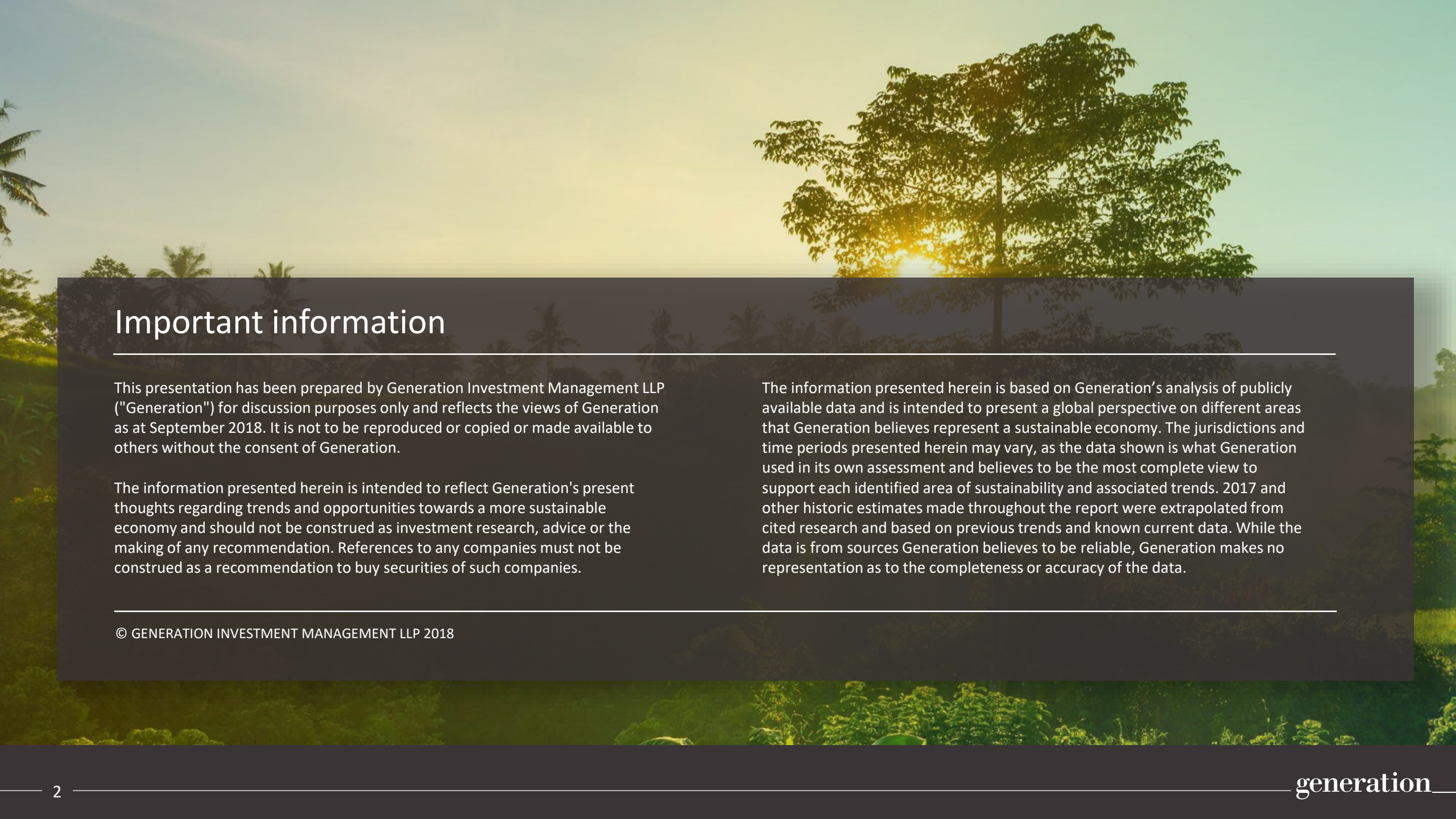


2018

Generation Investment Management
Sustainability Trends Report

generation



Important information

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The information presented herein is based on Generation's analysis of publicly available data and is intended to present a global perspective on different areas that Generation believes represent a sustainable economy. The jurisdictions and time periods presented herein may vary, as the data shown is what Generation used in its own assessment and believes to be the most complete view to support each identified area of sustainability and associated trends. 2017 and other historic estimates made throughout the report were extrapolated from cited research and based on previous trends and known current data. While the data is from sources Generation believes to be reliable, Generation makes no representation as to the completeness or accuracy of the data.

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A compendium of commercial opportunities paving the way to a sustainable economy

Generation has a unique investment process. The firm combines an assessment of business and economic factors with analysis of relevant sustainability trends. We track a wide variety of indicators – economic, social and environmental – to assess whether we are moving towards a more sustainable world. In this, Generation's second Sustainability Trends Report, we share many of them with you. Drawn from more than 200 sources, this report is the most comprehensive survey of the enormous sustainability challenges facing the world. The report takes about half an hour to read. We invite your feedback on each and every part.

Not everything is positive. Global temperatures continue to rise. Carbon-dioxide emissions, which need to turn negative, have continued to increase. Inequality remains too high. Some health problems, such as obesity, are getting worse.

Yet there is room for optimism. Sales of electric cars are booming. Consumers are demanding goods and services that are produced in a sustainable way, and the resource requirements of the inputs to our goods are changing. An explosion of health-related interventions allowing people to take better care of their health ensures that death rates from many diseases continue to plummet. And innovations in urban transportation could make cities greener, healthier and more efficient.

So it's a mixed message, reflecting the immense complexity of the modern world.

We have improved on last year's report. We have gone into more detail on many of the trends we analyse. Rather than simply offering descriptive statistics, we have also tried to analyse underlying dynamics where necessary. This allows us to explain what is going on, and why, rather than simply showing the trend.

Each of the five chapters of the report corresponds to a different aspect of the economy.

- > **Energy** – the natural inputs driving economic activity
- > **Urban mobility** – the movement of people and products
- > **Responsible consumers** – how people buy and sell goods and services
- > **Health and wellbeing** – how the economy affects the wellbeing of all people
- > **The future of work** – the role of people in creating economic value

We look forward to the conversation.

An enduring and equitable economy is characterised by sustainable...



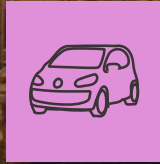
Energy systems



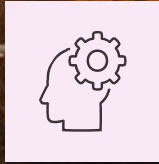
Consumers



Workplaces



Urban mobility



Health and wellbeing



Energy systems

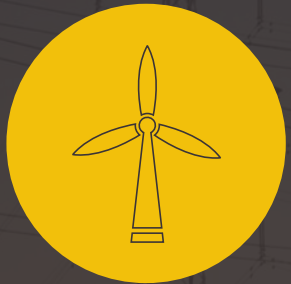
Section summary

The global energy system is undergoing rapid transformation.

Renewables are quickly becoming an important source of energy in many countries. Advances in energy storage suggest that the move towards renewable energy is likely to continue for some time. Both households and businesses are investing more in measures to reduce their consumption of energy.

But more needs to be done. Some governments are embracing measures to discourage carbon emissions, though progress has slowed. Much more action is needed.

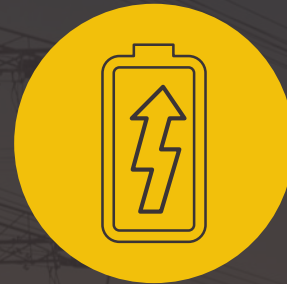
A sustainable energy system is characterised by:



Reliable, scalable and competitive renewable energy supply



Emerging-market leadership in the transition to clean energy



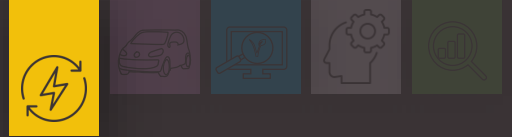
Improvements in energy storage



Innovations in reducing energy demand



Regulatory systems which encourage better outcomes



Renewable energy supply is becoming increasingly reliable, scalable and competitive



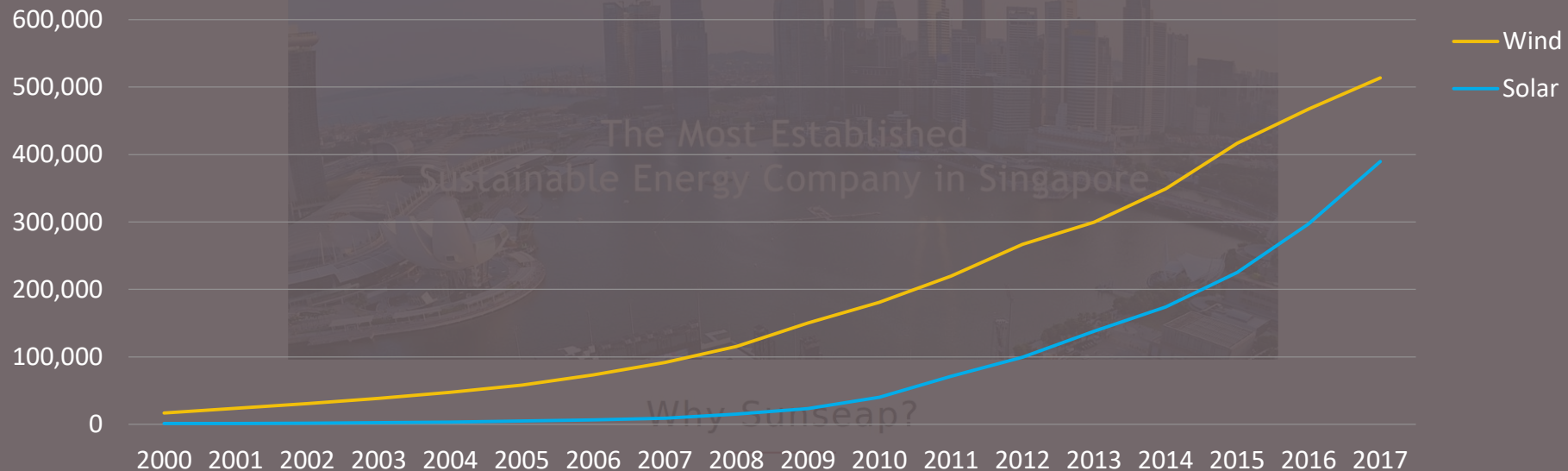
IMAGE: Sunseap Group
Solar is scaling up rapidly, with capacity nearly quadrupling over the past five years

Renewable energy supply is becoming increasingly reliable, scalable and competitive



Global wind and solar capacity is rising quickly

Installed capacity (MW), global



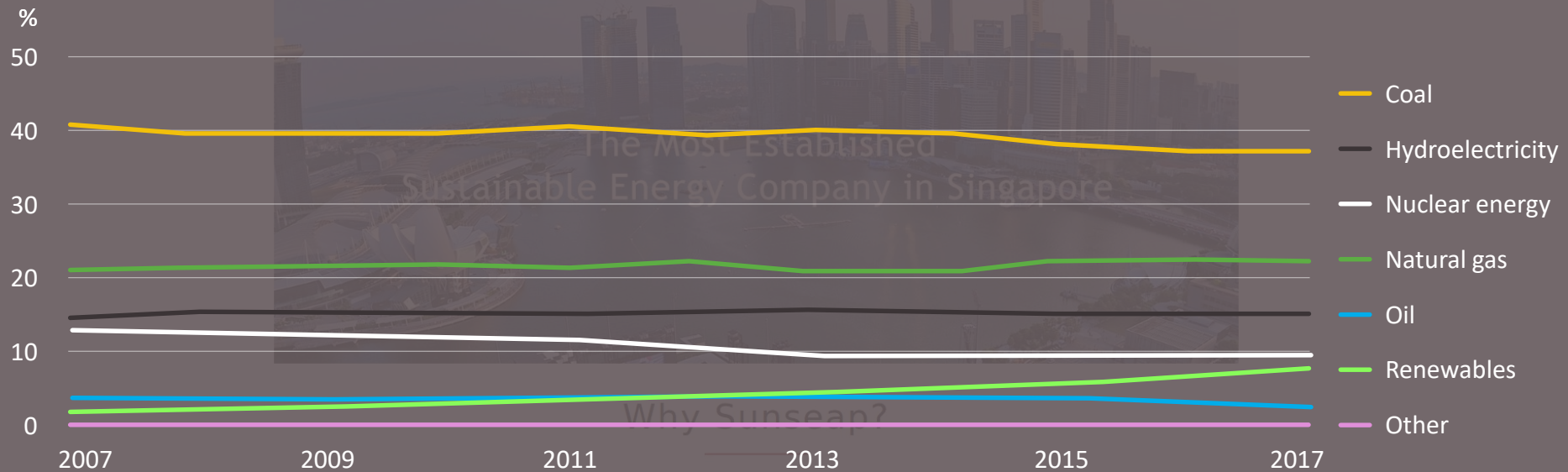
SOURCE: International Renewable Energy Agency (IRENA)

Renewable energy supply is becoming increasingly reliable, scalable and competitive



Though they are becoming more important, renewables still remain a small part of the overall global electricity mix

Share of global electricity generation by fuel



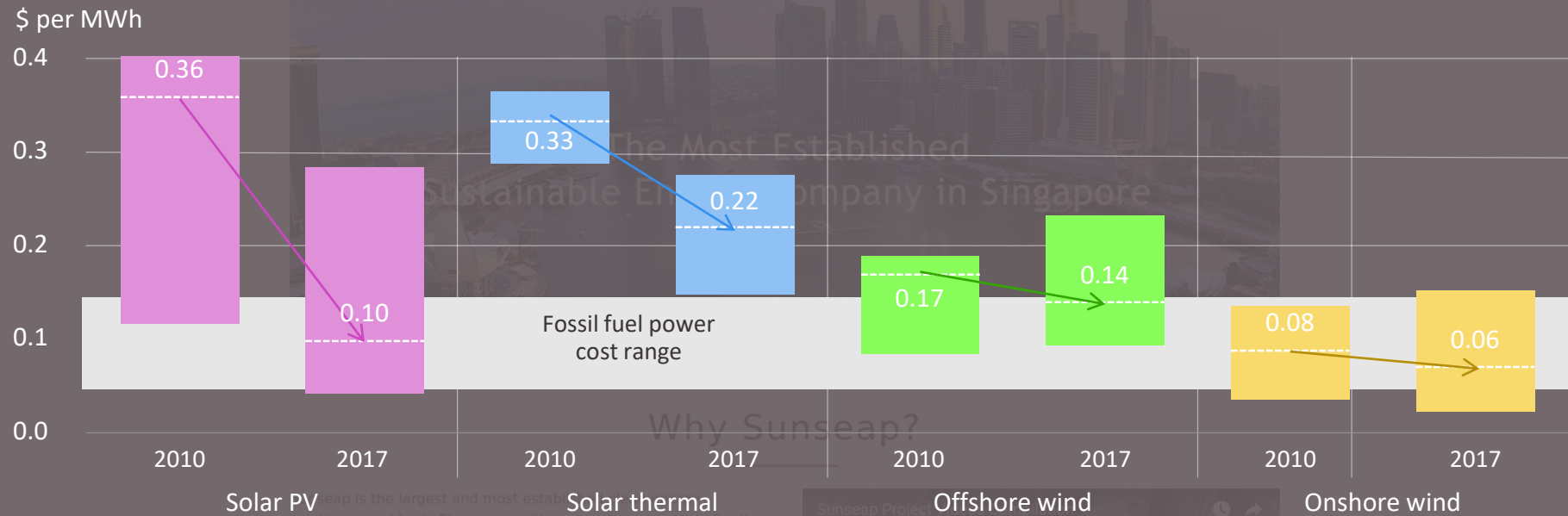
SOURCE: BP; US Energy Information Administration (EIA). One notable development in America is that the country now produces more electricity from natural gas than from coal.

Renewable energy supply is becoming increasingly reliable, scalable and competitive



The cost of renewable energies has fallen in recent years

Levelised cost of electricity, 2010 and 2017



SOURCE: IRENA

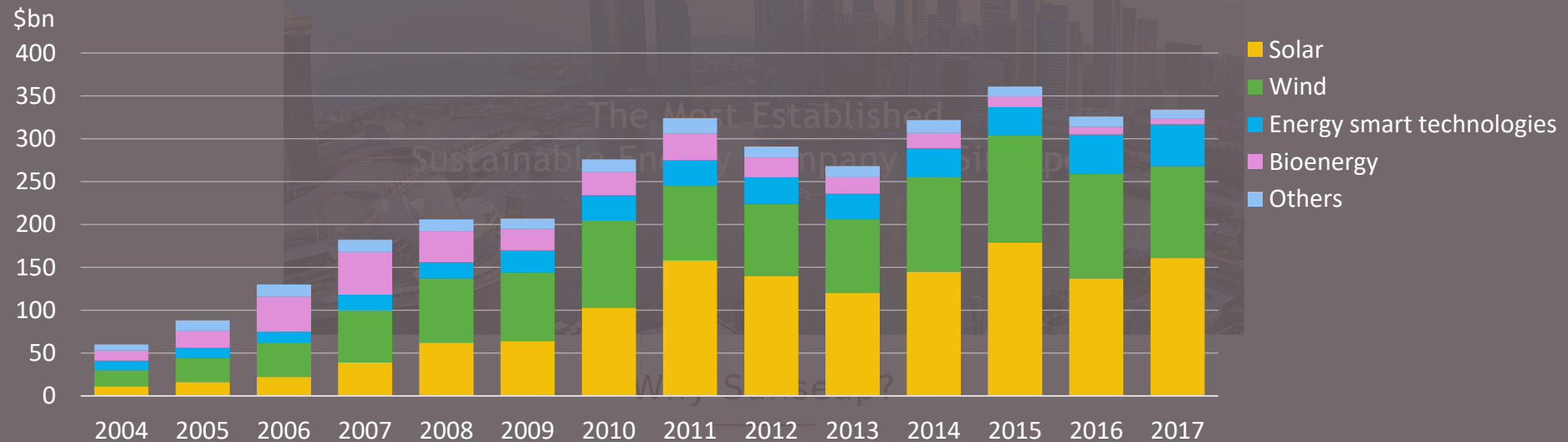
NOTE: Dollars are expressed in 2016 constant terms. The bars represent the range of values recorded. The increase in the price for some offshore wind may be because firms are installing hardware in more hostile environments.

Renewable energy supply is becoming increasingly reliable, scalable and competitive



Total investment in renewable energy is far higher than it was a decade ago

Global new investment in clean energy by sector, 2004-2017



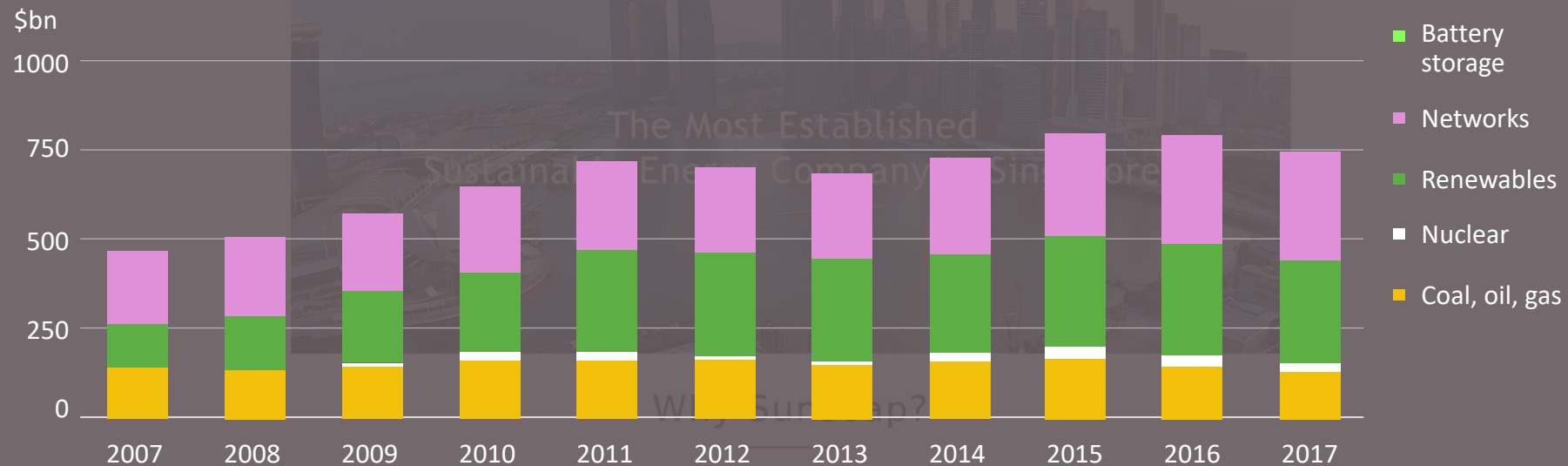
SOURCE: Bloomberg New Energy Finance (BNEF); International Energy Agency (IEA). Note: Despite investment stabilising, actual deployment of renewables continues to increase.

Renewable energy supply is becoming increasingly reliable, scalable and competitive



Three years ago, for every \$1 spent on fossil-fuel investment \$1.75 went on renewables. That has risen to \$2.26.

Global power-sector investment



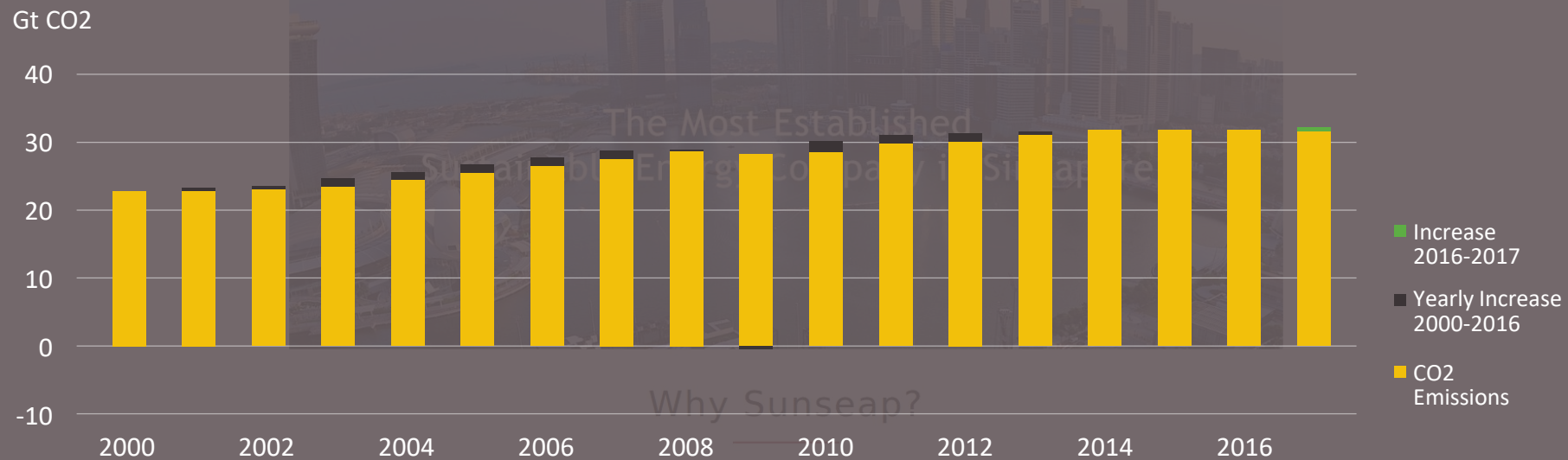
SOURCE: IEA. Dollars are expressed in 2017 constant terms.

