food waste. Digitalization has helped me move to e-books and journals and I found those even more convenient than traditional print."

– Katri Taskinen,
VP Marketing & Services Baltics, Neste

# Autonomous vehicles and new mobility concepts could substantially impact fuel demand

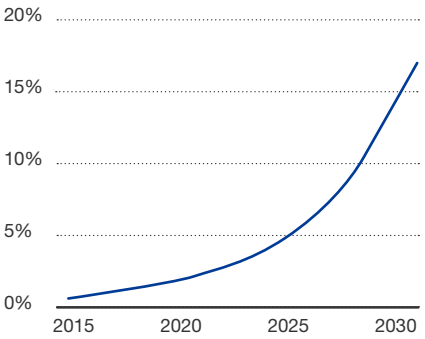
We are currently witnessing the beginning of a new era of mobility. Mobility is increasingly perceived as a concept, that is not necessarily linked to ownership of a private vehicle, in particular in urban areas. Several international corporations, including Google and Apple as well as several big OEMs, are working to bring autonomous vehicles to the market within the next 5–10 years. Development efforts are also under way in the heavy-duty segment, with autonomous trucks being developed by several companies.

The impact of autonomous vehicles and the more widespread use of car-sharing systems on fuel demand, are not yet fully understood. Most likely, the more efficient use of vehicles, and the faster penetration of new fuel-efficient vehicles in car-sharing services, will lead to a decline in demand. If electric powertrains penetrate these services, it could multiply the effect. Of course, if those technologies reduce the cost of mobility, fuel demand could even increase.

The next decade will deliver evidence on the direction, and we need to follow the developments closely.

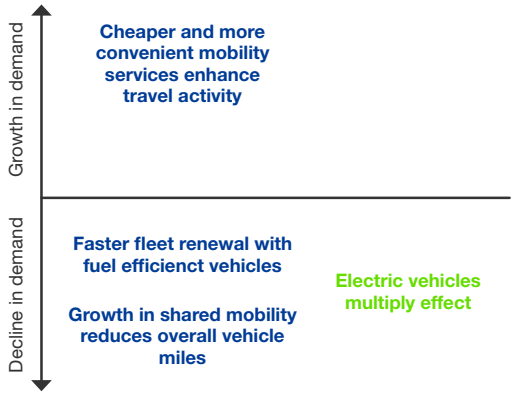
**Learn more about the future of urban mobility >**

### Share of shared vehicles in global car fleet




● Shared cars as % of total on road (including taxis, excluding car rental)

### Illustrative potential impact of autonomous vehicles and car-sharing systems on liquid fuel demand




NOTE: For more on the future of driverless trucking, see https://youtu.be/L_uW0_OvEkk
SOURCE: Neste based on Morgan Stanley data published in The Economist (Jan 9, 2016)

# Digitalization and the service economy will bring forth new business models

## Mobility-as-a-Service

Mobility-as-a-Service (MaaS) is a concept, where consumers do not own the transportation vehicles, but consume transportation as a service by utilizing the mode best suited to their needs. In MaaS, private and public transportation services are combined by an operator, which sells service packages to end users. An integral part of MaaS are trip chains, which combine several modes of transport, instead of customer having to organize each mode separately.

As urbanization continues, MaaS can provide a way to move people and goods faster and less expensively than current options. MaaS is best suited to urban environments with high density and supply of transportation modes. In Neste markets, MaaS has the largest potential in the capital cities of the Baltic Sea area, representing relatively small part of total transportation fuel market in the region.

## Fuel-as-a-Service

Service packages, combining multiple car-related services into one monthly fee, are becoming popular among consumers. Multiple companies are developing their services in this field, for example finance institutions, car resellers and leasing companies. None of the services currently available include fuel, but it is a natural next component to be included in the service package. Fuel–as-a-Service can be an alternative for more than 350,000 cars p.a. in Finland[1].