Renewable energy supply is becoming increasingly reliable, scalable and competitive



But global emissions are rising. To keep global average temperatures below 2°C, zero or even net negative emissions are required*

Global energy-related CO2 emissions



SOURCE: IEA

*This temperature refers to a baseline of pre-industrial levels

Emerging markets, where future energy needs are greatest, are leading the shift to renewables



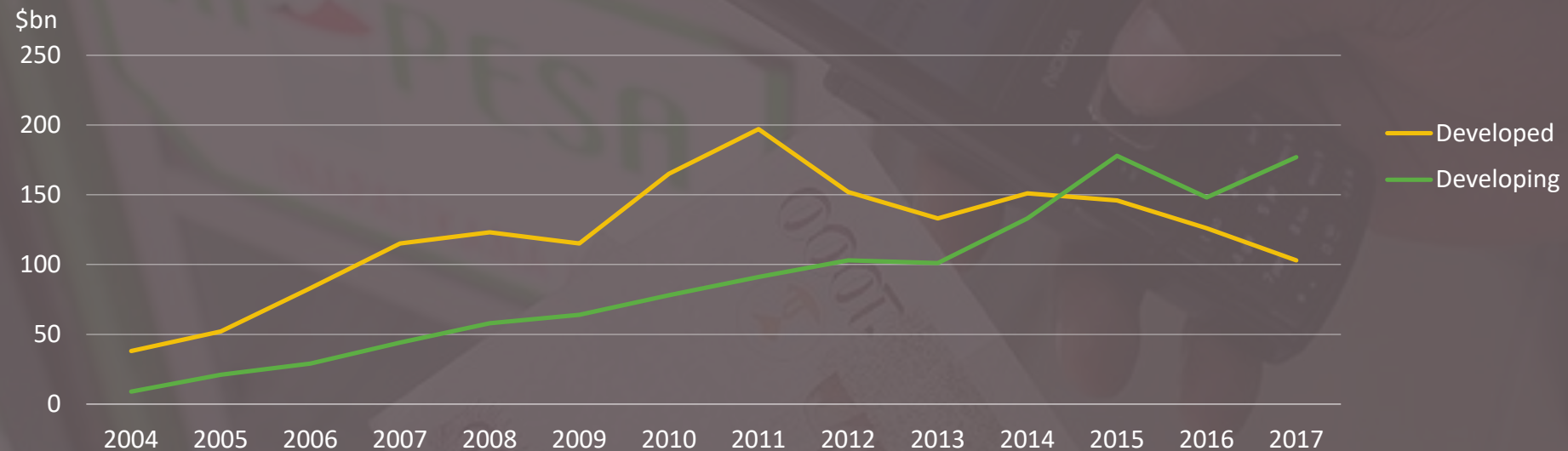
IMAGE: M-Pesa
Payment platforms, like M-Pesa, are powering the shift to household solar

Emerging markets, where future energy needs are greatest, are leading the shift to renewables



Most investment in renewables is now coming from developing countries

Global new investment in renewable energy: developed and developing countries, 2004-2017



SOURCE: FS-UNEP Centre; UN Environment; BNEF

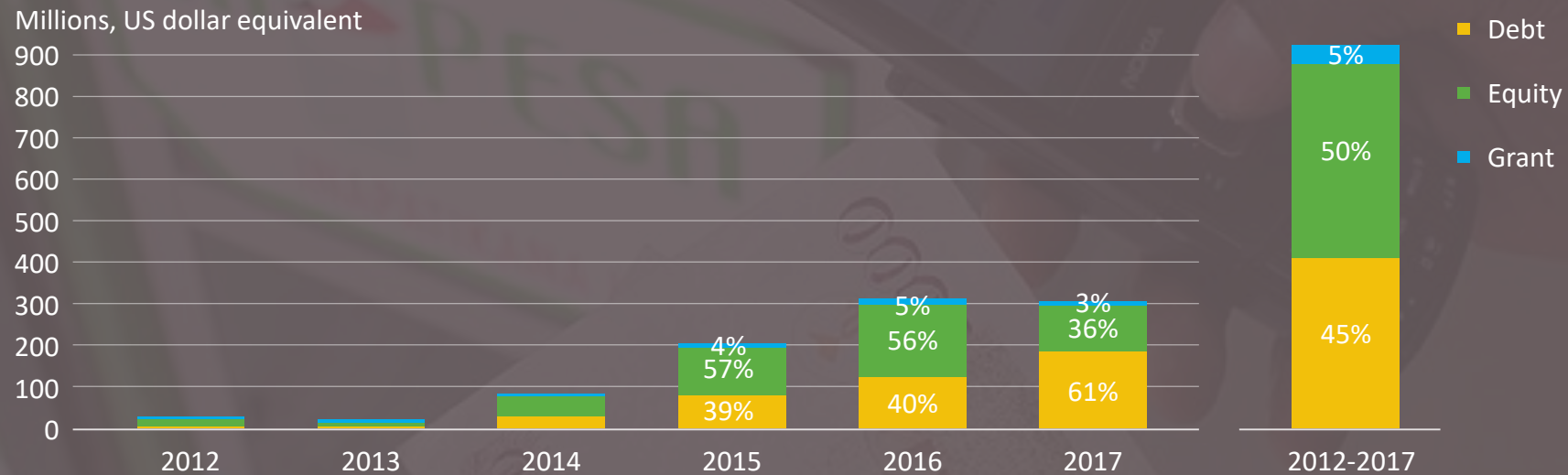
NOTE: Adjusted for re-invested equity. Total values include estimates for undisclosed deals. Developed volumes are based on OECD countries excluding Mexico, Chile and Turkey. China is classed as a developing country.

Emerging markets, where future energy needs are greatest, are leading the shift to renewables



Investment in off-grid solar has risen sharply

Global new investment in OGS, by financing instrument



SOURCE: Off-Grid Solar Market Trends Report 2018; Generation. It is estimated that in 2017, innovation in off-grid solar (OGS) resulted in improved electricity access to an estimated 73 million households previously reliant on kerosene and solid fuels

Emerging markets, where future energy needs are greatest, are leading the shift to renewables



Incentives for the shift away from hydrocarbons are multifold: the higher the share of GDP from oil rents, the worse the levels of corruption

Analysis suggests that there is a correlation between reliance on hydrocarbons and poor governance



SOURCE: Generation analysis of data from World Bank. Calculations using data from 2011-17. Oil rents are the difference between the value of crude oil production at regional prices and total costs of production. Countries with no corruption-index score are excluded.

Energy storage capacity is improving, which bolsters the case for renewables

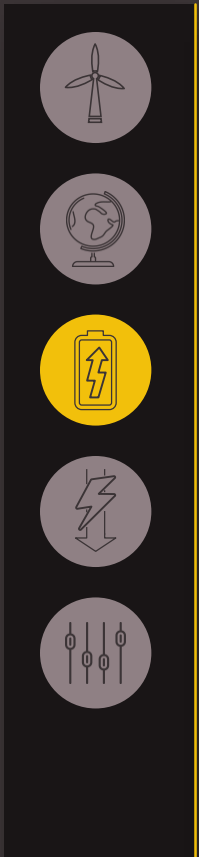


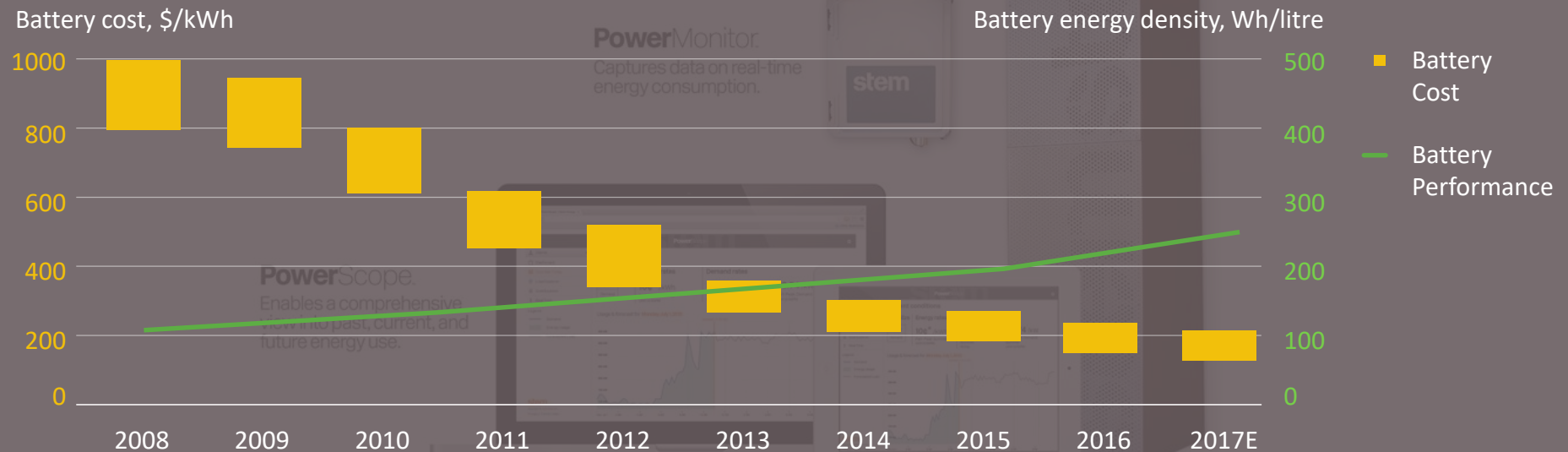
IMAGE: Stem AI-Powered Energy Storage
Improved battery performance and technology will allow more energy to be stored, solving the intermittency problem

Energy storage capacity is improving, which bolsters the case for renewables



Battery storage is getting cheaper. Performance is also rising.

Battery* cost and performance, 2008-17



SOURCE: US Department of Energy (DOE); Generation. *"Battery" refers to full battery.

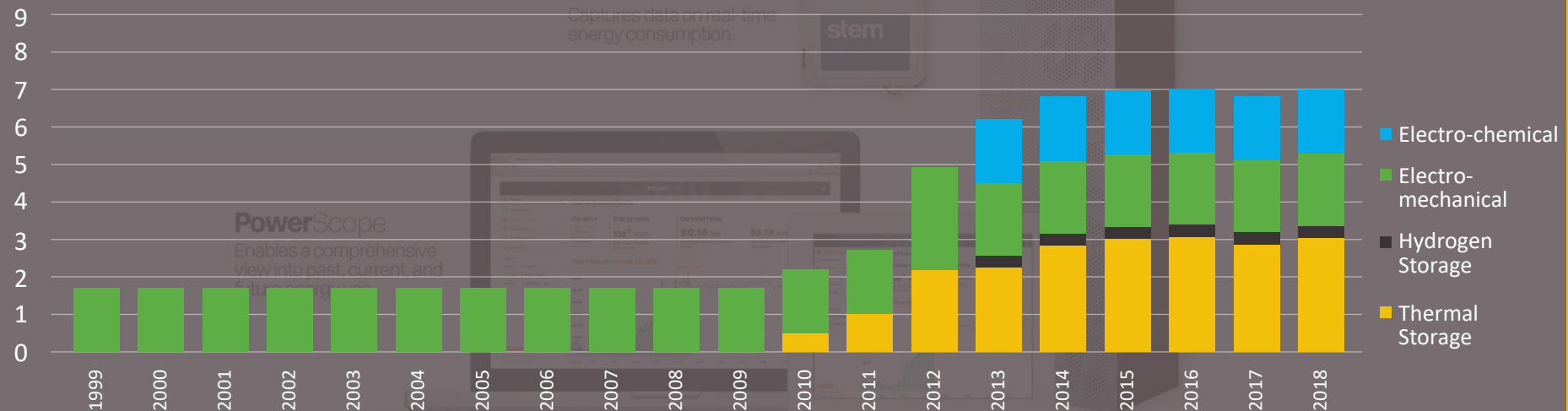
Energy storage capacity is improving, which bolsters the case for renewables



Storage capacity for all renewables is rising, meaning that renewables are a more viable source of energy supply over the long term

Global project installations over time

Rated power (GW)



SOURCE: US DOE; Generation

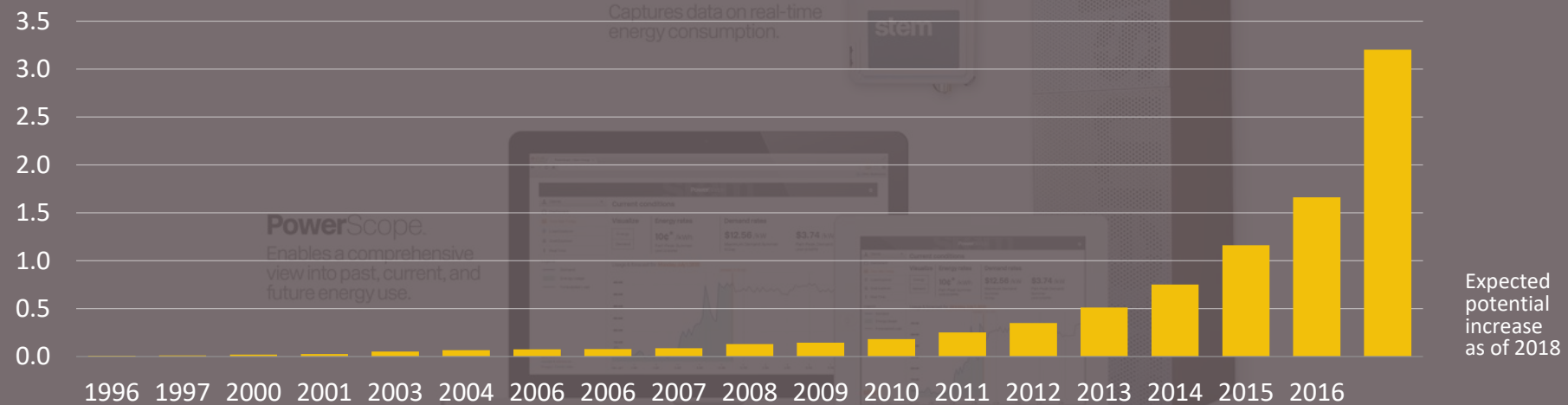
Energy storage capacity is improving, which bolsters the case for renewables



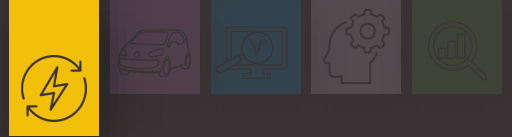
If all projects in the pipeline are completed, global electro-chemical energy storage is set to double

Global electro-chemical storage capacity, 1996-2018

Rated power, GW



SOURCE: US DOE; Generation

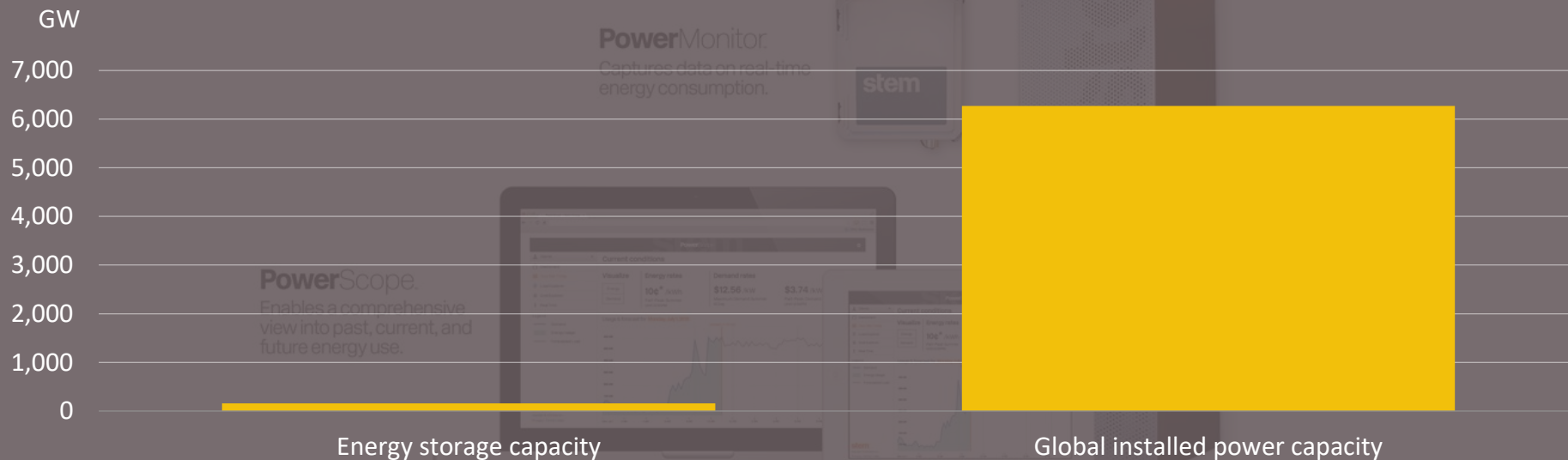


Energy storage capacity is improving, which bolsters the case for renewables



But storage still covers only 3% of global electricity generation capacity

Estimate of global electricity generation capacity, relative to total storage capacity, 2017



SOURCE: US EIA; US DOE; Generation

Innovations to reduce energy demand are proliferating

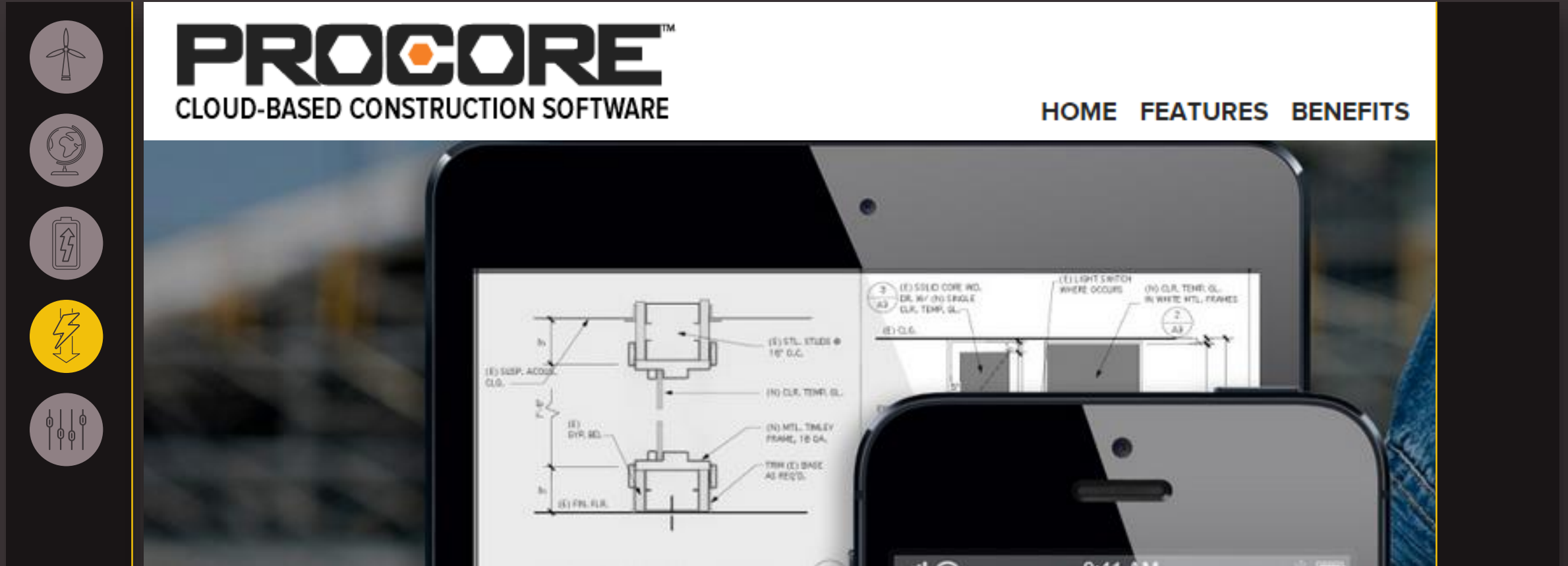


IMAGE: Procore

Construction software tools are enabling project teams to work together more efficiently, reducing waste and increasing productivity

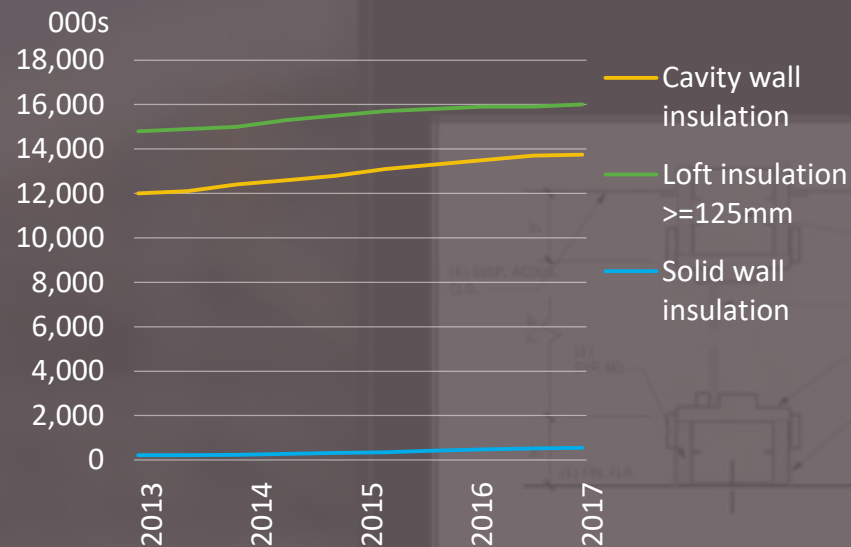
Innovations to reduce energy demand are proliferating



Households have become more efficient users of energy

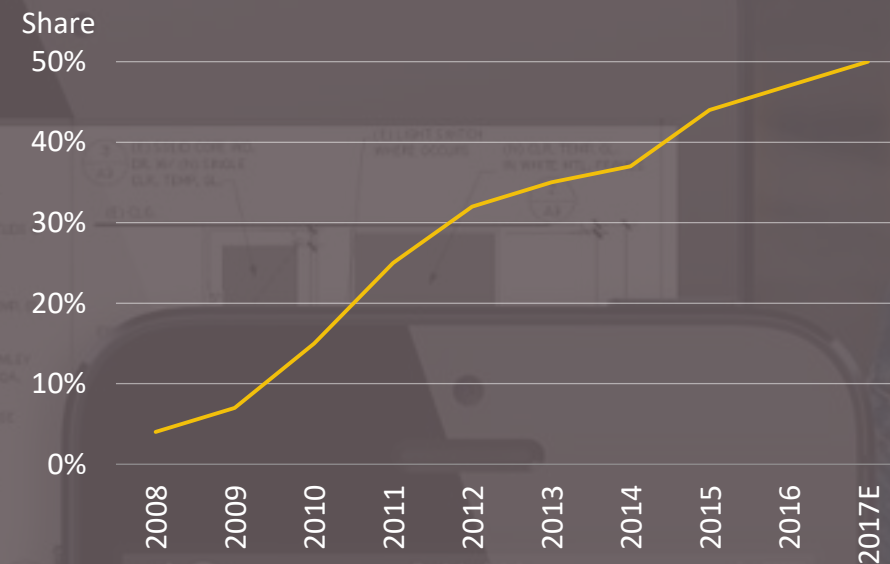
PROCORE™
CLOUD-BASED CONSTRUCTION SOFTWARE

Insulated homes in Great Britain, March 2013 to December 2017, cumulative totals



HOME FEATURES BENEFITS

Share of US households using smart meters



SOURCE: Department for Business, Energy and Industrial Strategy; Ministry of Housing, Communities and Local Government; BNEF; US EIA

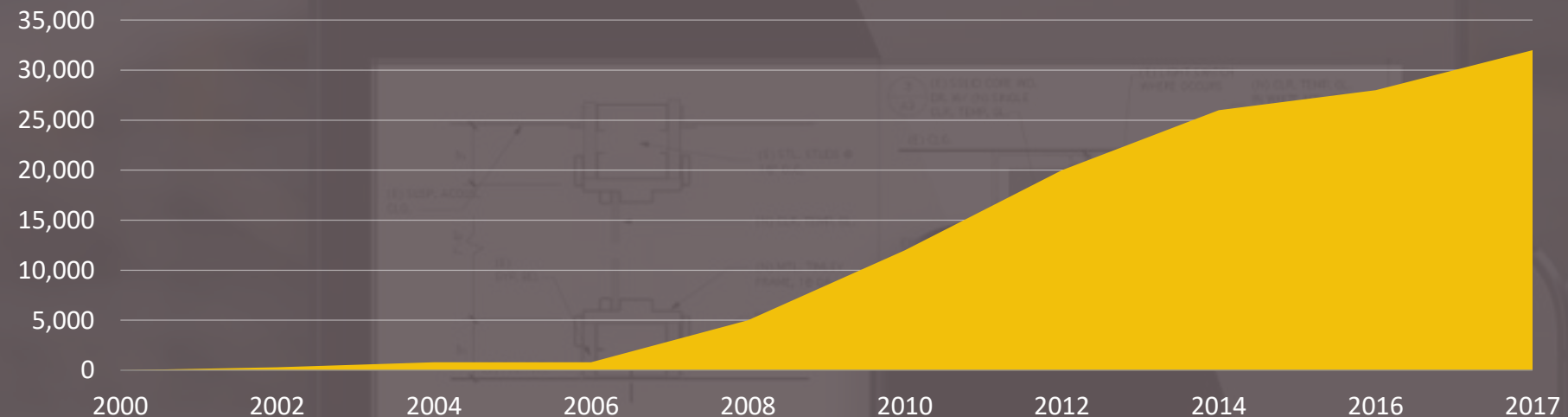
Innovations to reduce energy demand are proliferating



Commercial buildings are also becoming more energy-efficient

More than 32,000 commercial buildings in the US have earned EPA's Energy Star since 1999

No of buildings



SOURCE: US Environmental Protection Agency; US EIA

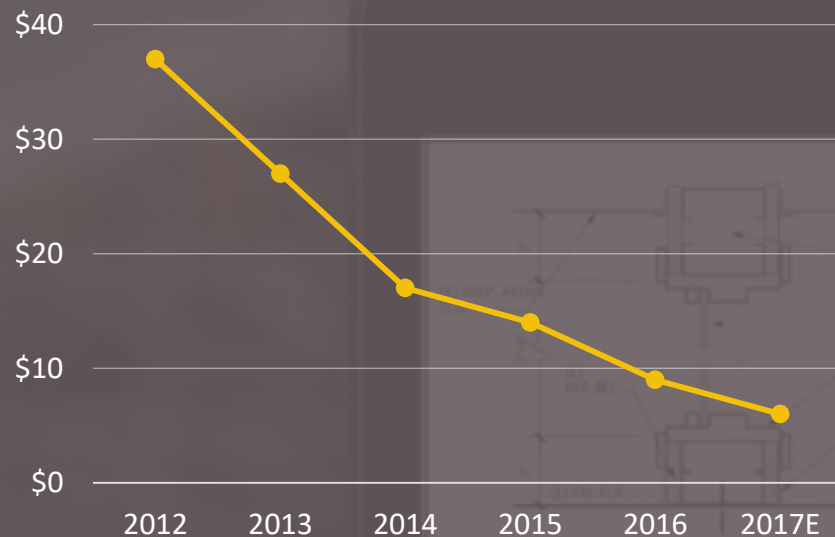
Innovations to reduce energy demand are proliferating



LEDs are becoming cheaper and performing better

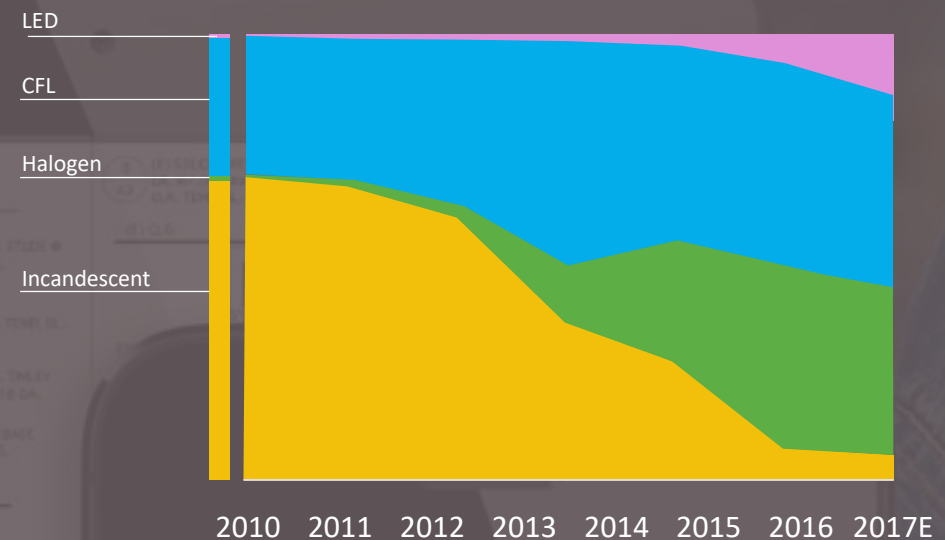
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A-type LED price, \$/klm



HOME FEATURES BENEFITS

US A-Type lighting installed stock, by mode



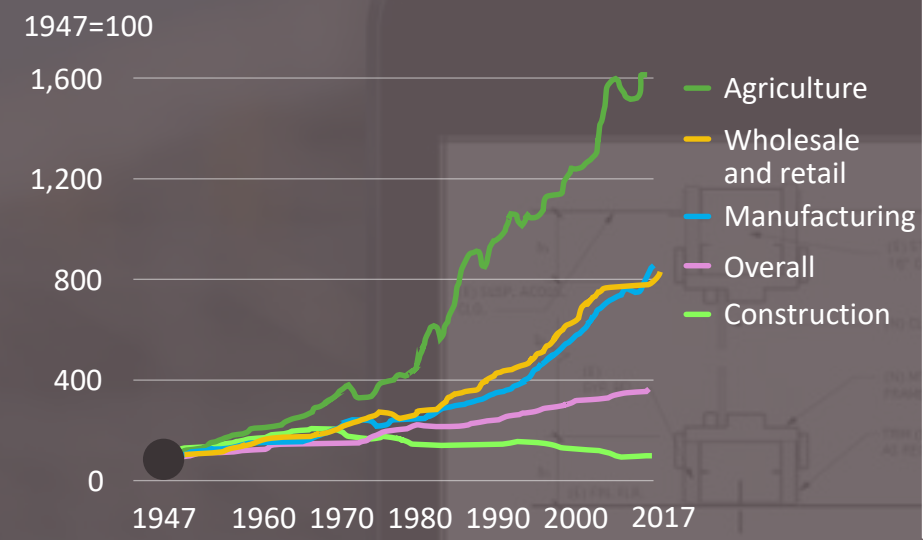
SOURCE: US DOE; Generation. An LED light-bulb is a solid-state lighting device that fits in standard screw-in connections but uses light-emitting diodes to produce light. LED bulbs are more environmentally friendly than incandescent bulbs.

Innovations to reduce energy demand are proliferating

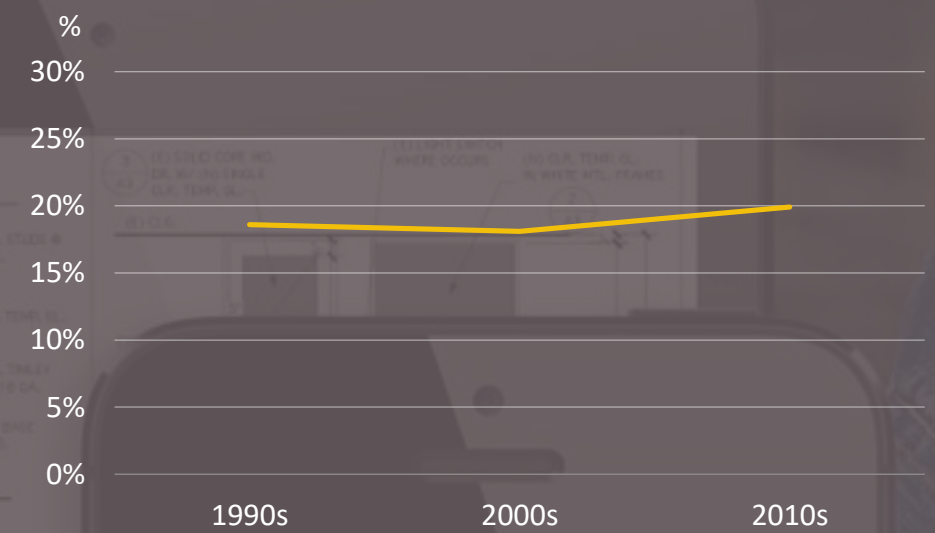


But improvements are not ubiquitous: poor productivity growth in construction has hindered its ability to reduce emissions

Productivity, by sector



Emissions from construction industry* as a share of total global emissions



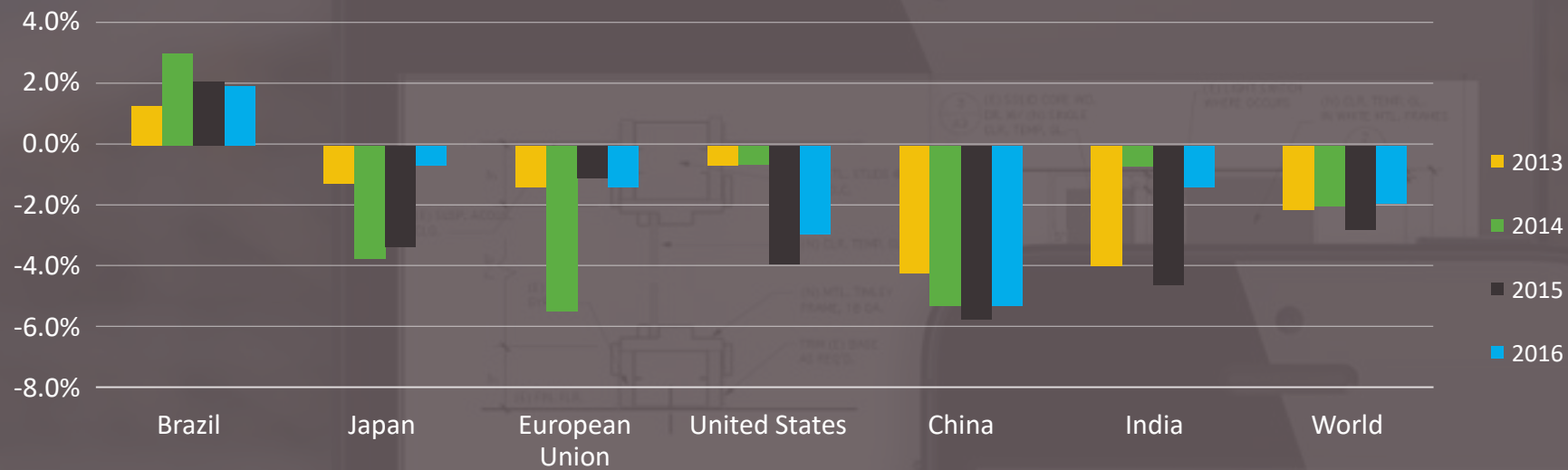
SOURCE: McKinsey Global Institute; World Bank; Generation
 * includes manufacturing

Innovations to reduce energy demand are proliferating



While across the whole economy, improvements in energy intensity are clear...

Change in primary energy intensity, per year



SOURCE: IEA. Energy intensity is calculated as primary energy demand per \$1,000 of GDP

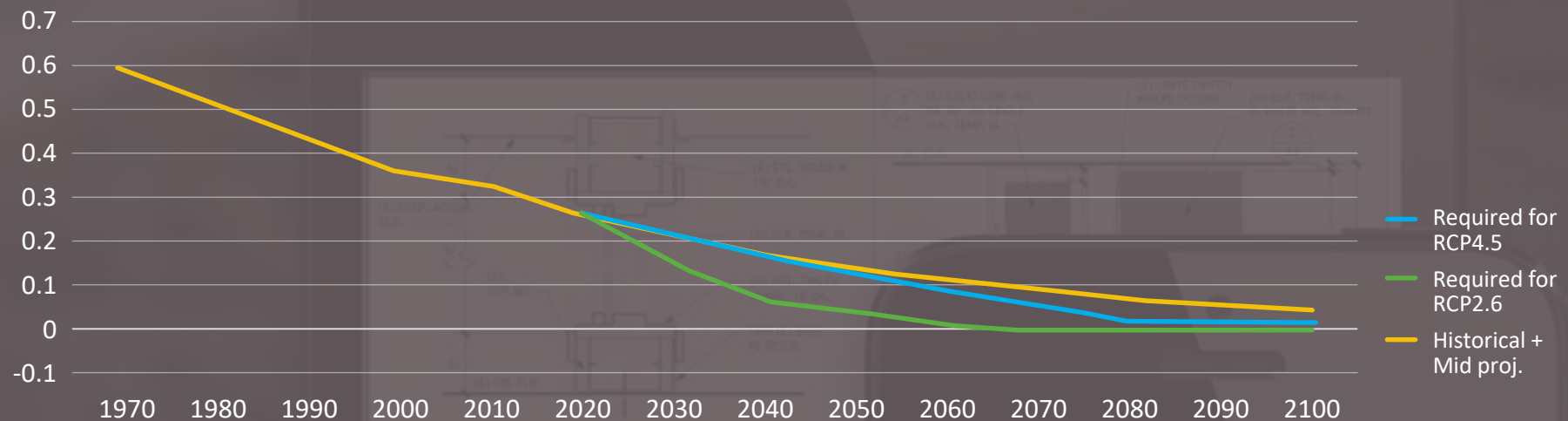
Innovations to reduce energy demand are proliferating



... Greater improvements yet in energy intensity are needed to avoid substantial environmental damage

Required CO2 intensity of GDP to meet certain planetary targets

CO2 Intensity of GDP (Kg. CO2/\$ GDP), with actual and hypothetical annual reductions (%)



SOURCE: UN Population Division (2017 revision); World Bank historical GDP/Capita PPP at constant 2011 int'l \$; BP Statistical Review of World Energy 2017, EIA International Energy Outlook 2017, PWC Low Carbon Index 2017. Note: RCP2.6 would keep the world <2 degrees above pre-industrial levels, RCP4.5 might do so

Improved regulatory systems are driving a more sustainable energy mix



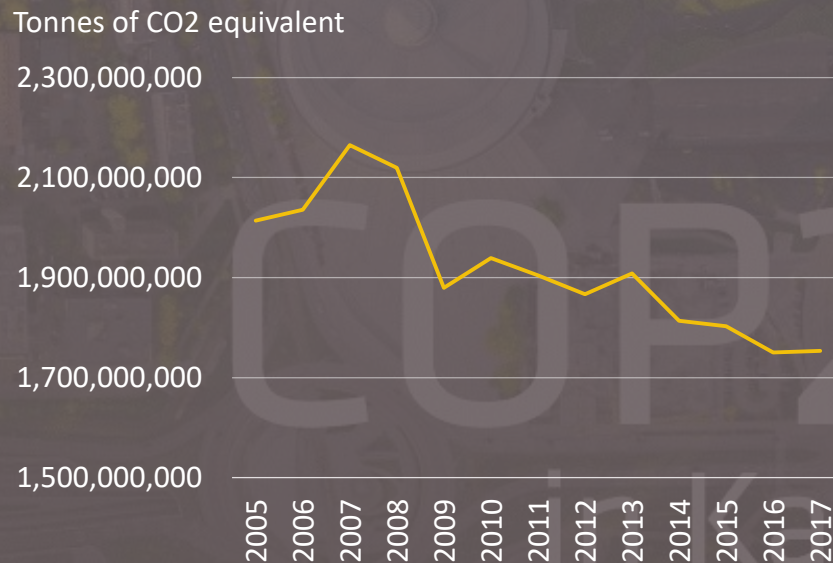
IMAGE: COP24 in Poland
2018 convenings and policy interventions will seek to build on the momentum from the Paris Agreement in 2015

Improved regulatory systems are driving a more sustainable energy mix

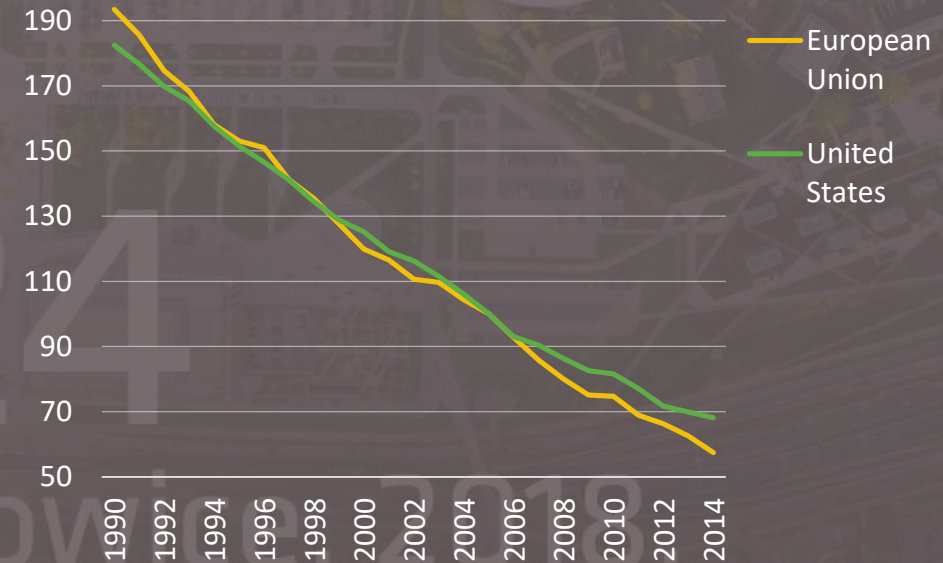


Supranational schemes appear to have controlled emissions. Following the introduction of the EU's cap-and-trade in 2005, the EU has reduced its carbon-intensity faster than the US

Emissions under EU's cap and trade carbon-pricing scheme



Carbon intensity per unit of GDP, 2005 = 100*



SOURCE: European Environment Agency; World Bank; Generation

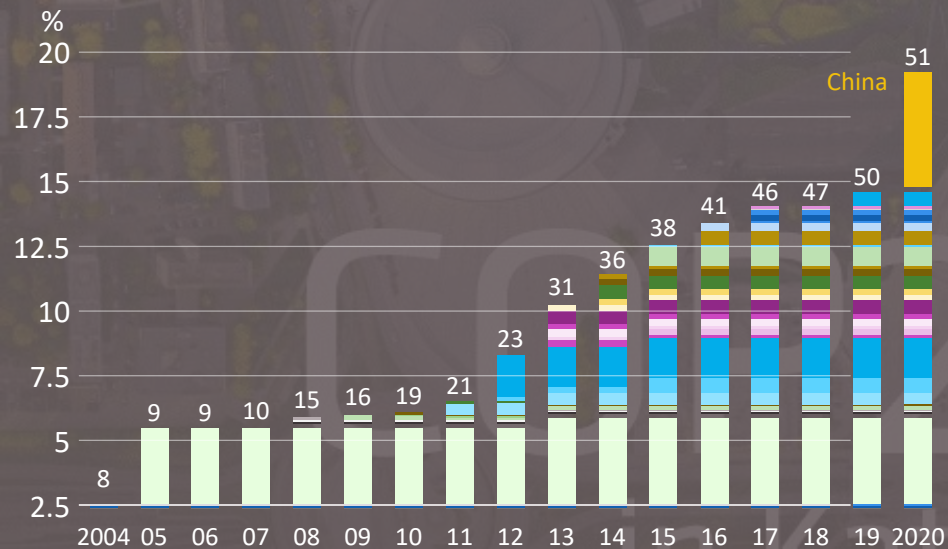
*The EU emissions-trading system had a slow start out of the gate, but has been reformed recently and is now driving greater reductions. The rate at which carbon intensity fell in the European Union increased after it introduced its cap-and-trade scheme. After 2005 the pace of reduction in America remained the same. In August 2018 the price of carbon credits in the EU hit the highest level in a decade, which should start to encourage switching to cleaner fuels.

Improved regulatory systems are driving a more sustainable energy mix

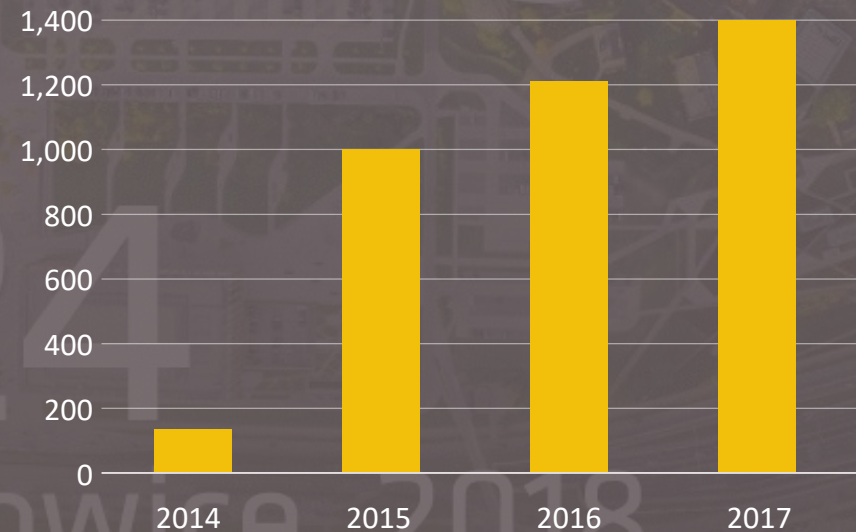


Carbon pricing is becoming more popular and effective

Share of global greenhouse emissions covered by carbon-pricing initiatives, 2004-20, % (and number of initiatives)



Number of global companies factoring an internal carbon price into their business plans



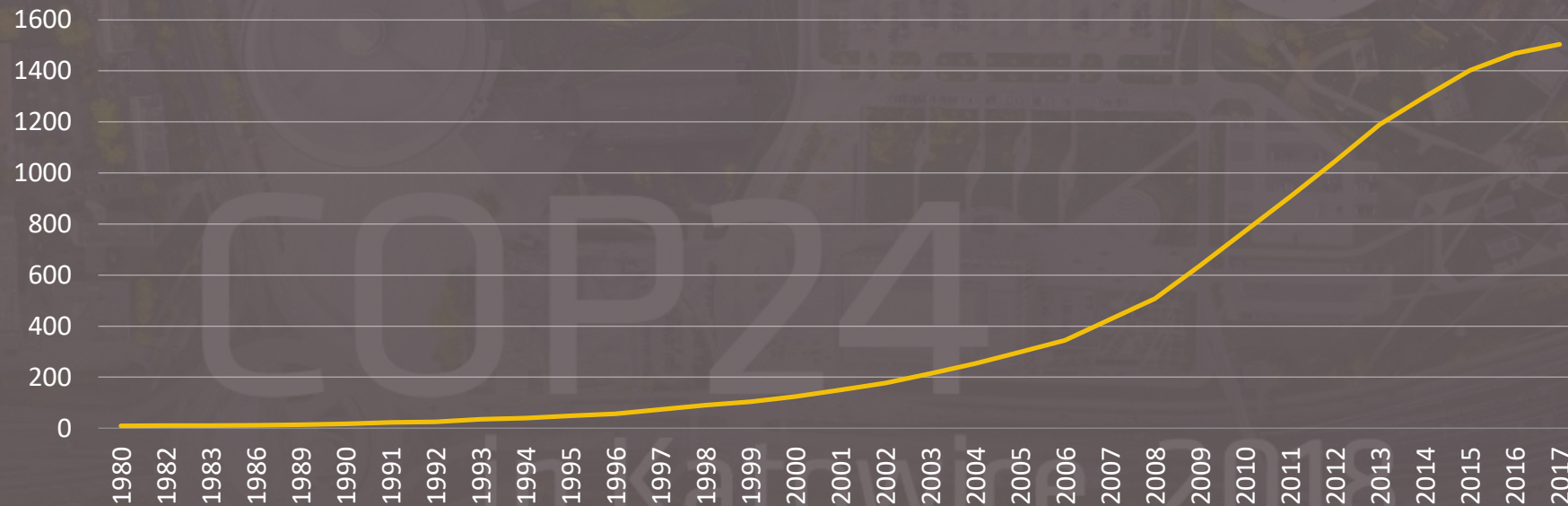
SOURCE: World Bank; CDP; UNPRI; Global Counsel

Improved regulatory systems are driving a more sustainable energy mix



Actions by national governments are trying to push behaviour in a more sustainable direction

Cumulative number of climate-change related laws introduced, global, 1963-2017



SOURCE: Climate Change Laws of the World; Generation

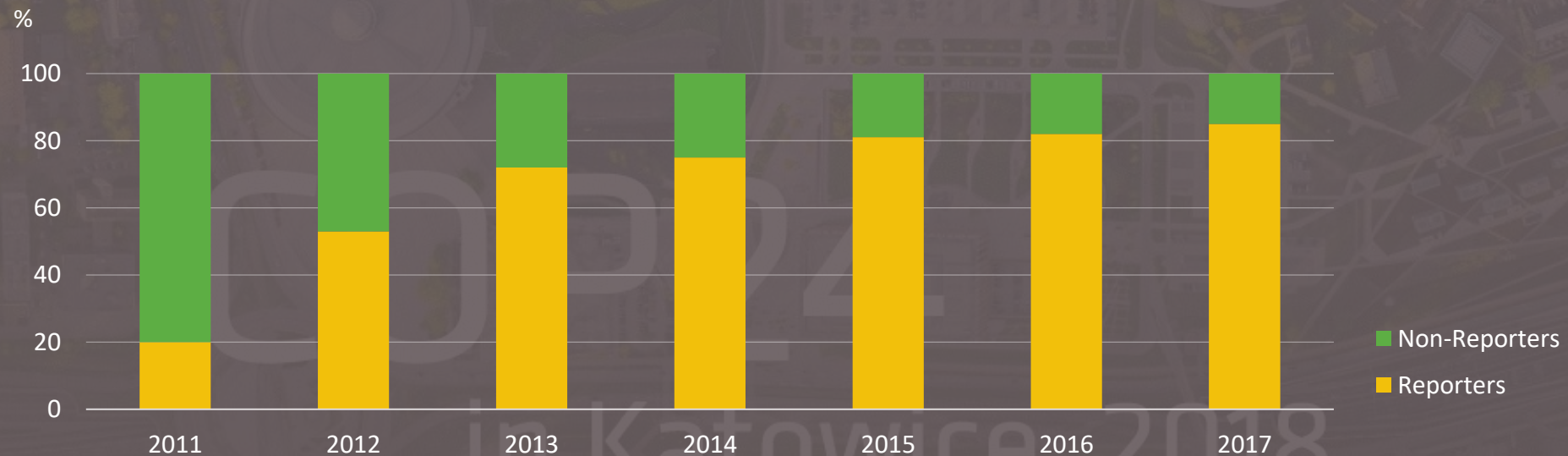
NOTE: Figures for 2016 and 2017 may be artificially low because of delays in reporting. In a related move, California recently passed legislation to shift the state to 100% carbon-free electricity by 2045

Improved regulatory systems are driving a more sustainable energy mix



More big firms are reporting sustainability metrics

S&P 500 companies' sustainability reporting



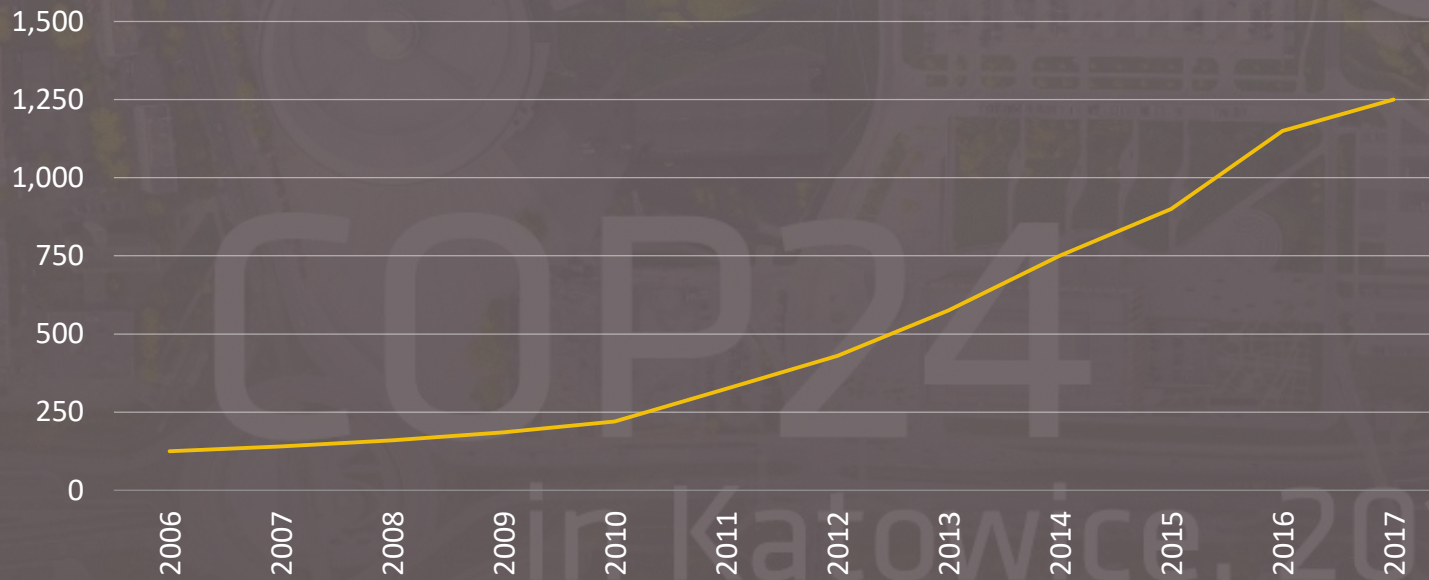
SOURCE: Governance & Accountability Institute

Improved regulatory systems are driving a more sustainable energy mix



More and more firms are incorporating as B-corporations*

Growth of US certified B corps (initial year certified)



SOURCE: B Lab; Generation.