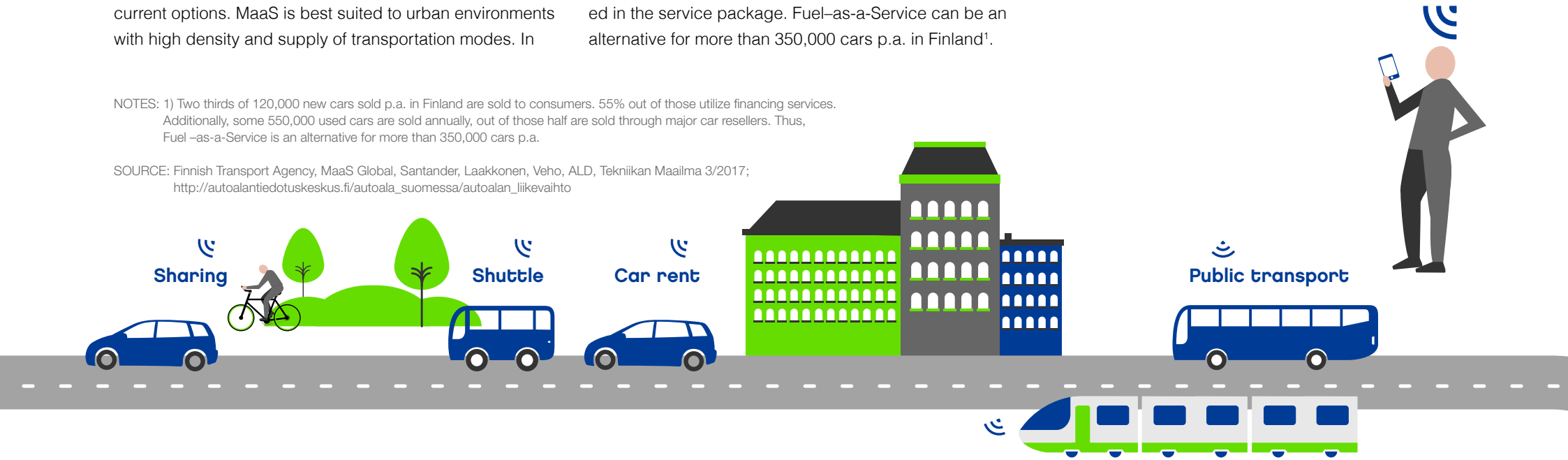
ALL-IN-1 HUOLENPITOSOPIMUS

## Service example:

Santander All in One is a service which packages selected services into one monthly fee. The package can include financing for new or used cars, guaranteed residual value, services, insurance, tire changes and other value adding services. The service is available through Santander's partners.

NOTES: 1) Two thirds of 120,000 new cars sold p.a. in Finland are sold to consumers. 55% out of those utilize financing services. Additionally, some 550,000 used cars are sold annually, out of those half are sold through major car resellers. Thus, Fuel –as-a-Service is an alternative for more than 350,000 cars p.a.

SOURCE: Finnish Transport Agency, MaaS Global, Santander, Laakkonen, Veho, ALD, Tekniikan Maailma 3/2017; http://autoalantiedotuskeskus.fi/autoala_suomessa/autoalan_liikevaihto



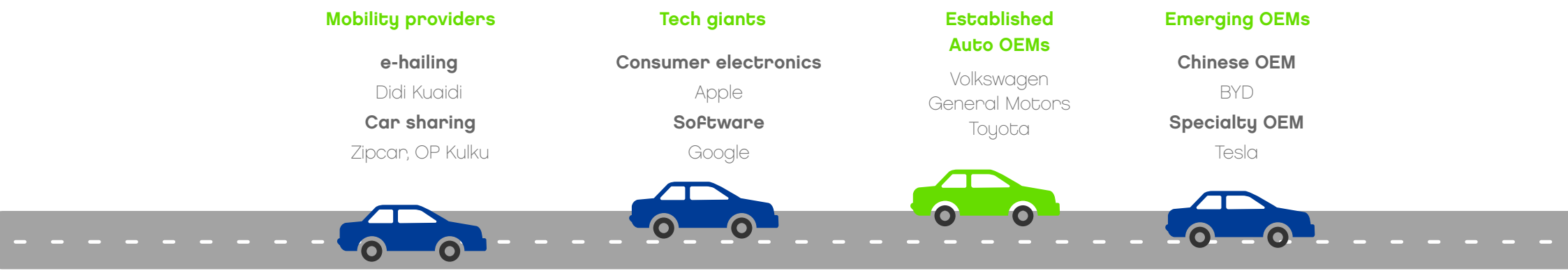
# Competition between ecosystems – active participation is crucial as predicting winners is challenging

Many industries, like mobile handsets, have recently gone through significant disruption. Automotive and transportation industries have not seen fundamental change in several decades. However, a paradigm shift to mobility as a service, along with new entrants, will inevitably force incumbents to compete on multiple fronts. We will see new competition between ecosystems of established and emerging auto OEMs, tech giants, and mobility providers.