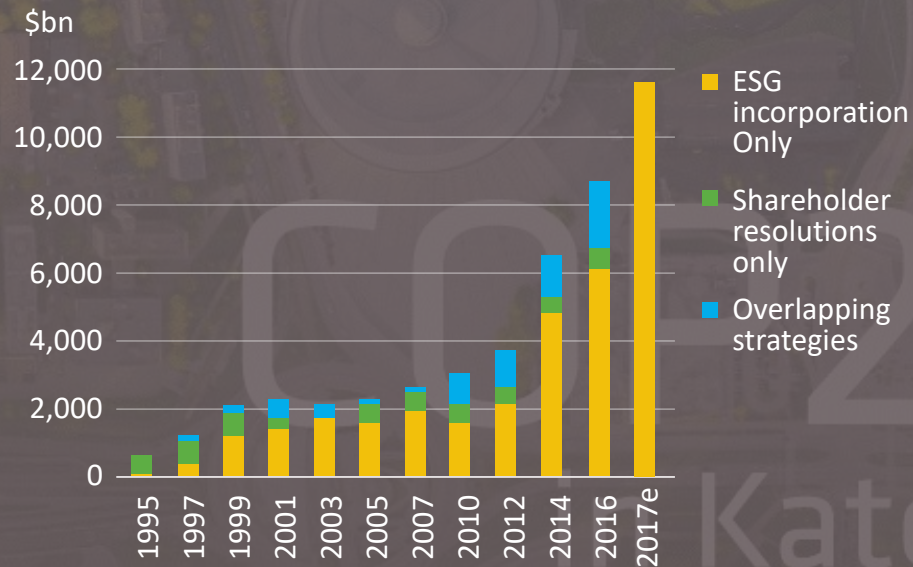
* B Corps are for-profit companies certified by the nonprofit B Lab to meet rigorous standards of social and environmental performance, accountability, and transparency

Improved regulatory systems are driving a more sustainable energy mix

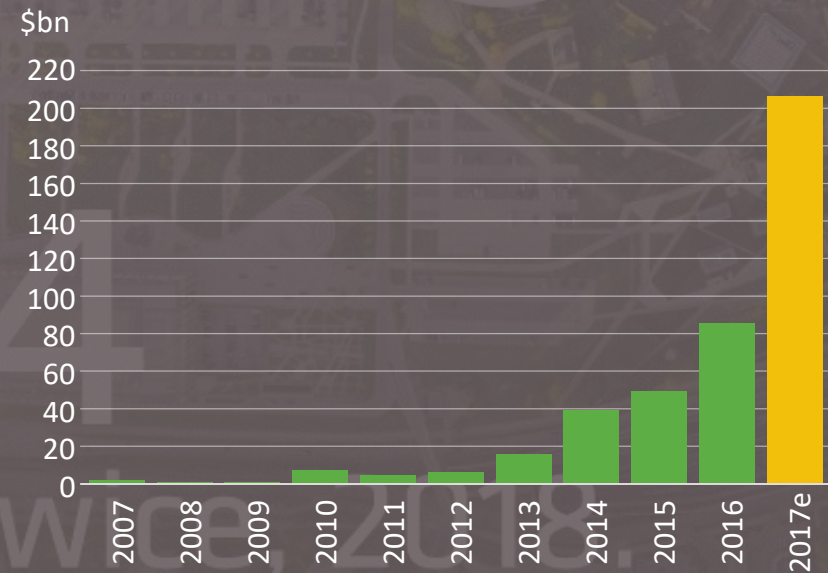


Sustainable investing appears to be increasing

Assets under sustainable-investment management have increased significantly



The global market for green bonds is gaining momentum



SOURCE: US SIF Foundation; BNEF; Moody's; Generation

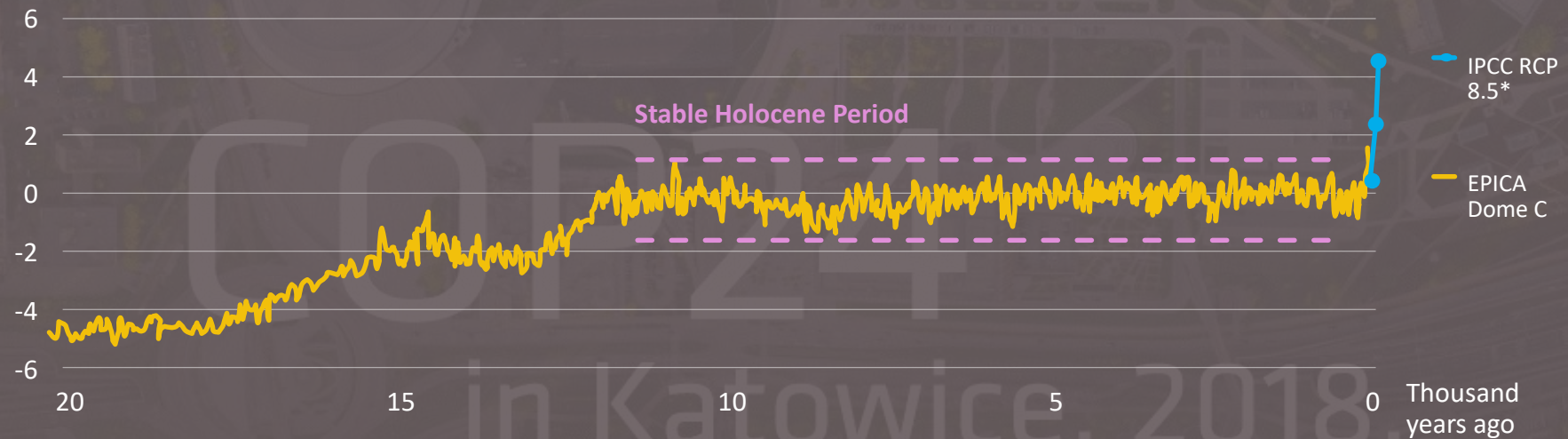
Improved regulatory systems are driving a more sustainable energy mix



But still, this progress is not enough. The world continues to warm rapidly

Global temperature variation over last 20,000 years

Degrees centigrade vs 1960-1990 average



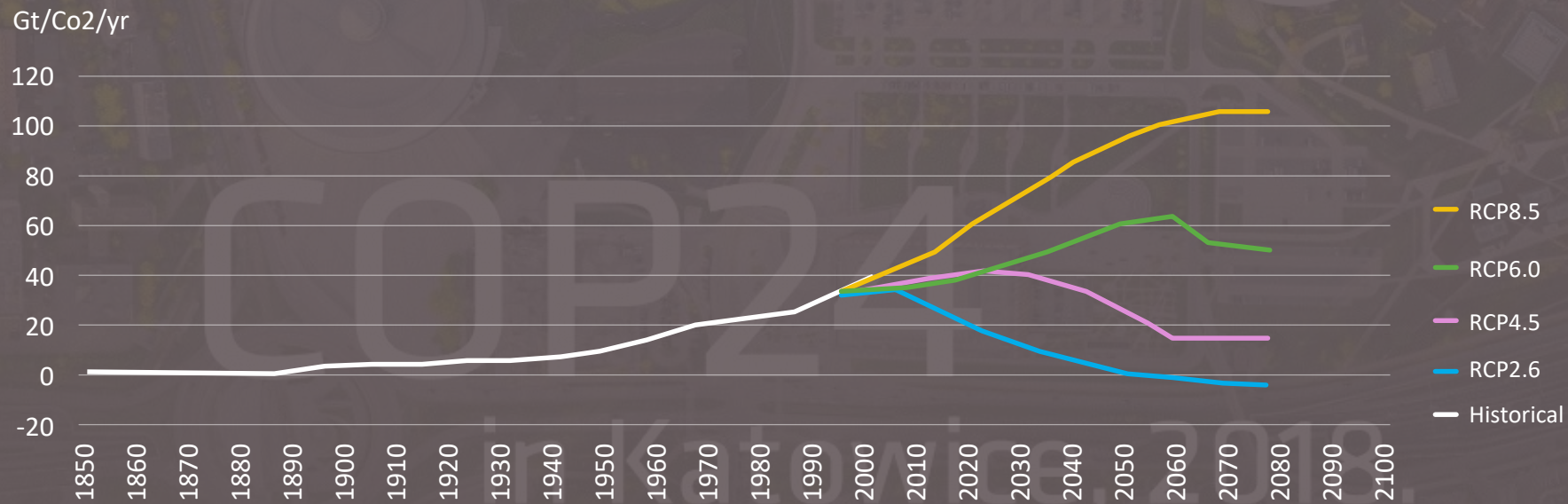
SOURCE: EPICA Dome C; Marcott et al 2013; IPCC RCP 8.5; Generation *IPCC RCP 8.5 represents likely temperature increase if current emissions trends continue.

Improved regulatory systems are driving a more sustainable energy mix



Of the four representative pathways for greenhouse-gas emissions, only the lowest gives a >50% chance to remain below 2°C in this century*

CO2 emissions from fossil fuels & industry



SOURCE: IPCC 5th Assessment Report; RCP Database; Carbon Brief; Generation. *Specifically, two degrees below pre-industrial levels.

Trends we continue to track



The integration of wind and solar with batteries as economically competitive options



Increased use of energy auctions that continue to drive down prices for solar and wind



Emergence of offshore wind, especially in Europe and Asia



The industrial “internet of things” that will drive efficiency improvements and accelerate demand destruction



Upholding of Paris commitments

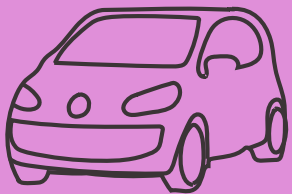


The effectiveness of carbon pricing over time



And others...

COP24
in Katowice, 2018.



Urban
mobility

Section summary

The urban landscape is changing. Consumers and businesses are rapidly embracing new, cleaner types of transportation. City governments are responding, making it easier for people to make sustainable decisions. Provision of public transport has come under intense pressure with the rise of ride-hailing apps. But modes of transport such as cycling and walking are slowly becoming more popular.

Progress is faster in some parts of the world than in others. But slowly, many cities are becoming safer, more pleasant places to be.



Sustainable urban mobility
is characterised by:



Zero-emissions
travel



Integrated
transportation
which optimises for
efficiency



Autonomy
to facilitate
positive societal
externalities



Healthy and
safe cities



Variety in and
access to transport
options

Electrification of vehicles is proceeding rapidly

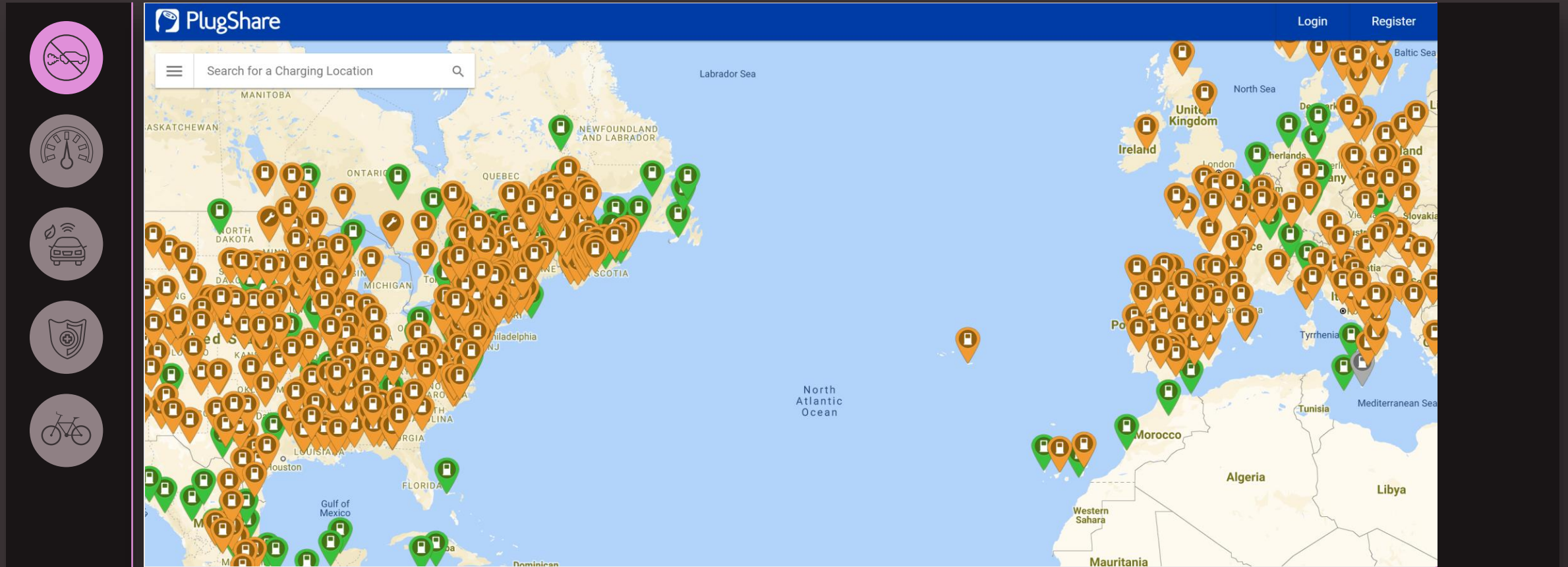


IMAGE: PlugShare as at 20/09/2018

Innovation in transportation means that electricity-powered modes of mobility, accompanied by smart charging solutions, are becoming increasingly common



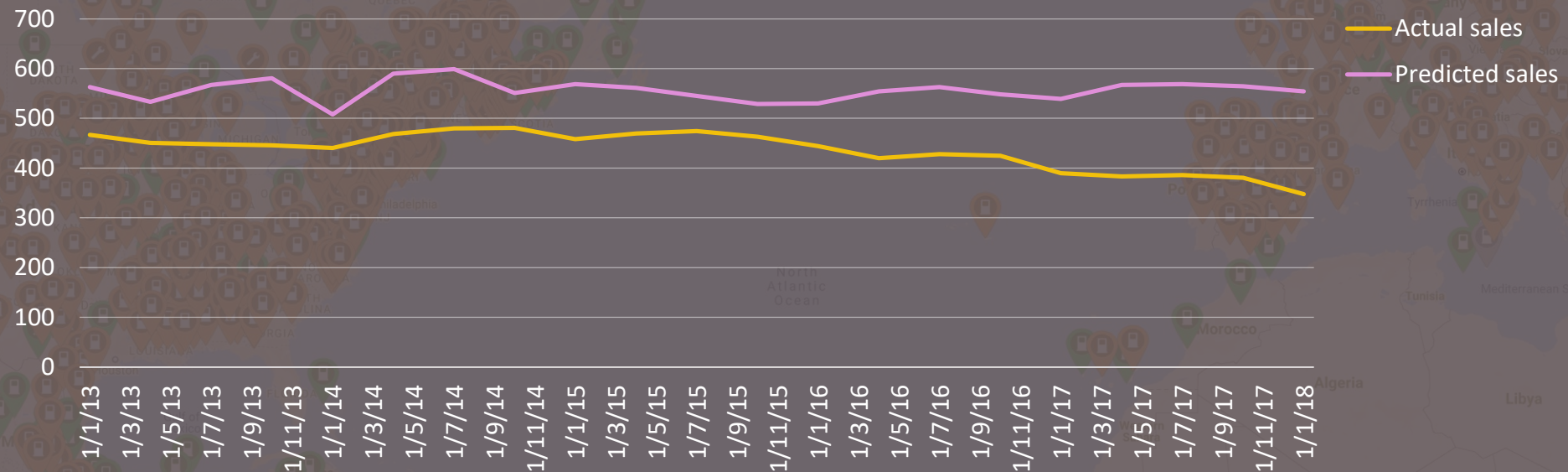
Electrification of vehicles is proceeding rapidly



PlugShare

Based on past statistical relationships, Americans “should” be buying over 500,000 cars a month. In fact they are buying about 350,000.

Domestic car sales per month, America, quarterly average '000:



SOURCE: Generation Investment analysis of Federal Reserve Bank of St Louis (FRED) data. Predicted sales are based on historical relationship between GDP growth and number of domestic auto retail sales.



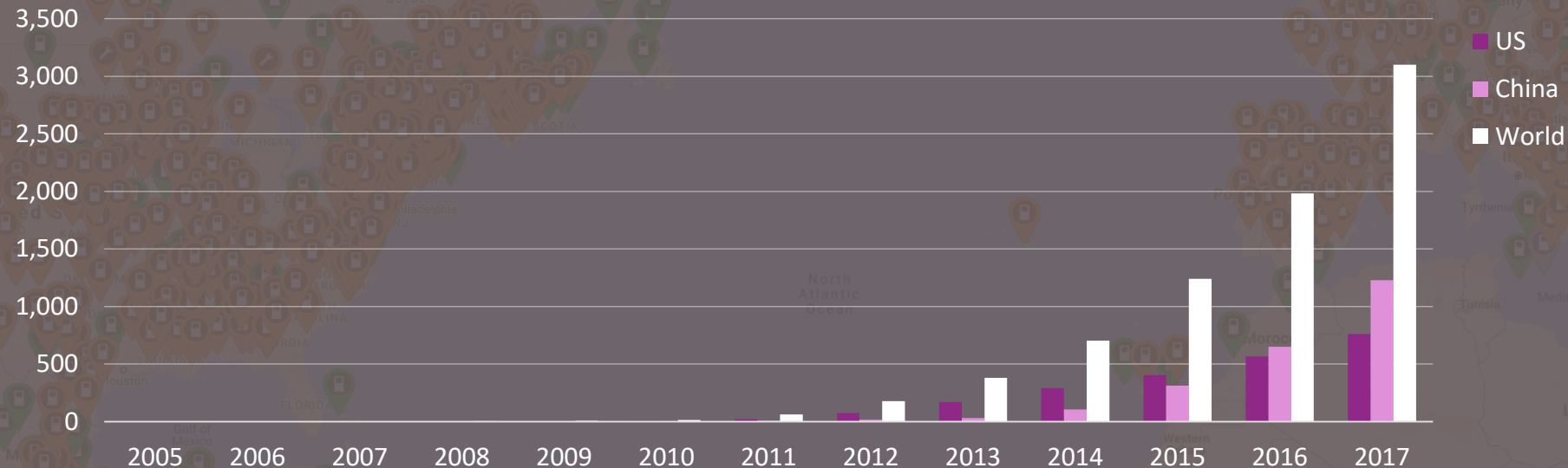
Electrification of vehicles is proceeding rapidly



PlugShare

And of those cars that are being sold, sales of electric cars are increasing rapidly: as of 2018 there are likely to be around 4m EVs on the road

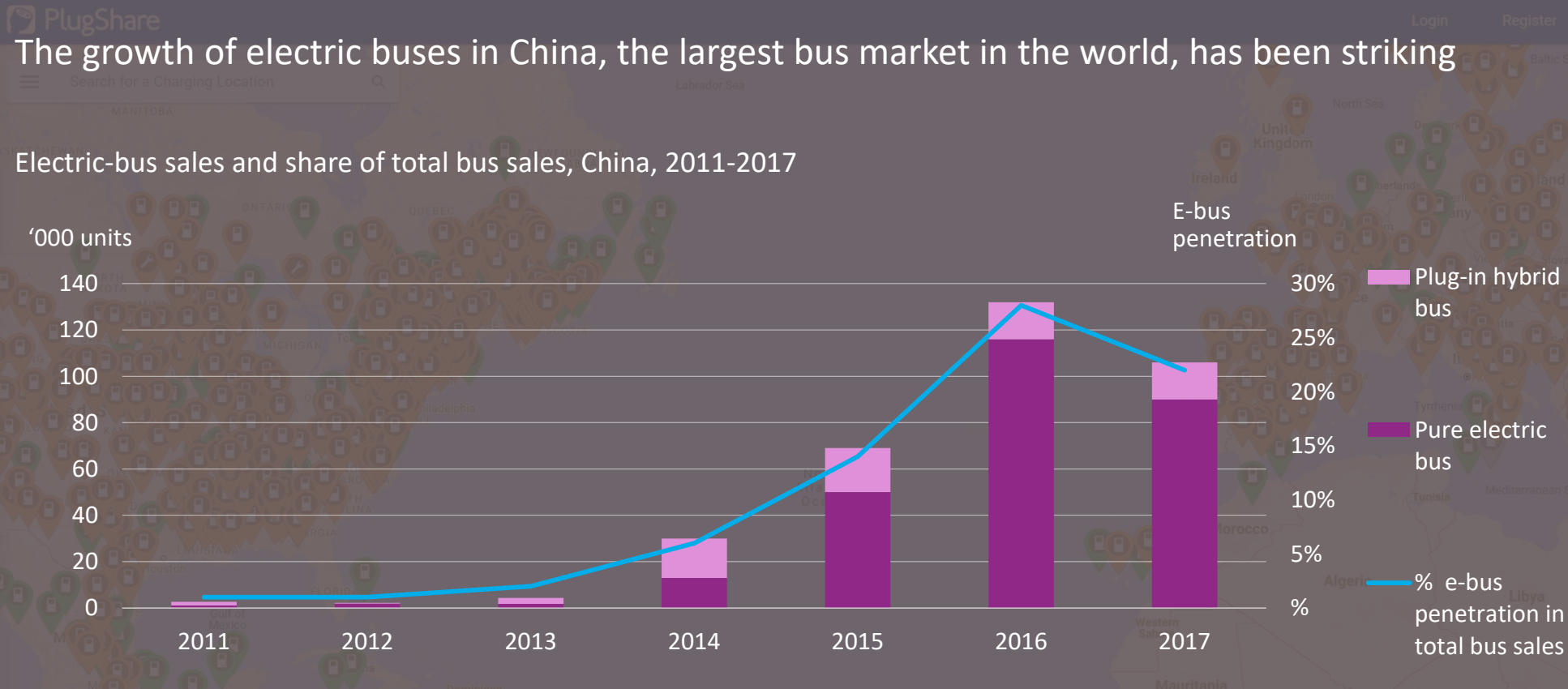
Electric car stock, global, thousands



SOURCE: IEA; BNEF. Electric vehicles include both Battery Electric Vehicles (BEVs) and Plug-in Hybrid Electric Vehicles (PHEVs). BEVs account for the majority of electric car sales. 40% of the world's electric cars are in China.

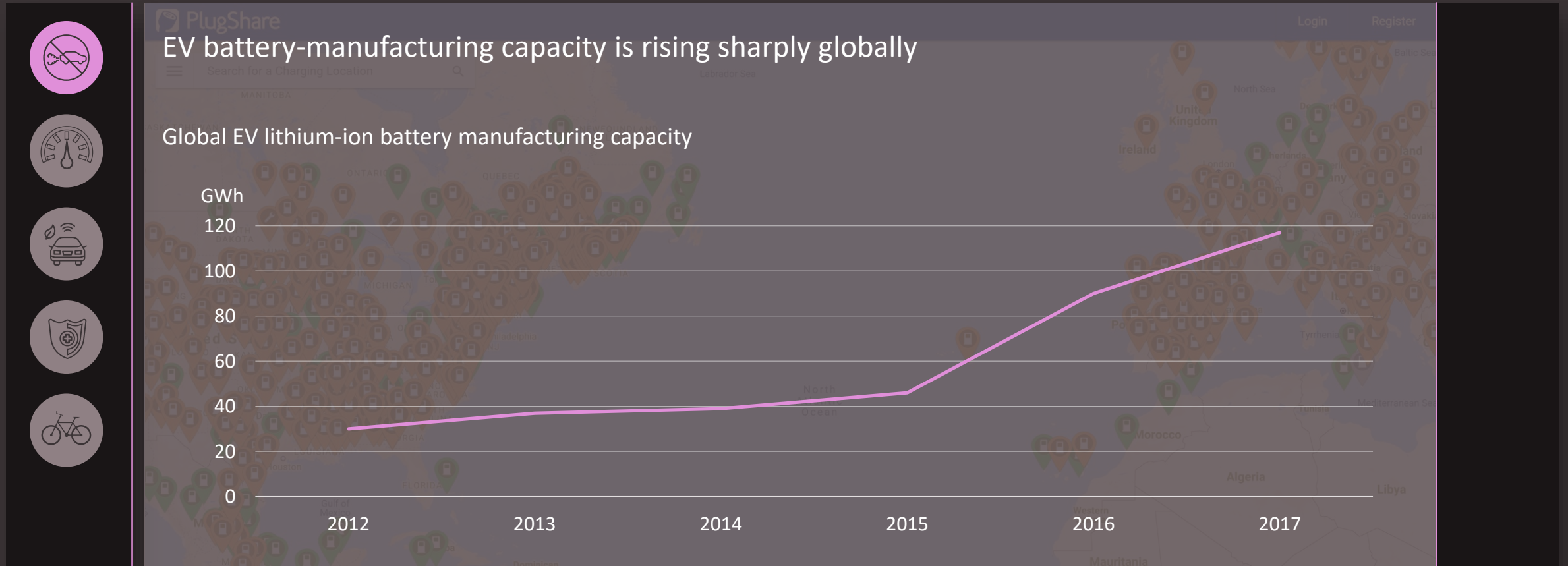


Electrification of vehicles is proceeding rapidly



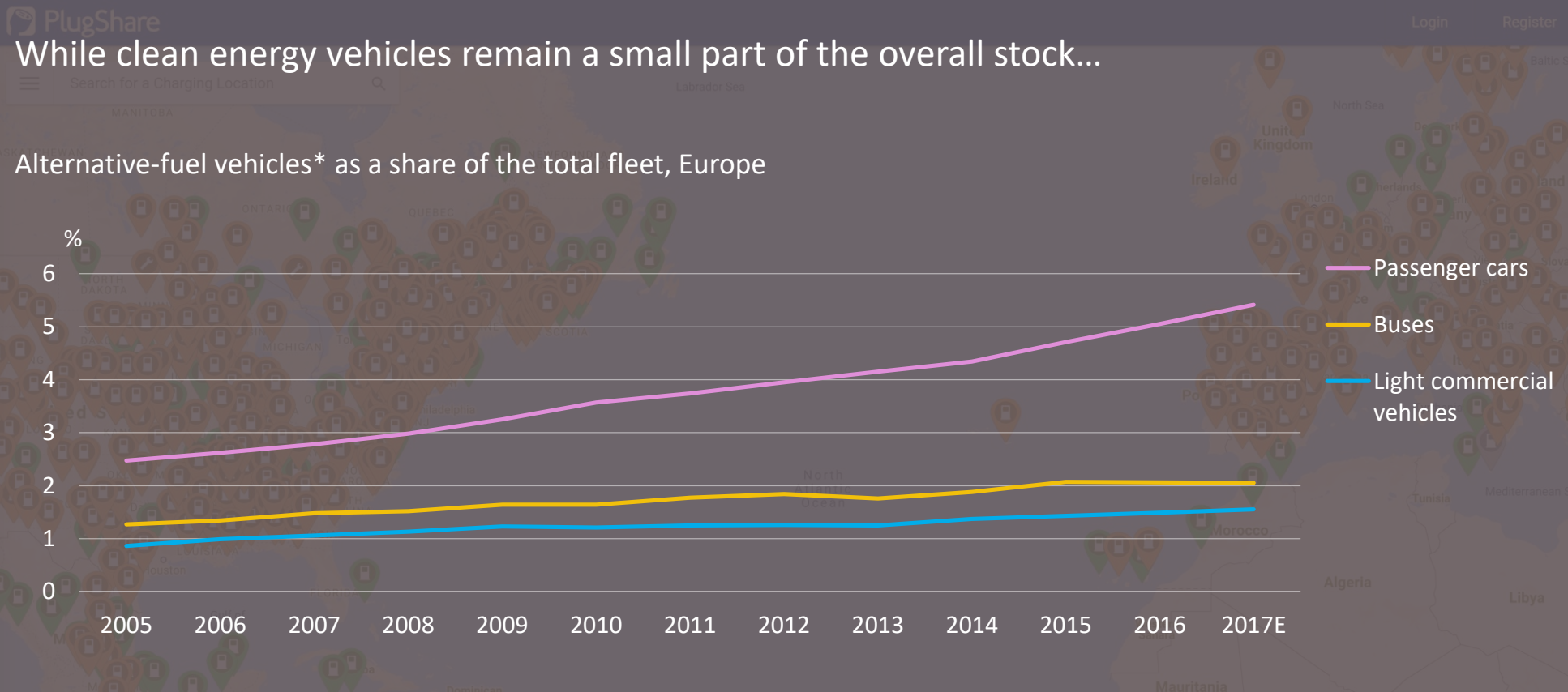
SOURCE: BNEF; OFweek

Electrification of vehicles is proceeding rapidly



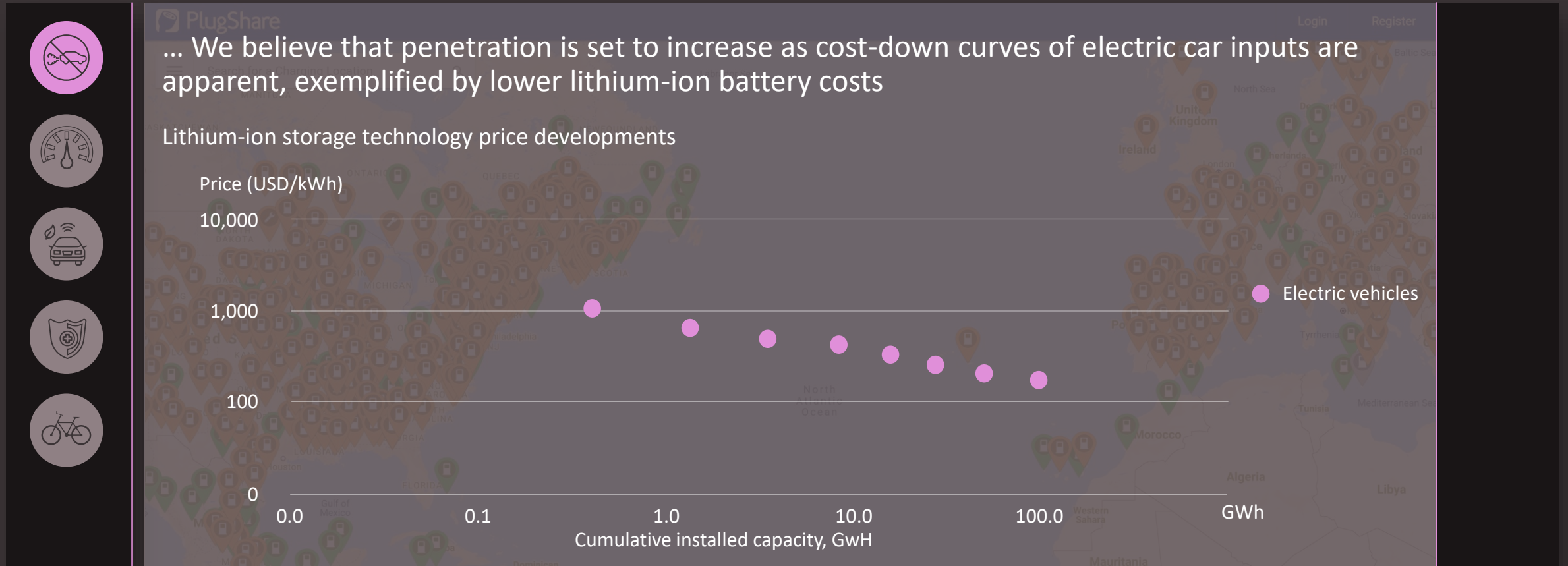
SOURCE: BNEF

Electrification of vehicles is proceeding rapidly



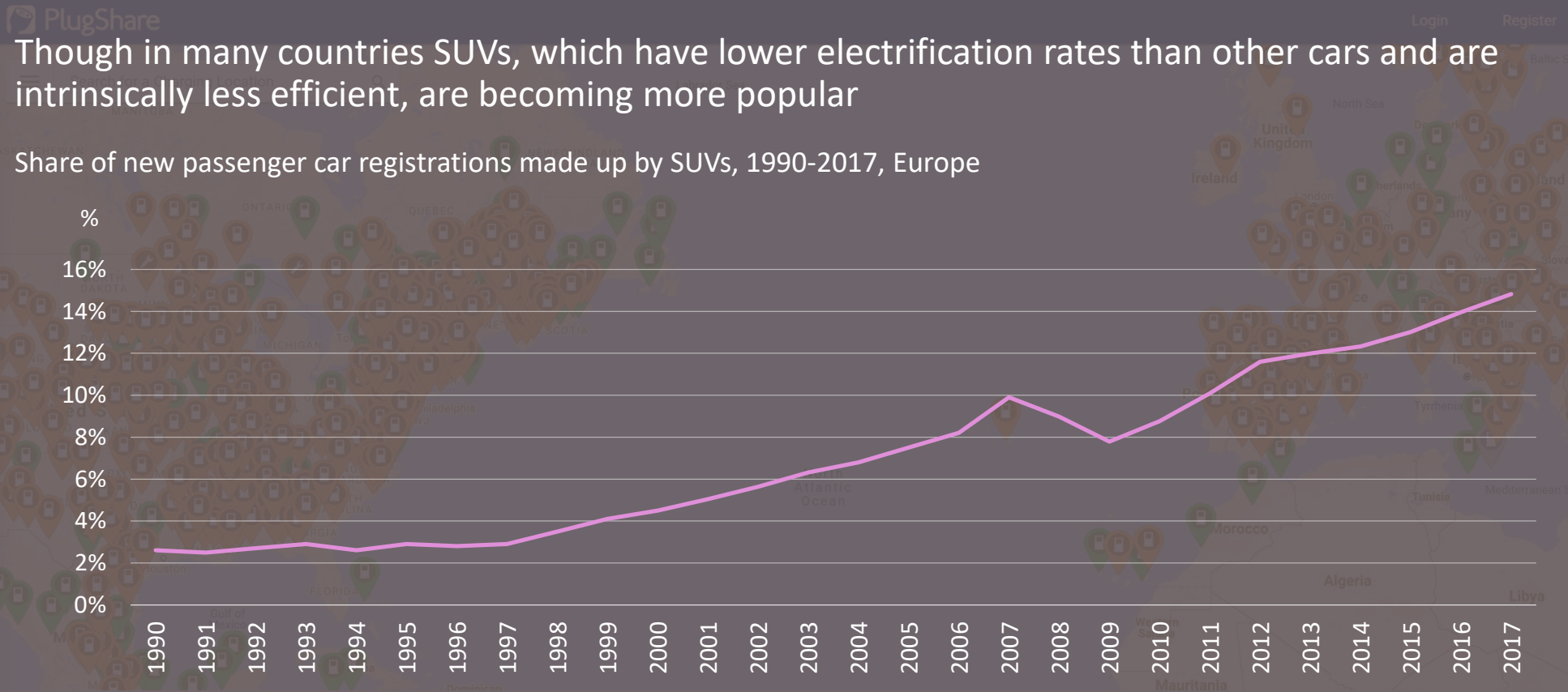
SOURCE: European Environment Agency; Generation. *Alternative fuel vehicles are those which do not run on petrol or diesel.

Electrification of vehicles is proceeding rapidly



SOURCE: Clean Energy Ministerial; Generation. Estimates based on research published in 2017. Please note: logarithmic scale

Electrification of vehicles is proceeding rapidly








SOURCE: European Automobile Manufacturers Association. This is also a global trend

Electrification of vehicles is proceeding rapidly

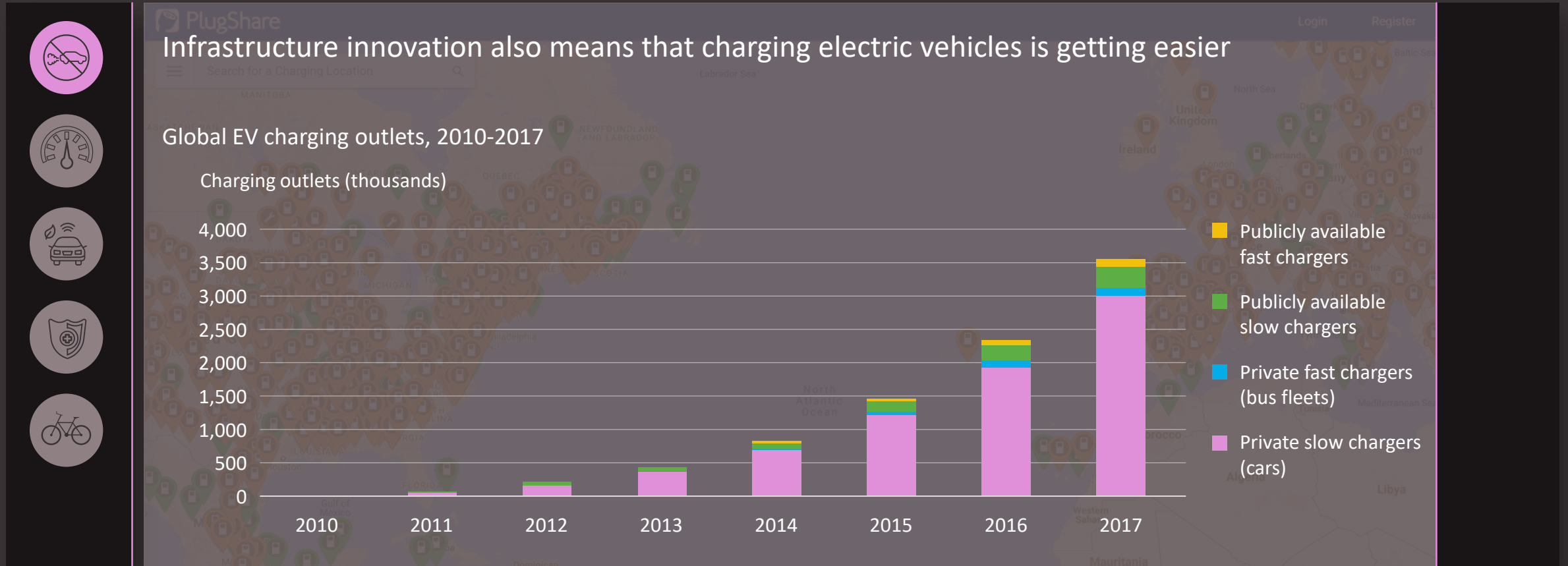


PlugShare
Search for a Charging Location

Regulation may further encourage consumers to move towards less-polluting vehicles

 <p>The British government has confirmed that it will end the sale of all new conventional petrol and diesel cars and vans by 2040</p>	 <p>The French government says that it wants to end sales of gas and diesel-powered vehicles by 2040</p>	 <p>The Indian government has said that every vehicle sold in the country should be powered by electricity by 2030</p>	 <p>In 2017 China announced that it plans to ban the production and sale of diesel and petrol cars and vans</p>	 <p>Norway's parliament has set a non-binding goal that by 2025 all cars sold should be zero emission</p>
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Electrification of vehicles is proceeding rapidly



SOURCE: IEA analysis based on EVI country submissions, complemented by Zheng (2018) and EAFO (2018)

Urban transport is undergoing radical change



Grab What it's like to Hitch
Simple. Affordable. Social

	TAXI	GrabHitch	Product X
Fares	\$16 Tampines to Raffles Place \$30 Jurong East to Changi	\$11 Tampines to Raffles Place \$15 Jurong East to Changi	10-30% MORE EXPENSIVE (even with pooling)
Journey	Your choice	Your choice	Subject to changes and detours along the way
Social	Be driven by a taxi driver	Ride along with a driver like you	Be driven by a commercial driver

IMAGE: Grab
Platforms providing integrated mobility solutions continue to emerge globally, with algorithms aiming to improve asset utilisation

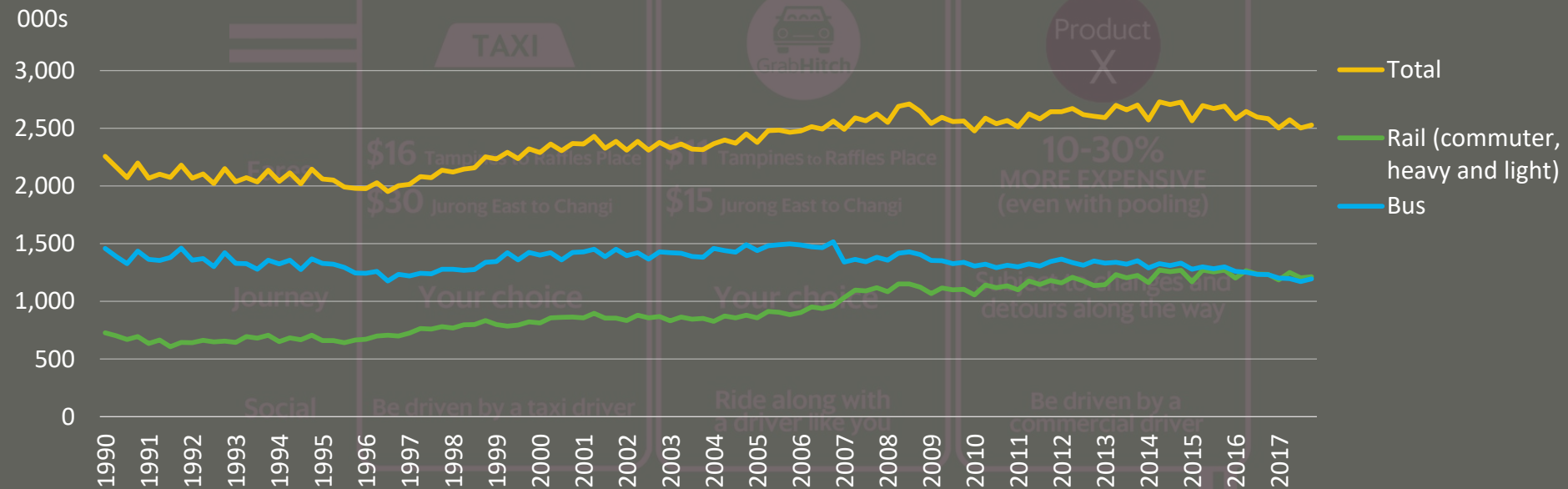


Urban transport is undergoing radical change



The number of annual public-transport rides per American has fallen by 10% since 2014. This may have negative consequences on public investment and hence universal access.

Number of trips made on public transport, 1990-2017, USA



SOURCE: American Public Transportation Association Quarterly Ridership Report; World Bank

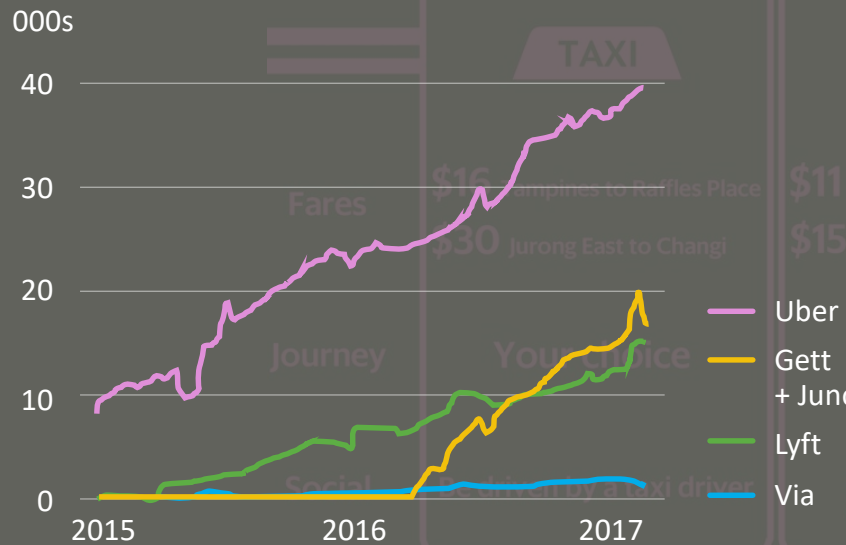


Urban transport is undergoing radical change

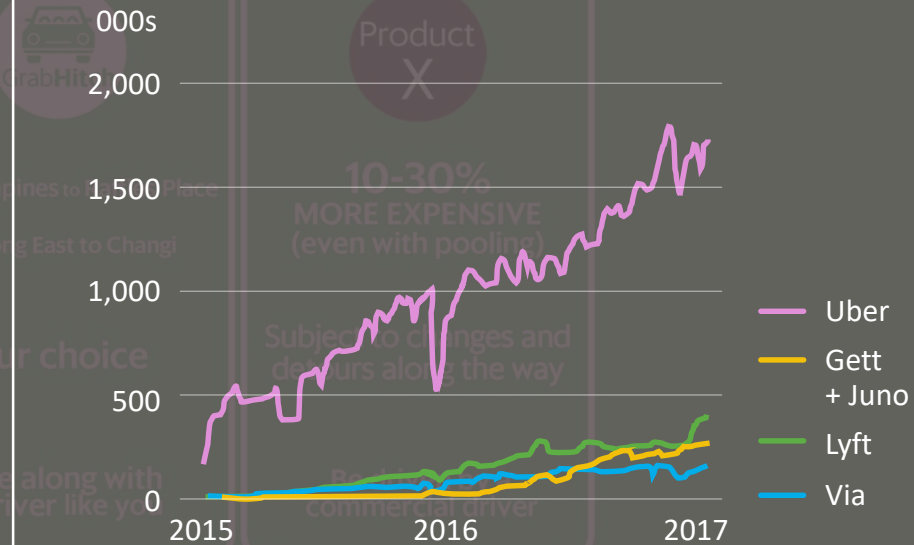


The decline in public transport is in large part to do with the rise of ride-hailing

Weekly unique dispatched vehicles in NYC



Weekly total dispatched trips in NYC



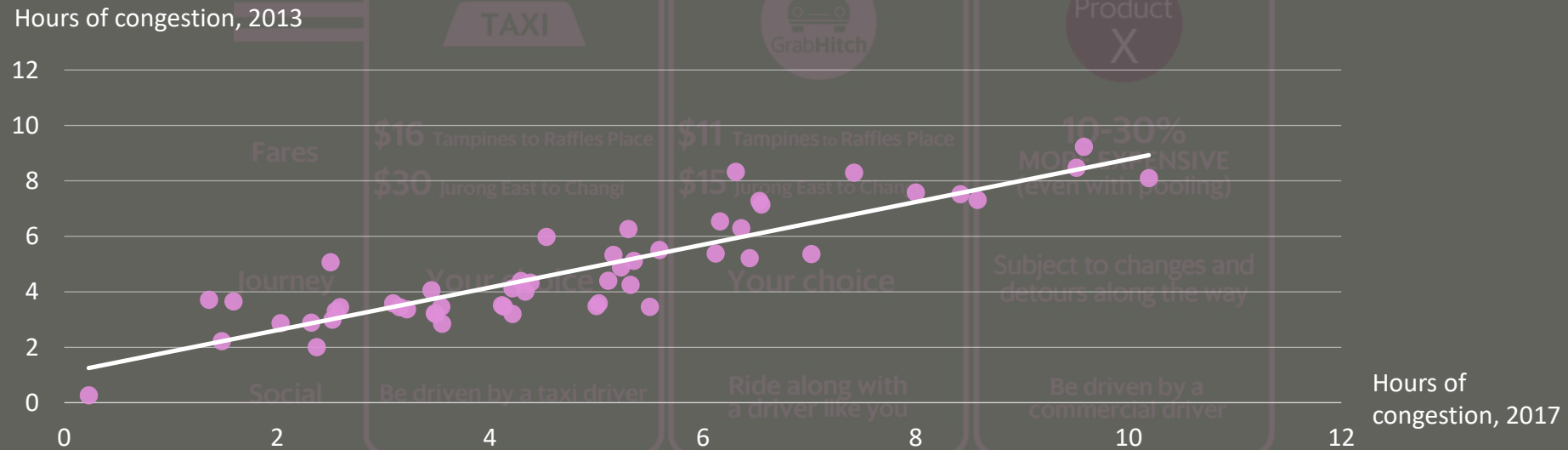
SOURCE: NYC Taxi & Limousine Commission; Barron's

Urban transport is undergoing radical change



Congestion in cities is not increasing everywhere, though ride-hailing services often increase the overall amount of traffic in urban areas.