Competition between ecosystems brings both risks and opportunities for fuel suppliers. On the one hand, fuel aggregators are likely to enter ecosystems creating new competition. On the other hand, new routes to value adding services also open up.

Fuel suppliers are not likely to be at the center of the change, but they need to actively utilize ecosystems for fuels and value added services. As predicting winners is challenging, it is important to be ready to connect to multiple ecosystems.

**2030: Automotive & transport ecosystem landscape**




SOURCE: McKinsey & Company: Automotive revolution – perspective towards 2030

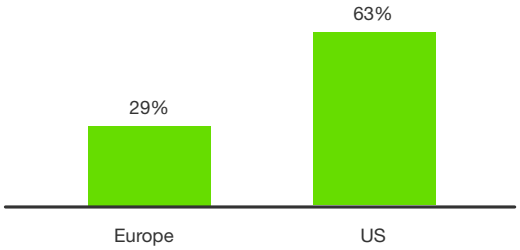

# Convenience is king in fuel retail

North America is leading the transformation from fuel to convenience retailing. Currently 80% of the convenience stores are also selling fuel, which accounts for the majority (80%) of total fuel sold in the country. Fuel has become a throw-in product: in the US, 63% of Couche-Tard profits come from convenience, whereas in Europe the share is only 29%, but the set-up is changing. The backcourt has importance in attracting and keeping customers, as well as ensuring the future profits when consumption of conventional fuels declines.

Consolidation of fuel retail is taking place in Europe and US as convenience players are entering the market (e.g. Couche-Tard/Circle K, 7-Eleven and ABC) and oil majors are withdrawing from the fuel retail gradually (e.g. Statoil, Exxon, Shell).

In the future the focus of fuel retail will be on customers, not cars. Developing fuel stations into service centers is one way to respond to this call. This trend is already strong and will gain more importance with the emergence of alternative fuel solutions. Fuel retailers are utilizing two different avenues for the backcourt: (i) Focus on fuel and partner with convenience provider or (ii) become convenience retailer, making the best efforts to obtain, retain and satisfy customers' needs.

**Convenience gross profit contribution (%) at Couche Tard (2015–2016)**




SOURCE: Couche-Tard presentation Oct 2016

# Services increasingly important for success: profitability, differentiation and creating customer loyalty

Companies selling mainly bulk products face constantly increasing competition on price. Differentiation is increasingly made through truly differentiated products or value-added services. In many industries we are seeing the shift from selling only products to being service providers.

More companies are getting used to buying value adding services in order to concentrate on their core business. Fuel is not an exemption. As fuel demand is declining in many markets, services offer the possibility to differentiate and gain extra margins compared to product sales.

Services are a great way to improve customer loyalty through captivity, due to longer contracts, easiness and difficult comparability. This means that the first mover has a true advantage against the competition. This can be seen especially in traditional, previously well protected industries, as new disruptive entrants are gaining market share in areas such as payments, taxis (Uber), television (Netflix) and media (Google & Facebook).

Transport is witnessing signs of change: fuel-as-a-service, ecosystems, electric vehicles, self-driving cars and other possible game changers. Conventional fuel retailers need to realign from selling products to selling services in order to stay competitive and relevant to customers. Companies need to understand customer needs in detail in order to create appealing services that add-value.

# Conclusions

This Outlook highlights a selection of drivers that are shaping the market up to 2030. Some of these changes might take place faster than we anticipate today, whereas others may never materialize. While these changes inevitably create some uncertainty, they also open significant new opportunities.

Without full transparency to the future, it is best to remain on one's toes: ready to question the view of the future and ready to act when needed.