Change in level of congestion, American urban areas, 2013-17 (below line = more congested)



SOURCE: Generation analysis of traffic statistics in 52 US metro areas, data from Texas A&M Transportation Institute and Generation estimates

* "Congested hours": estimate of average daily period of very low traffic. Each dot represents a single American metropolitan area.

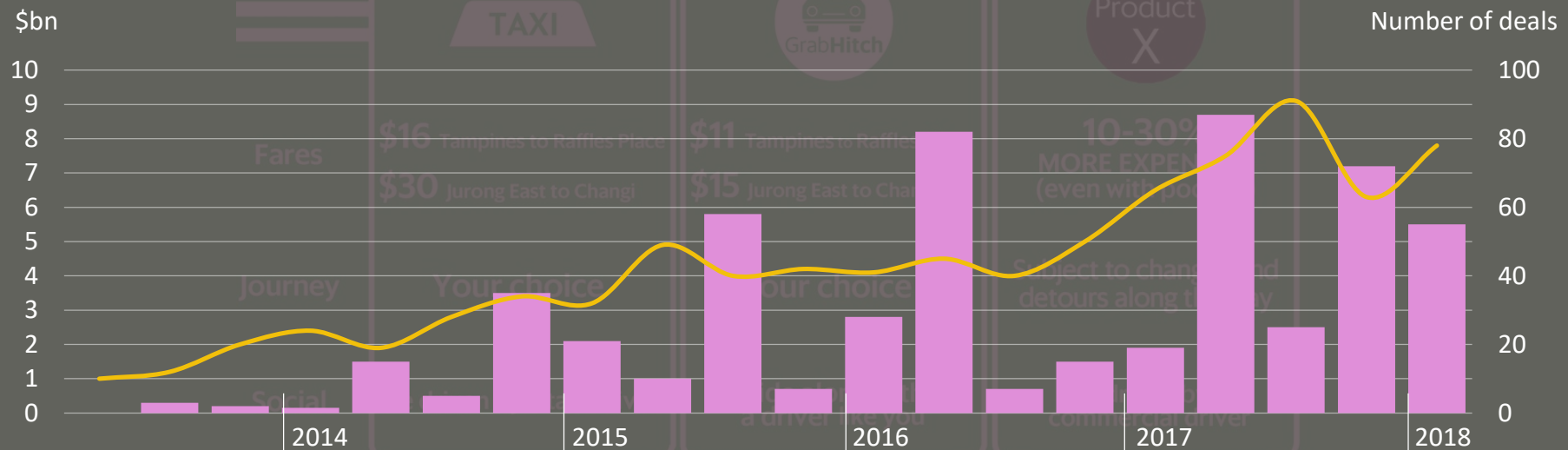


Urban transport is undergoing radical change



Congestion may be reduced if people are travelling more efficiently.
Private investment in software to make journeys quicker has increased rapidly.

Corporate and venture M&A activity in software designed to improve efficiency of transport systems or otherwise proliferate clean transportation



SOURCE: I3 Connect; Generation



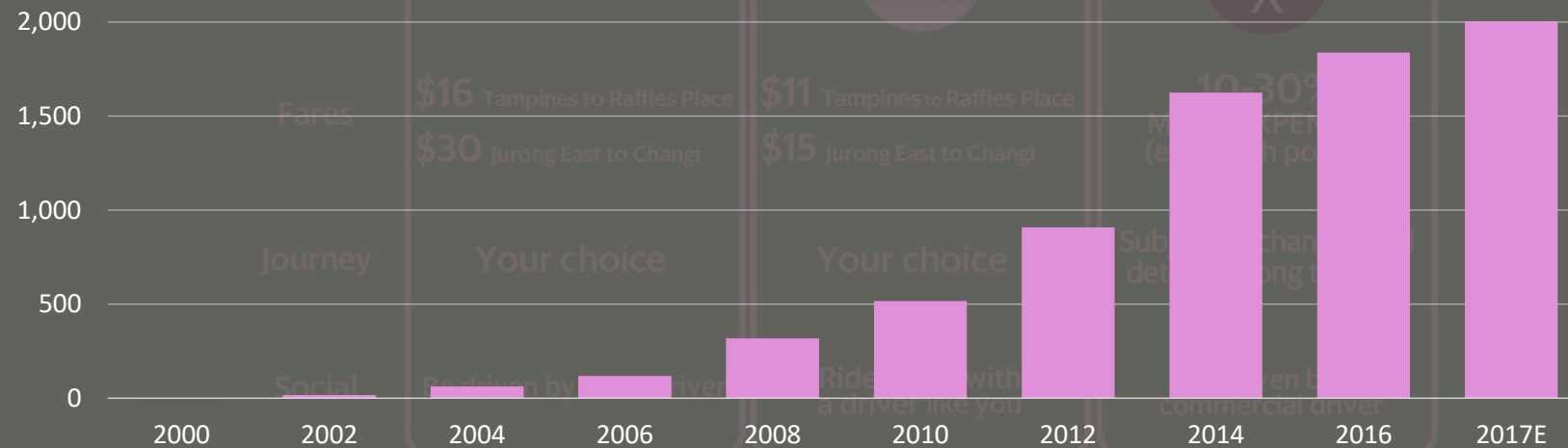
Urban transport is undergoing radical change



Car-sharing* also means that existing vehicles can be used more efficiently

North American car-sharing member growth

Number of members, total, '000



SOURCE: Statista; New York DMV; NYC Department of City Planning; Generation

* Car-sharing (Zipcar, Enterprise Car Club) is to be distinguished from ride-hailing (Uber, Lyft)

As autonomous vehicles become more popular, environmental and social benefits will follow



IMAGE: nuTonomy vehicle
Innovations in autonomous driving will help improve fuel mileage and road safety

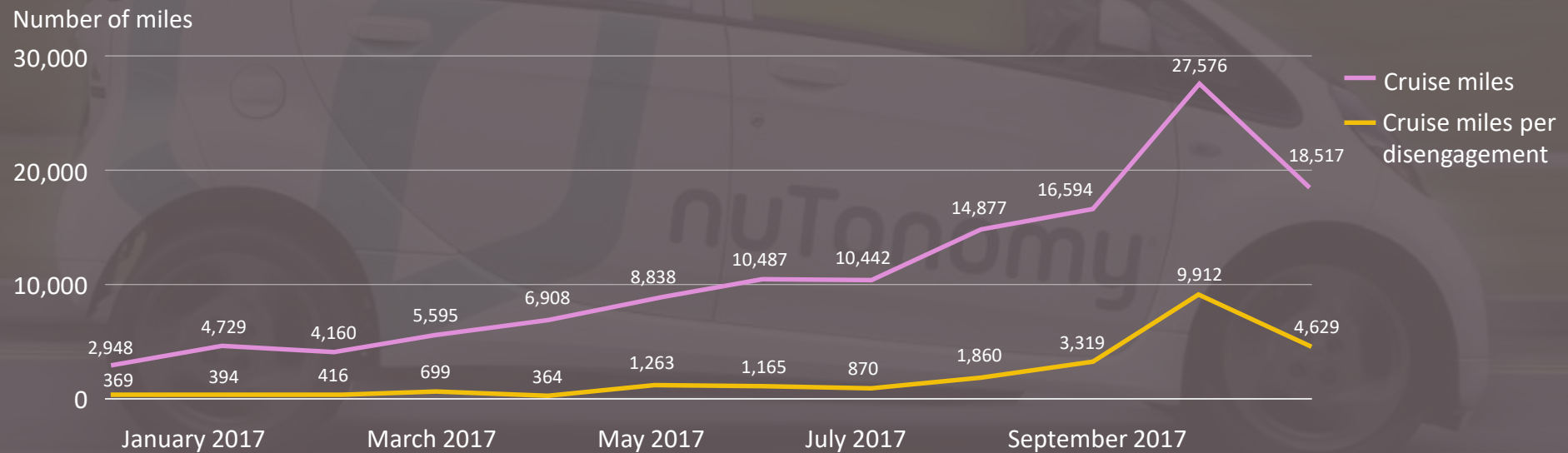


As autonomous vehicles become more popular, environmental and social benefits will follow



2017 saw autonomous vehicles increasingly become a feasible transport option

The number of AV miles travelled without having to be manually overridden*



SOURCE: Ars Technica. *Figures refer to miles driven per month in California by a leading autonomous-vehicles division

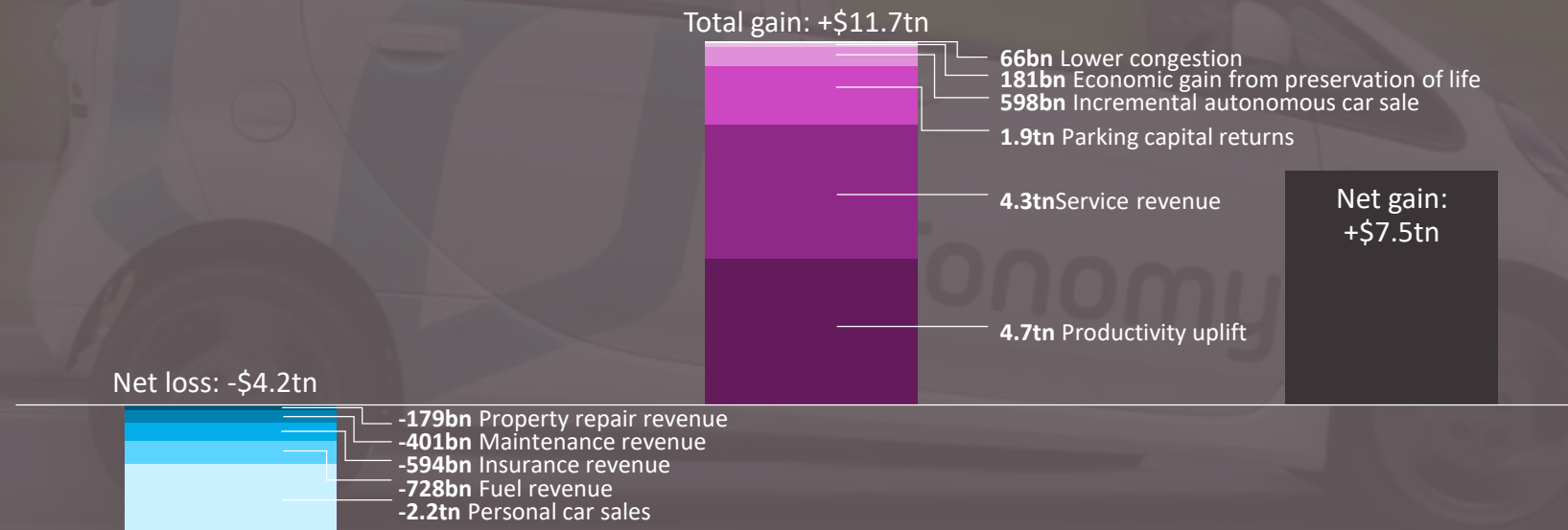


As autonomous vehicles become more popular, environmental and social benefits will follow



Autonomy may have large economic benefits, enabling more productive use of land and human capital

Net present value of US autonomous taxis



SOURCE: ARK Investment Management LLC

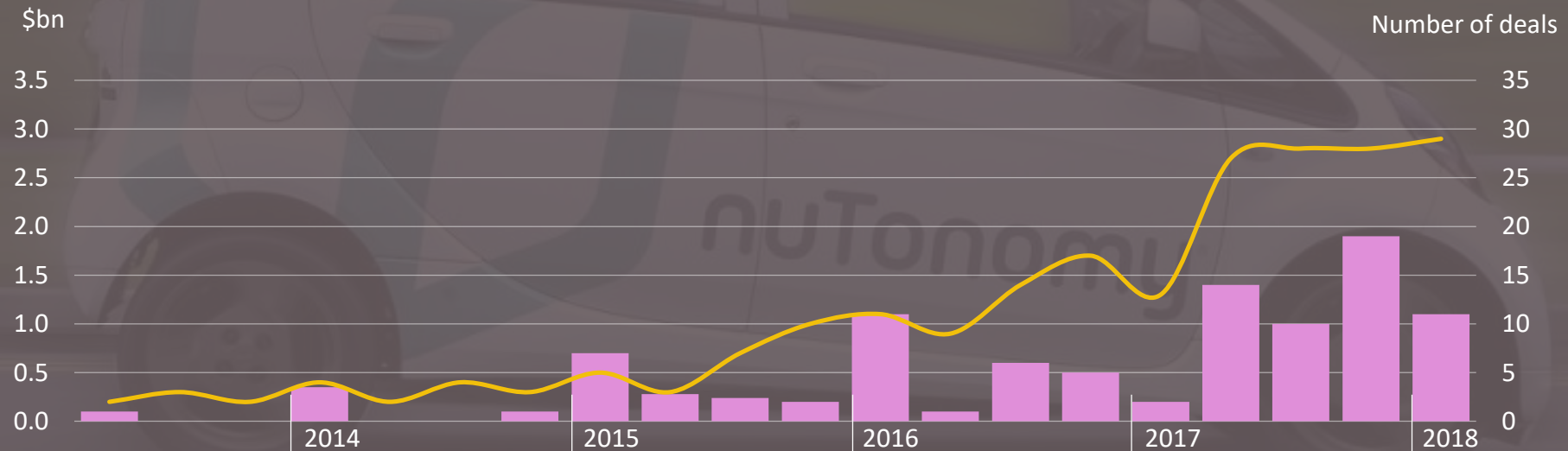


As autonomous vehicles become more popular, environmental and social benefits will follow



Rising investment in autonomous technologies suggests that improvements will continue

Autonomous driving, private venture activity from both corporate and venture investors, and deal count



SOURCE: I3 Connect

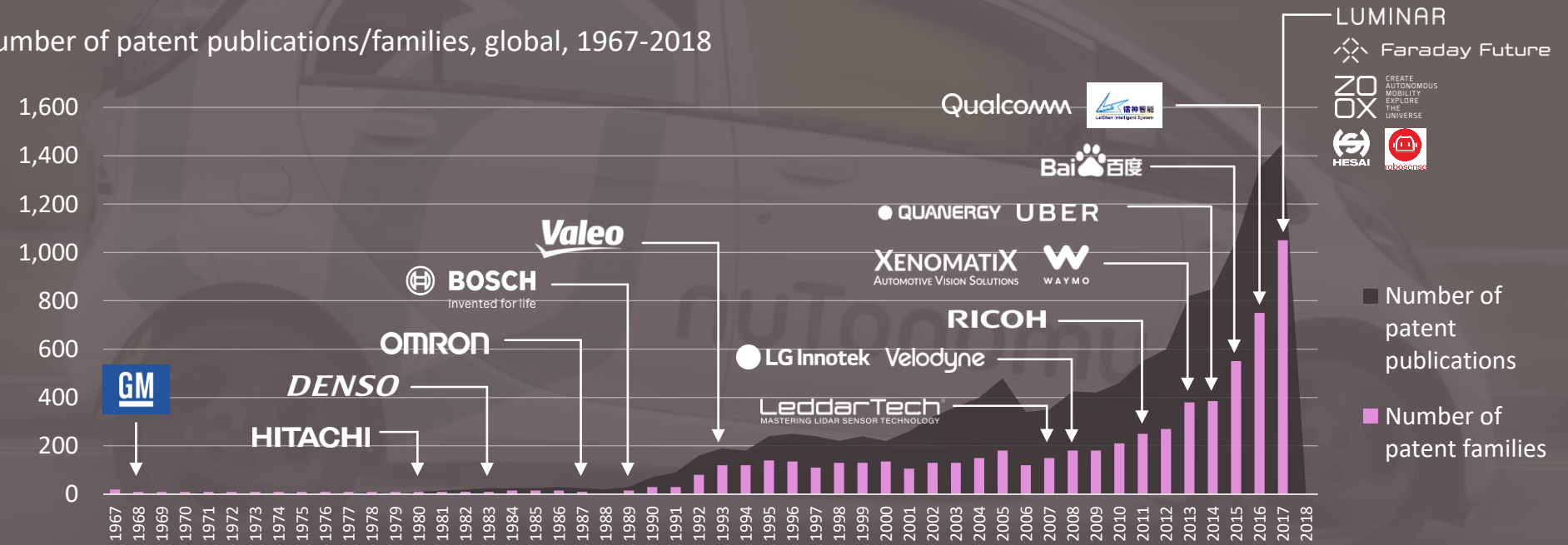


As autonomous vehicles become more popular, environmental and social benefits will follow

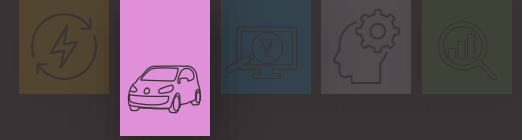


Rapid innovation is also suggested by a boom in autonomy-related patents, globally

Number of patent publications/families, global, 1967-2018



SOURCE: Climateer Investing



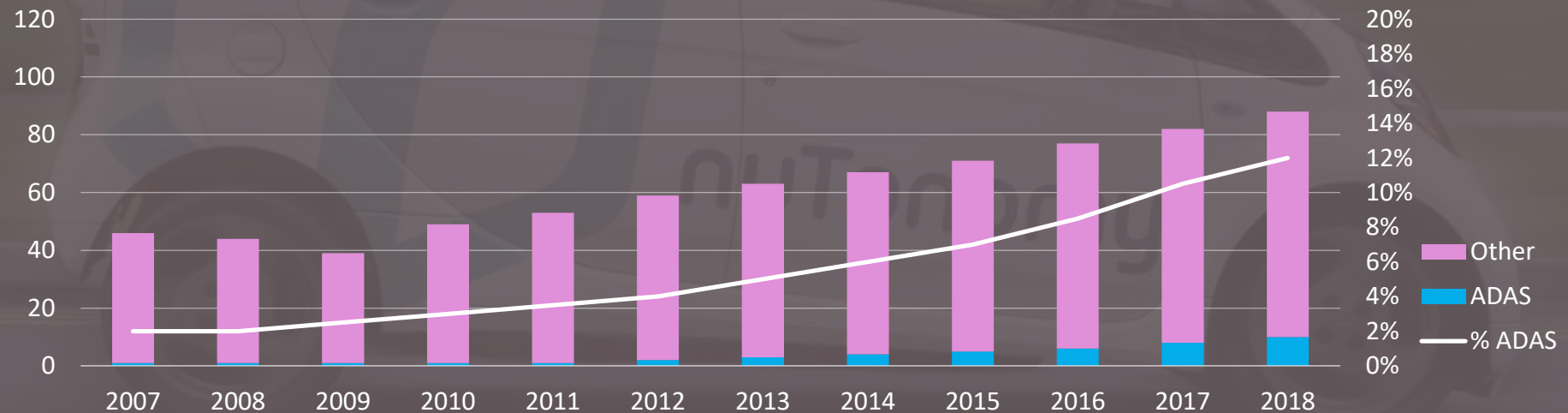
As autonomous vehicles become more popular, environmental and social benefits will follow



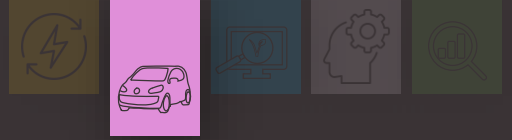
Elements of autonomy are already being rapidly adopted by OEMs

Advanced driving assisted systems (ADAS) are one of the fastest growth areas for automotive engine-control units (ECU)

Market size of engine control unit, global, 2007-18, \$bn



SOURCE: Strategy Analytics



Urban environments have become more pleasant and safer places to be



neighborly

FEEDBACK GET STARTED HOW IT WORKS Sean

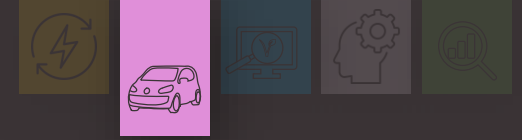
Invest in the change you want to see in the world

Be neighborly by investing in your community through public projects like parks, education, and other civic infrastructure.

Neighborly is on Product Hunt!

Get started How it works

IMAGE: Neighborly
Improvements in urban environments are being catalysed by companies modernising access to public finance

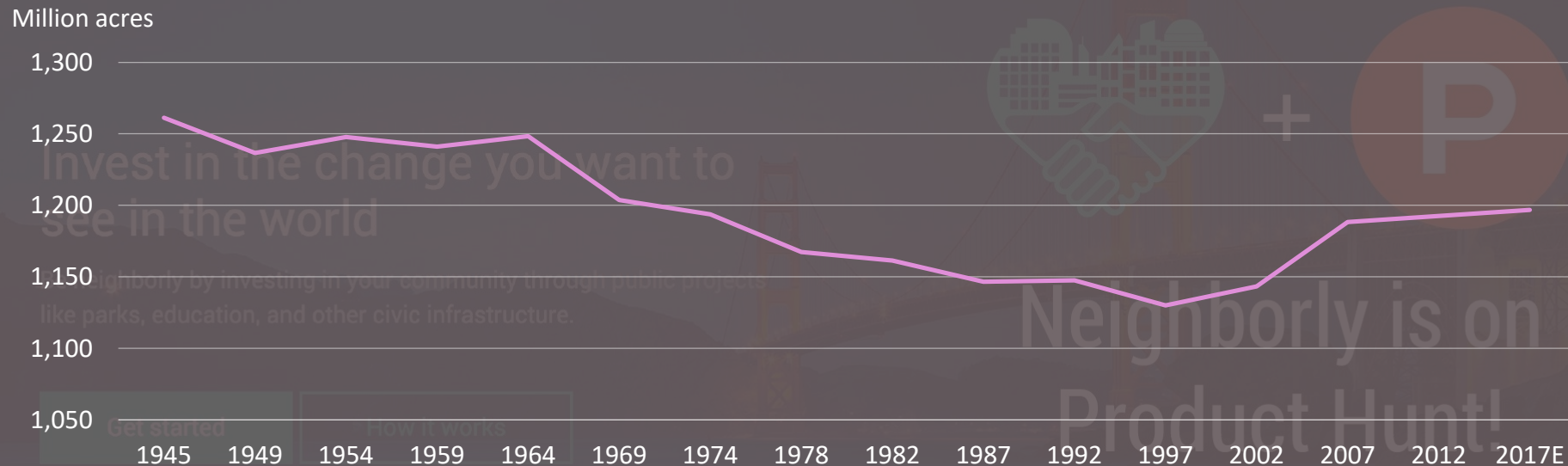


Urban environments have become more pleasant and safer places to be

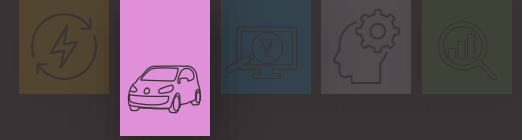


In many countries the amount of green space across the country is rising, after decades of decline, allowing easier access for residents both rural and urban

Amount of grassland and forest across the country, USA, 1945-2017



SOURCE: US Department of Agriculture; Generation

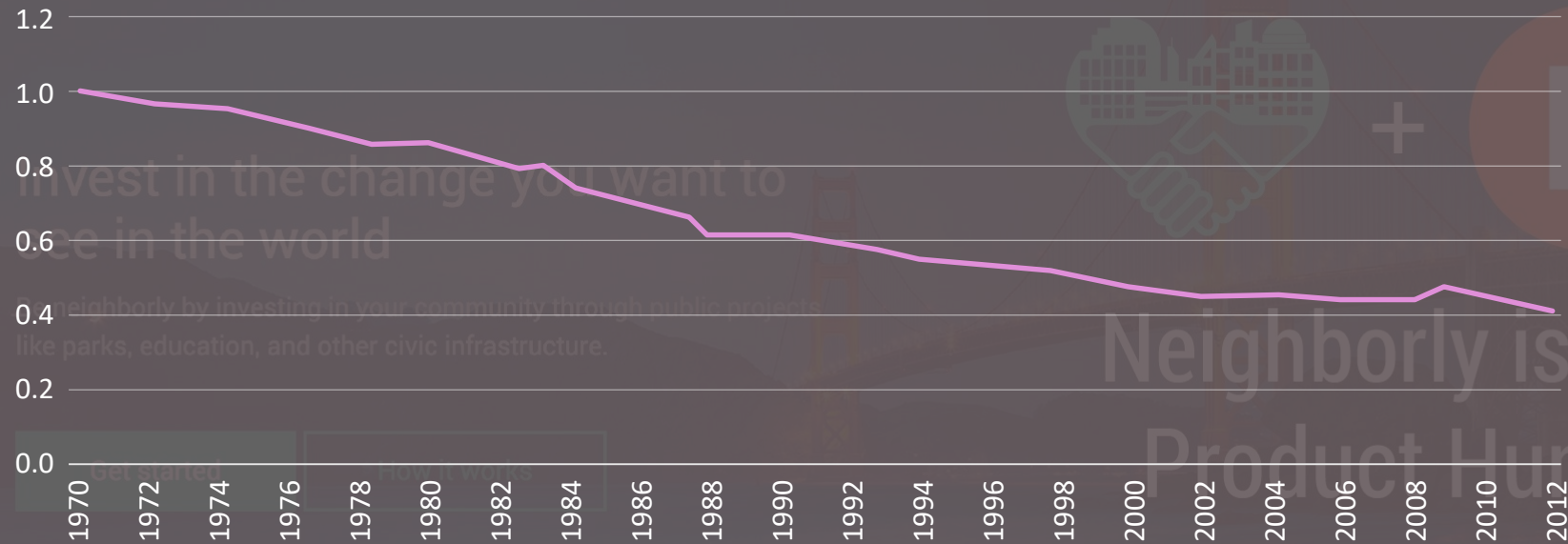


Urban environments have become more pleasant and safer places to be

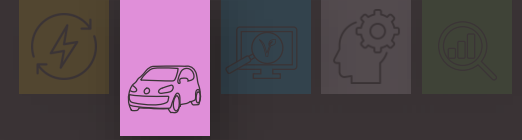


Yet globally the planet is becoming less biologically diverse

Global Living Planet Index*



SOURCE: Living Planet Index. The Living Planet Index (LPI) is a measure of the state of the world's biological diversity based on population trends of vertebrate species from terrestrial, freshwater and marine habitats. *Latest available data



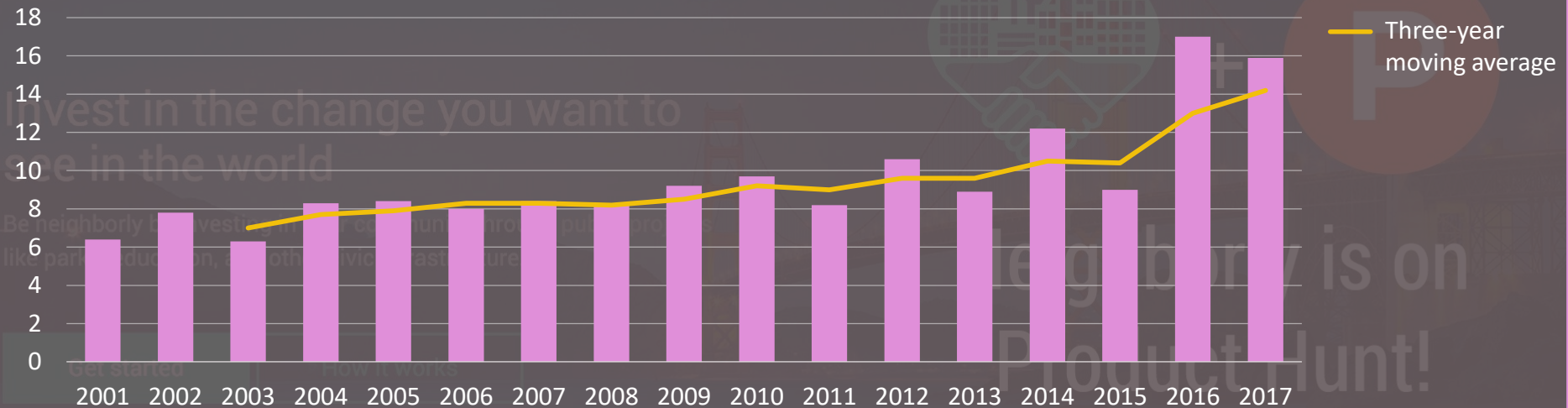
Urban environments have become more pleasant and safer places to be



Global tree cover loss has reached new heights

Annual tree cover loss (millions of hectares), global, 2001-17

Tree cover loss (Mha)



SOURCE: World Resources Institute

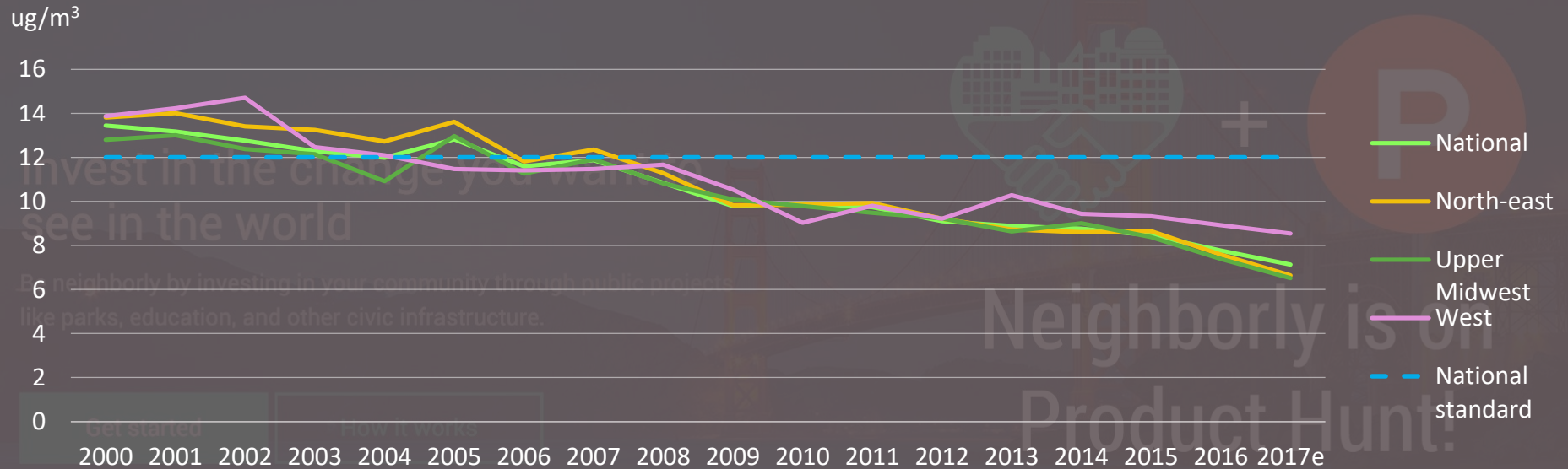


Urban environments have become more pleasant and safer places to be



Though air quality has improved across America.

PM2.5 concentration, American regions, 2000-2017



SOURCE: US Environmental Protection Agency

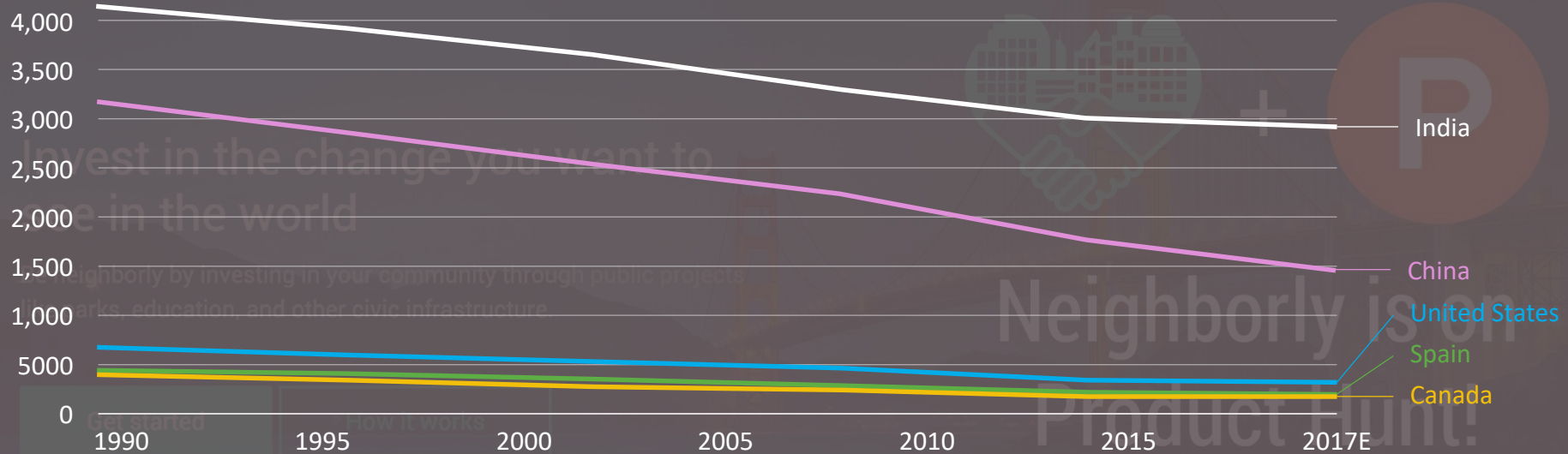


Urban environments have become more pleasant and safer places to be



While the number of deaths globally linked to poor air quality rose 20% from 1990 to 2015, mortality rates, as measured by lost years of life, have fallen substantially

Disability-adjusted life years (DALYs) loss from particulate matter (per 100,000)



SOURCE: State of Global Air; Generation; Our World in Data

Alternative modes of transport are becoming increasingly mainstream



IMAGE: Urban travel, including by Lime scooters
Consumers are embracing more efficient last-mile travel solutions

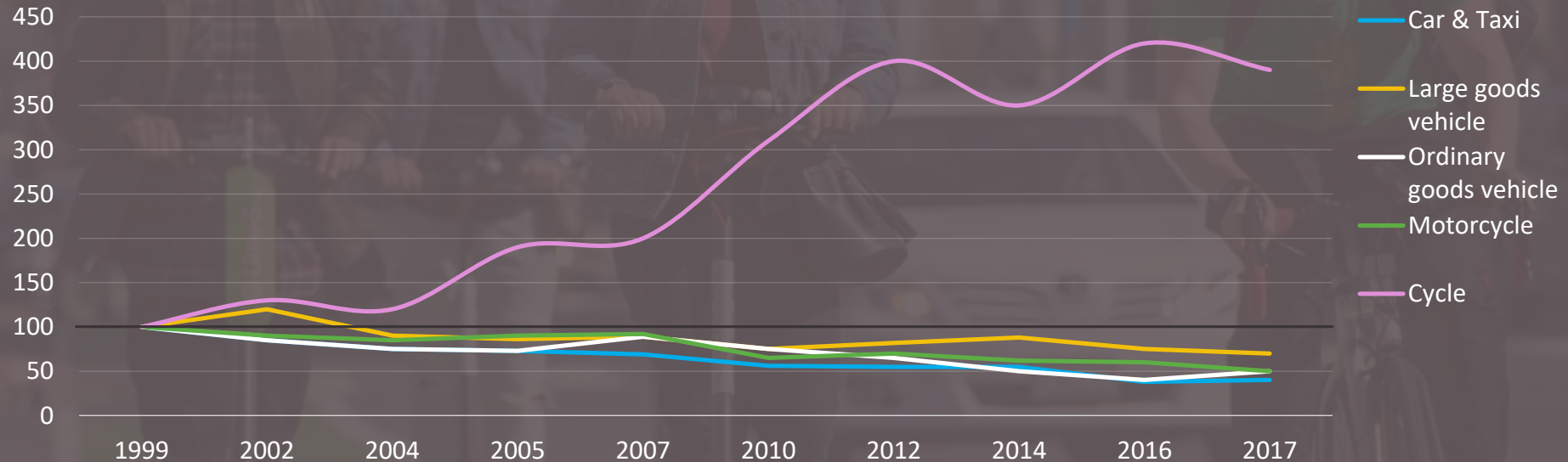


Alternative modes of transport are becoming increasingly mainstream



London is an example of how fundamental systemic shifts in transport choices are possible with the right mix of individual incentives and regulatory support

Traffic composition of City of London, 1999-2017, 100=1999
Index, 100=1999



SOURCE: City of London

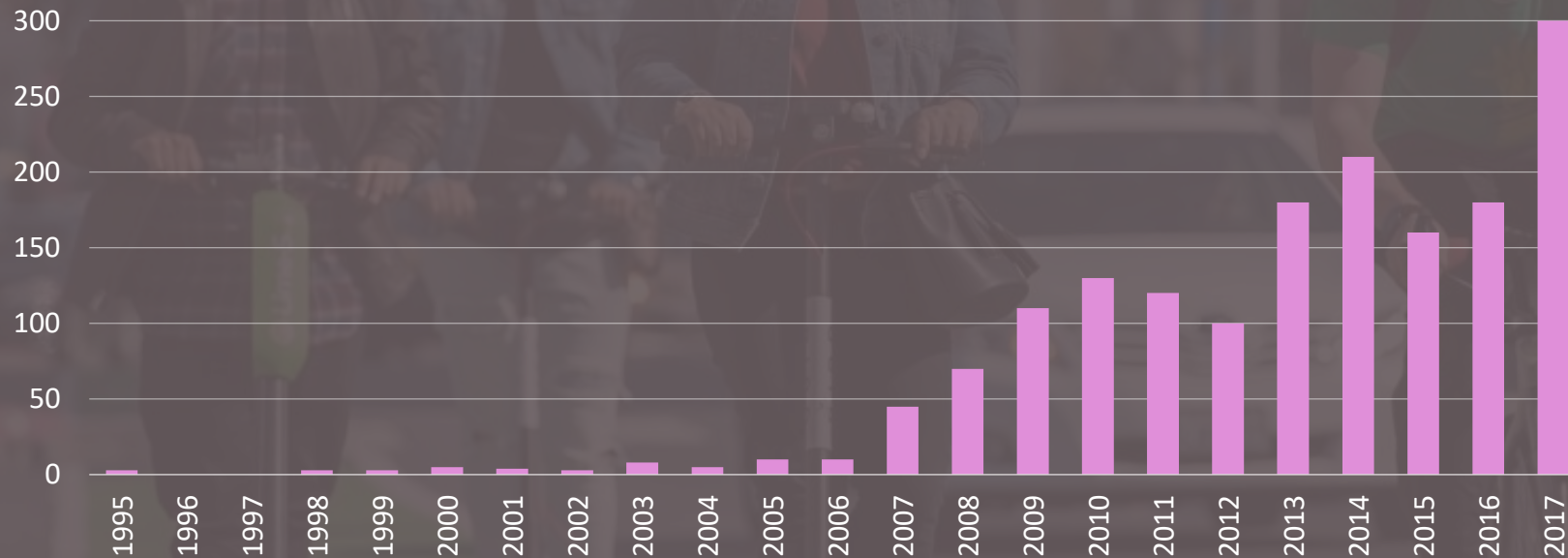


Alternative modes of transport are becoming increasingly mainstream



Bike-sharing schemes are becoming increasingly popular

Worldwide bike-sharing schemes launched per year*



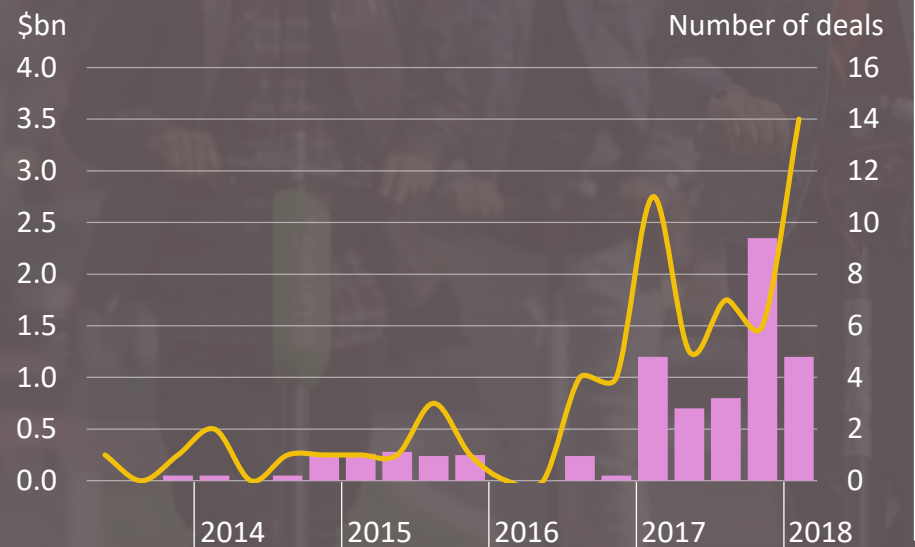
SOURCE: Russell Meddin; *The Economist* *Includes docked and dockless bikes

Alternative modes of transport are becoming increasingly mainstream



2017 saw record levels of capital flow to new modes of sustainable and shared transportation

Corporate and venture capital deal activity in bike-sharing



Cityscoot
la liberté sans bornes



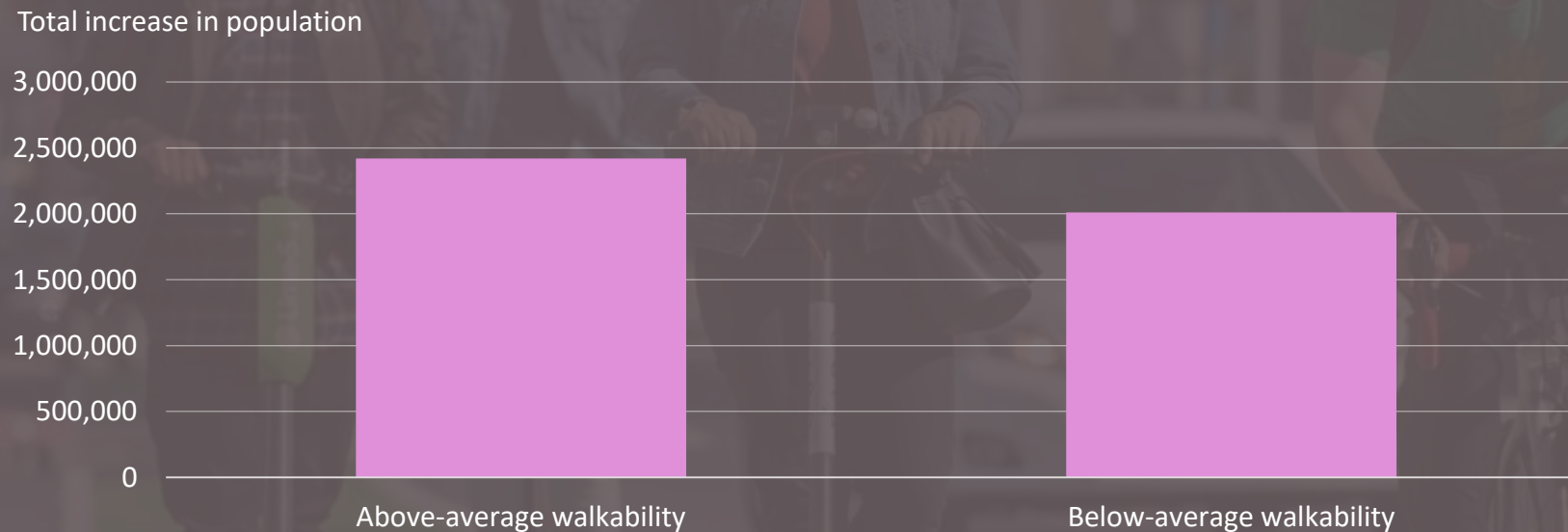
SOURCE: I3 Connect

Alternative modes of transport are becoming increasingly mainstream



And more and more people are living in "walkable" cities...

Population growth by type of city, 2010-17, USA



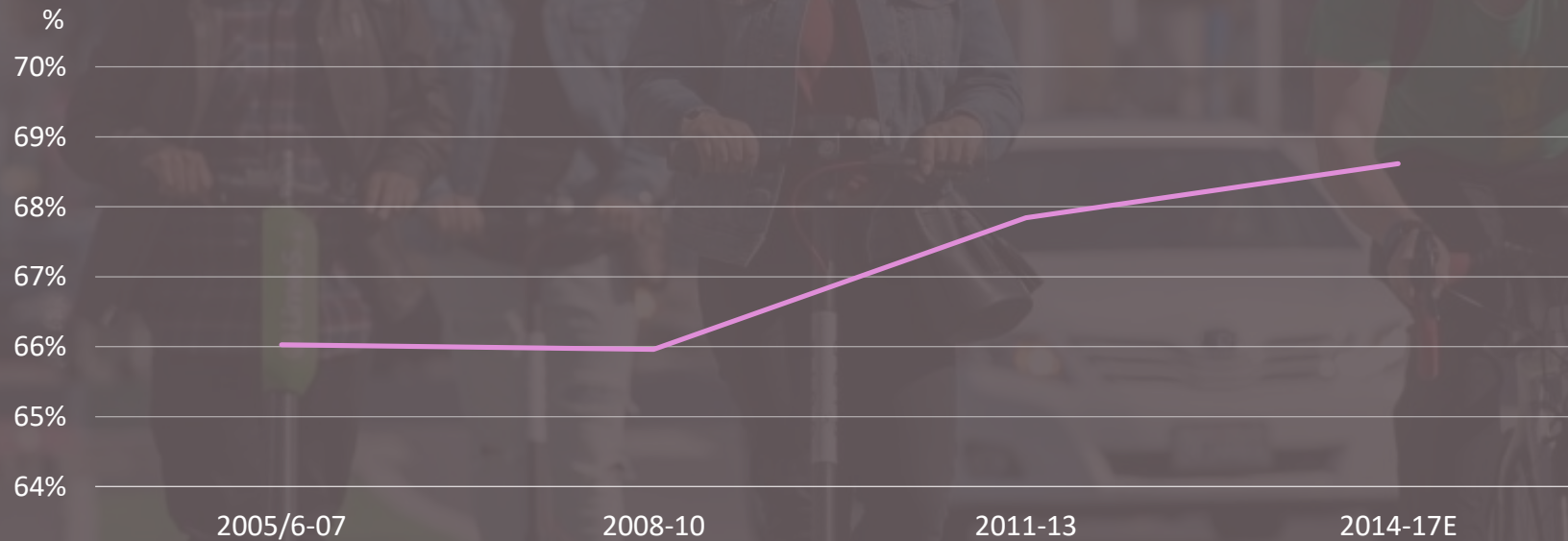
SOURCE: US Census Bureau; Walkscore; Generation. "Walkability" is a points-based index that measures how easy it is to access amenities by foot.

Alternative modes of transport are becoming increasingly mainstream



... As people around the world feel marginally safer about walking around cities

Share of people saying that they feel safe when walking around at night, OECD



SOURCE: OECD; Generation

Trends we continue to track



Cost competitiveness of zero-emission vehicles, stimulating consumer demand based on price alone



More efficient urban architecture and design, enabled by smart technologies such as ubiquitous sensors



Progress on medium term EV supply chain constraints



The impact of the growth of ride-sharing services on congestion and pollution



Adoption of electric school buses



Progress on reducing fine-particulate air pollution



And others...