# Acronym key

| Acronym | Meaning | Description |
|---|---|---|
| **1G, 2G** | First generation, second generation | Classification of biofuels |
| **B2B** | Business to business | |
| **B2C** | Business to customer | |
| **B7, B10, B30** | 7%, 10%, 30% bio-content | Biodiesel blend with certain percent of bio-content |
| **BAT** | Best available technique | EU pollution regulation defining limits and/or required technologies for discharges to water and air ($CO_2$ excluded) |
| **CAGR** | Compound annual growth rate | |
| **CAPEX** | Capital expenditure | |
| **CNG** | Compressed natural gas | Fuel that can replace e.g., fossil gasoline and diesel |
| **ECA** | Emissions Control Area | Area where the emission standards apply, defined by International Maritime Organization |
| **ETS** | Emissions Trading System | EU's market-based approach to lower GHG emissions in heavy energy-using installations (e.g., industry) |
| **EV** | Electric vehicle | Vehicle with electric powertrain and on-board source of electricity in form of a battery |
| **FAME** | Fatty-acid methyl esther | Also referred to as biodiesel. Lower-quality competitor of renewable diesel |
| **FT** | Fischer-Tropsch process | Gasification (coal, wood) coupled with Fischer-Tropsch synthesis to produce high-quality drop-in fuel |
| **$gCO_2$/km** | Grams of carbon dioxide per kilometer | |
| **$gCO_2$/MJ** | Grams of carbon dioxide per megajoule | |
| **GHG** | Greenhouse gas | Typically refers to $CO_2$, and also includes methane, nitrous oxide and other gases. |
| **HSFO** | High-sulphur fuel oil | Fuel used in marine bunkers with >1% sulfur content |
| **HTL** | Hydrothermal liquefaction | Technology that can be used to convert biomass into bio-oil |
| **HVO** | Hydrotreated vegetable oil | Alternative industry term for renewable diesel |
| **ICCT** | The International Council on Clean Transportation | |
| **IEA** | International Energy Agency | |
| **ILUC** | Indirect land-use change | Carbon emissions occurring through deforestation that is indirectly driven by increased demand for vegetable oils elsewhere |
| **IMO** | International Maritime Organization | |

| Acronym | Meaning | Description |
|---|---|---|
| **LCFS** | Low Carbon Fuel Standard | Market-based approach to lower GHG emissions from transportation fuels in California |
| **LNG** | Liquefied natural gas | Methane converted to liquid form for use in e.g., heavy-duty trucks and marine engines |
| **LPG** | Liquefied petroleum gas | Liquid mixture of propane and butane, used for transport or as household fuel |
| **LSFO** | Low-sulphur fuel oil | Fuel used in marine bunkers with <0.5% sulfur content |
| **MaaS** | Mobility as a Service | |
| **Mbbl** | Million barrels | |
| **Mt** | Million tons | |
| **Mt/a** | Million tons per annum | |
| **Mtoe** | Million tons of oil equivalent | |
| **NGO** | Non-governmental organisation | |
| **Non-ETS** | Non-Emissions Trading System | EU sectors whose emissions are not covered by ETS, including transport, buildings and agriculture |
| **NOx** | Nitrogen oxide | Emission formed during fuel combustion, currently in strong focus in connection with diesel passenger cars across the EU |
| **OEM** | Original equipment manufacturer | Car manufacturers, such as Volvo or Volkswagen |
| **OPEX** | Operating expense | |
| **PFAD** | Palm fatty acid distillate | Side stream from palm oil processing. Feedstock for renewable diesel |
| **REB** | Russian export blend | Russian export benchmark crude, a mixture of several crude grades |
| **RED II** | Renewable Energy Directive II | Proposal for new EU directive 2021–2030, which sets specific targets for renewable energy use in the EU |
| **RFS** | Renewable Fuels Standard | US federal legislation that mandates use of biofuels |
| **RJF** | Renewable jet fuel | Jet fuel produced from renewable origin |
| **SOx** | Sulfur oxide | Emissions caused mainly by burning high-sulfur fuel oil in marine vessels without scrubbers |
| **TOP** | Tall Oil Pitch | By-product of wood pulp manufacturing. Feedstock for renewable diesel |
| **ULSFO** | Ultra-low-sulphur fuel oil | Fuel used in marine bunkers with <0.1% sulfur content |
| **WTW** | Well-to-wheels | Emission analysis taking into account full impact from primary feed source to end use for fuels |

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