Responsible consumers

Section summary

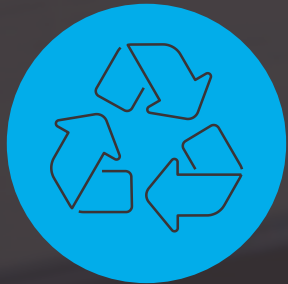
Consumers across the world are embracing more sustainable lifestyles. People are more informed about their purchases and are acting accordingly. They want to have less of an impact on the environment. Their diets are also becoming more sustainable.

In many places there is a long way to go, however. Plastics consumption continues to grow rapidly. And businesses need to enable consumers to make the right choices.

Responsible consumers
are characterised by:



The pursuit of
more sustainable
products



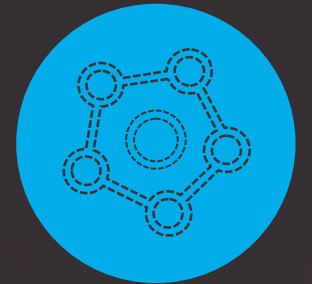
The effective
re-use of
end-products



Increased demand
for more efficient
material inputs



Expressed
preference for
sustainable food
& agricultural
systems



Knowledge of
outcomes, informed
by business and
regulators

Sustainability is increasingly becoming a mainstream consumer option



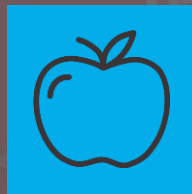
IMAGE: Carousell
Circular economy marketplaces encourage long-term asset utilisation and increase the value of goods

Sustainability is increasingly becoming a mainstream consumer option



Research suggests that the global market for sustainable consumer products was worth \$2.5trn in 2017, accounting for 6% of total global consumer spending

Share of global consumers highly attracted to a product if it has the following attributes:



42%

contains organic/
all natural ingredients



39%

contains environmentally
friendly/sustainable
materials



31%

delivers social
responsibility claims

SOURCE: Unilever; World Bank; Europanel; Generation

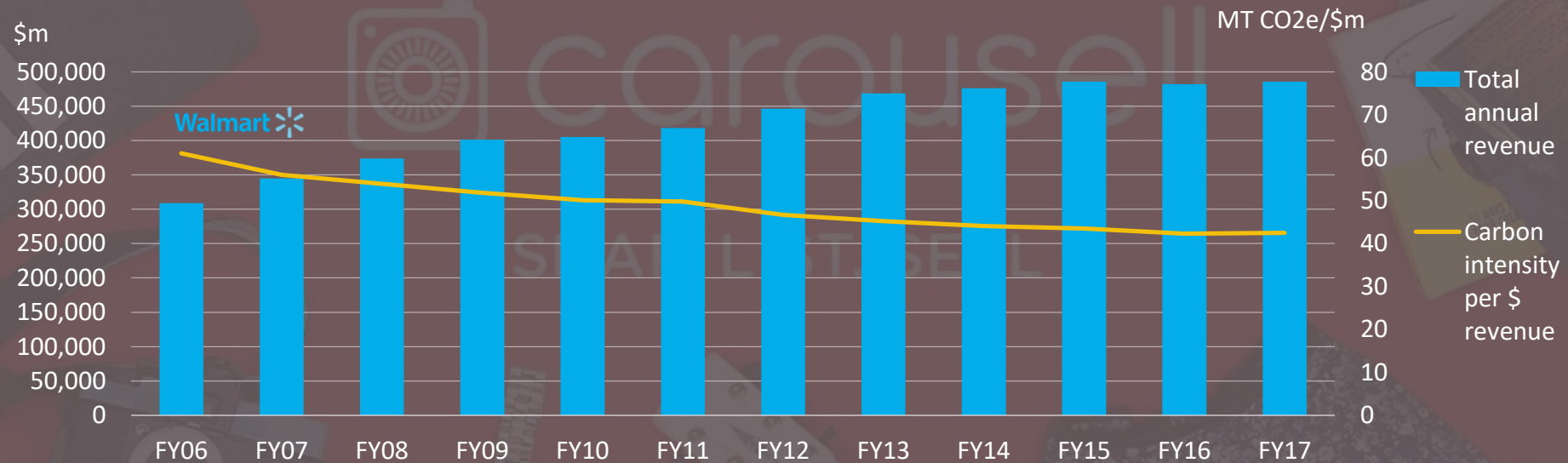
Sustainability is increasingly becoming a mainstream consumer option



Retailers are also responding to the demand for sustainable retailing



Walmart's carbon intensity* (i.e. how much carbon it produces per dollar of revenue) has sharply declined



SOURCE: Walmart *Scope 1 and 2 emissions, which include direct emissions from owned or controlled sources and indirect emissions from the generation of purchased energy

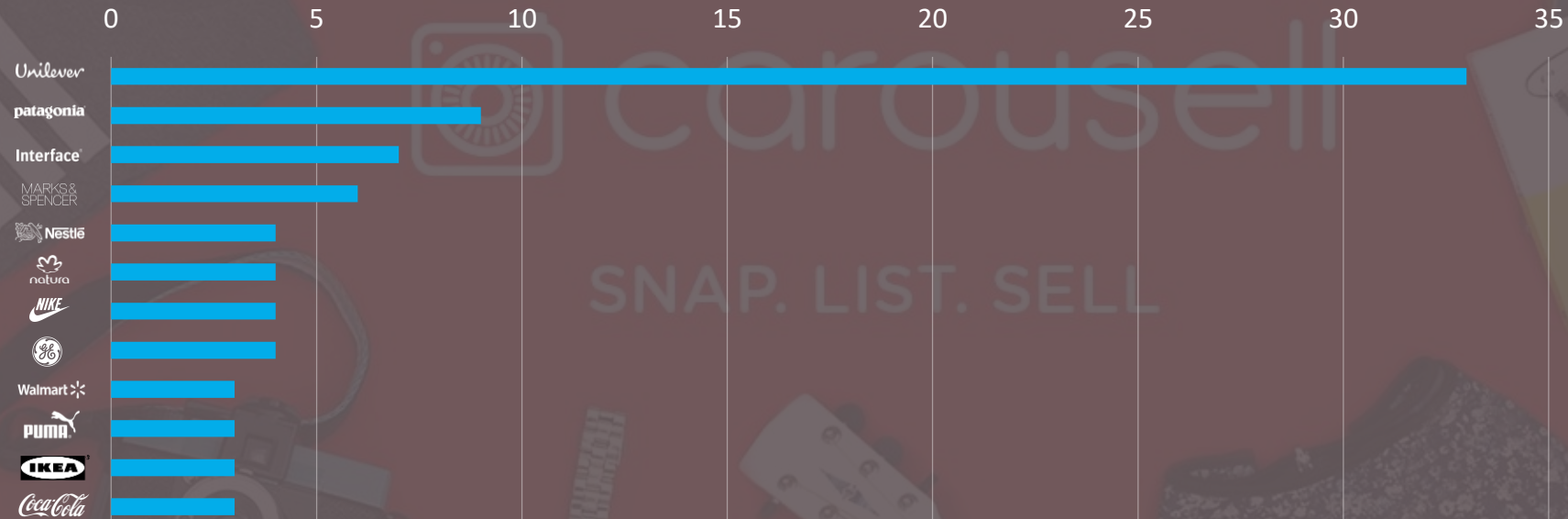


Sustainability is increasingly becoming a mainstream consumer option



Mainstream consumer brands are adopting sustainability as a core operating principle

Leaders in sustainability, % of analysts polled



SOURCE: *The Economist*; GlobeScan / SustainAbility Survey



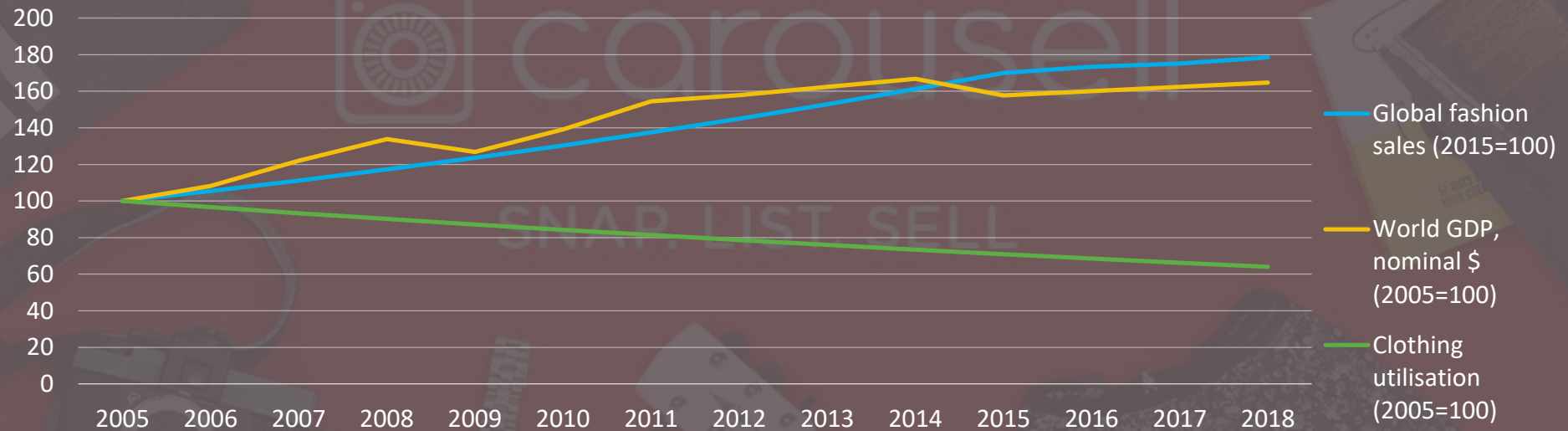
Sustainability is increasingly becoming a mainstream consumer option



Unfortunately, fashion is becoming faster: clothes are being worn fewer times than ever

Clothing sales have outpaced global GDP growth globally since 2005

Index 2005=100



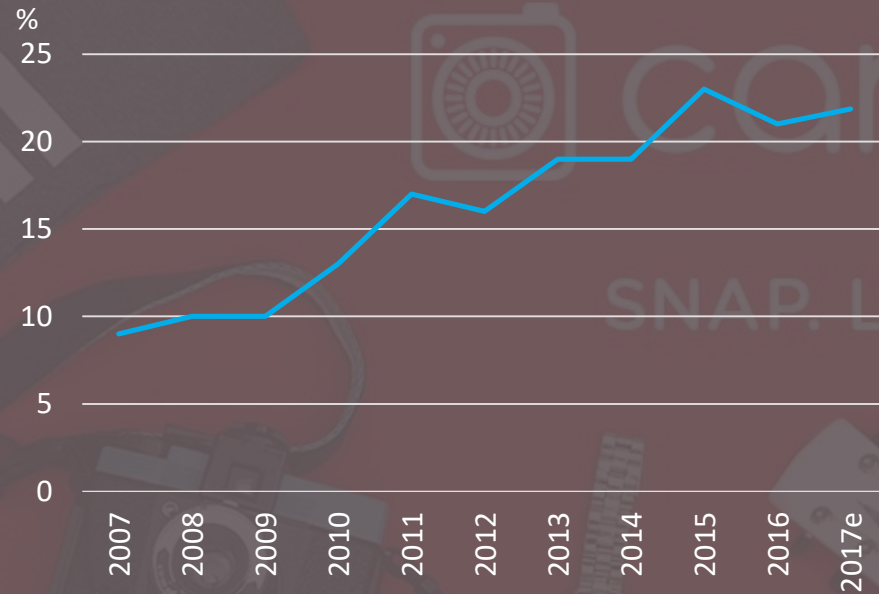
SOURCE: Generation estimates based on assorted McKinsey fashion reports, chain-linked, nominal terms; World Bank; Ellen MacArthur Foundation. Clothing utilisation refers to how many times clothes are used before being discarded

Sustainability is increasingly becoming a mainstream consumer option

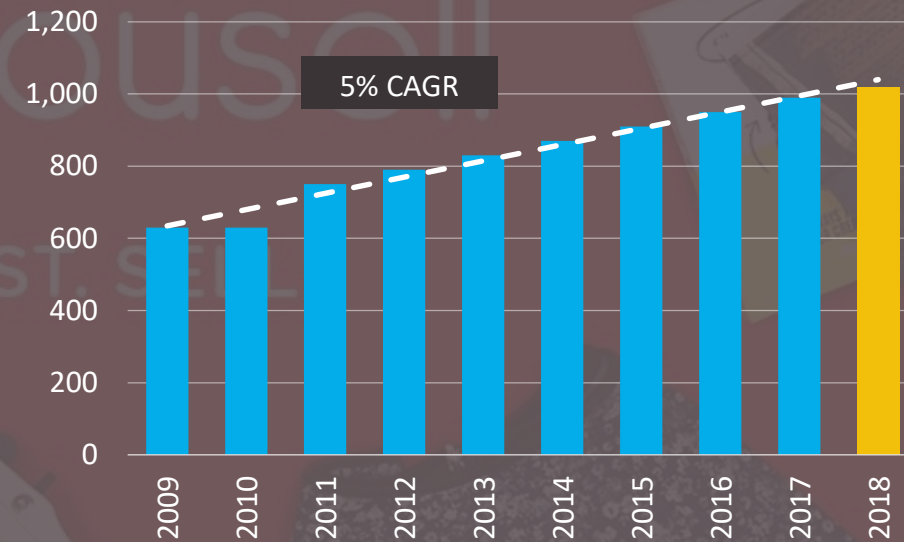


But used goods marketplaces are burgeoning as consumers improve the asset utilisation of their clothes and increase their value

Share of EU individuals selling goods or services online to other consumers, 2007-17



Number of people interacting through used-goods marketplaces, global, m



SOURCE: Statista; Generation

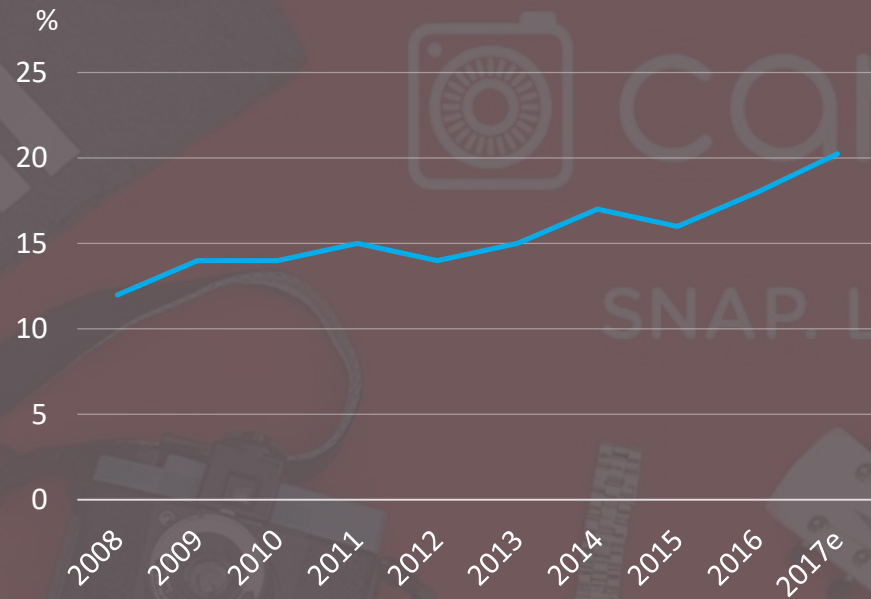
Sustainability is increasingly becoming a mainstream consumer option



Firms are seeing a higher share of their revenue move online. And research suggests that innovations like e-commerce have a smaller carbon footprint

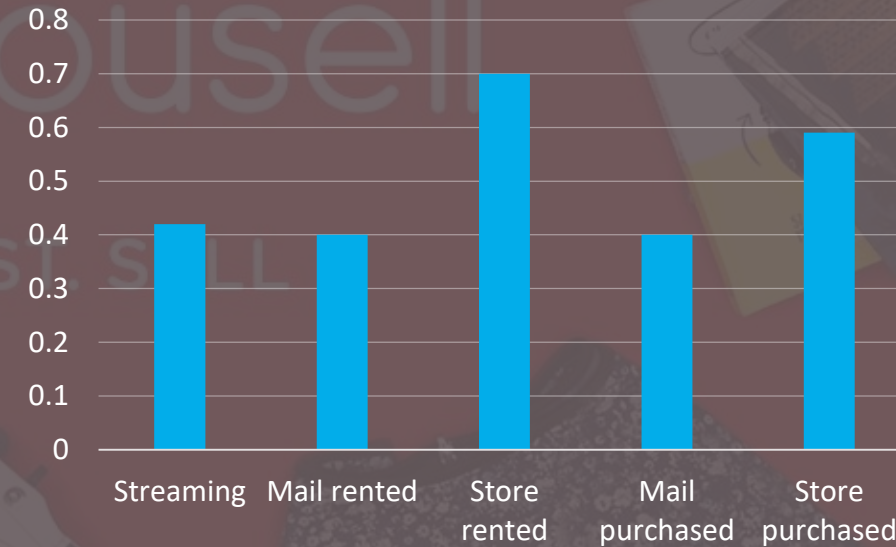


Turnover from e-sales, 2008 to 2017, EU28

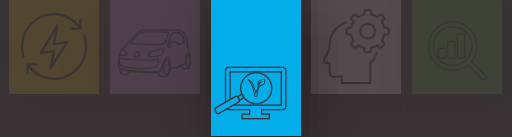


CO2 emissions of films/shows, by viewing method

Kg of CO2(e) emissions per viewing hour



SOURCE: Eurostat; Generation; Shehabi, Arman, Ben Walker, and Eric Masanet. "The energy and greenhouse-gas implications of internet video streaming in the United States." *Environmental Research Letters* 9, no. 5 (2014): 054007.



The by-products of economic activity are being treated in a more sustainable way



The screenshot shows the Compology web application interface. The browser address bar displays "https://app.compology.com/riverbend/dispatch". The navigation menu includes "Dispatch", "Containers", "Routes", "Customers", and "Service Requests". The main content area is divided into two sections: "3 Unassigned Tasks" and "3 Routes".

3 Unassigned Tasks

Task Name	Status	Created
TEMP-PALM LAKE APARTMENTS R/O - 40444 Empty and return	Empty and return	created 4/17
PERM-CENTRAL FREIGHT LINES/ RO - 40763 Final service	Final service	created 4/17
PERM-STATE PUBLISHING /WESTROCK - 40694 Empty and return	Empty and return	created 4/17

3 Routes

Route	Assigned To	Created
Route 3 Tuesday 4/18	Unassigned	created 13 minutes ago
Route 2 Tuesday 4/18	Jordan Hamel	created 14 minutes ago
Route 1 Tuesday 4/18	Eric Johnson	created 14 minutes ago

The right side of the interface shows a map view for task 40694. The map is titled "Apr 16th at 3:01 pm" and shows a satellite view of a residential area. A pop-up window for task 40694 displays "38% 1 week on site" and a "Select Route" menu with three options: "Route 3 Tuesday 4/18 — No driver assigned", "Route 2 Tuesday 4/18 — No driver assigned", and "Route 1 Tuesday 4/18 — No driver assigned". Below the map, the "Work Order: 4039594" and "Empty and return" status are visible, along with edit and delete icons.

IMAGE: Compology
Improved waste management systems can result in more efficient use of materials

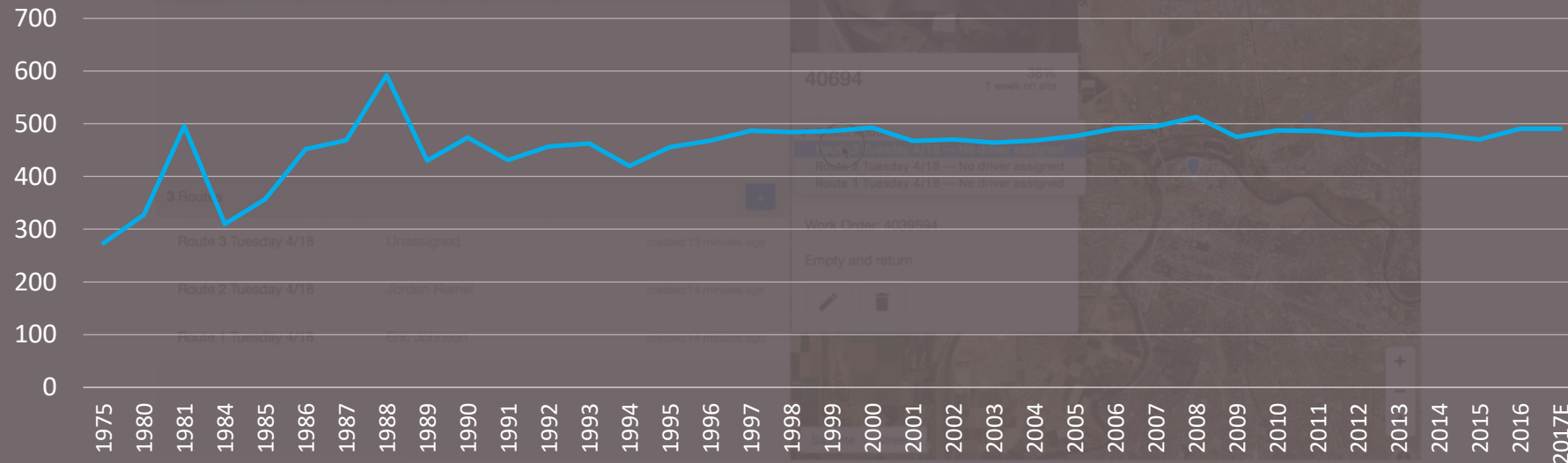
The by-products of economic activity are being treated in a more sustainable way



Per-capita generation of waste in developed countries has remained steady for some time

Municipal waste generated per capita, kg, median OECD country, 1975-2017

Kg of waste per capita per year



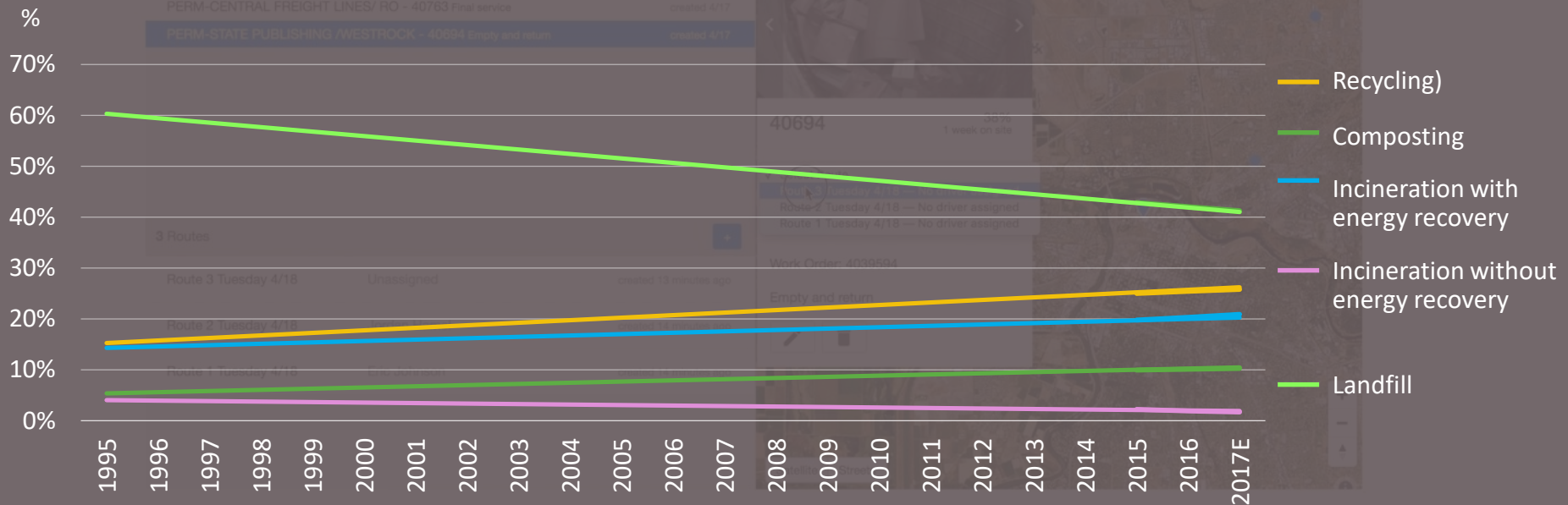
SOURCE: OECD; Generation

The by-products of economic activity are being treated in a more sustainable way



Over 25% of waste in the OECD is now recycled

What happens to municipal waste in the OECD, share by destination



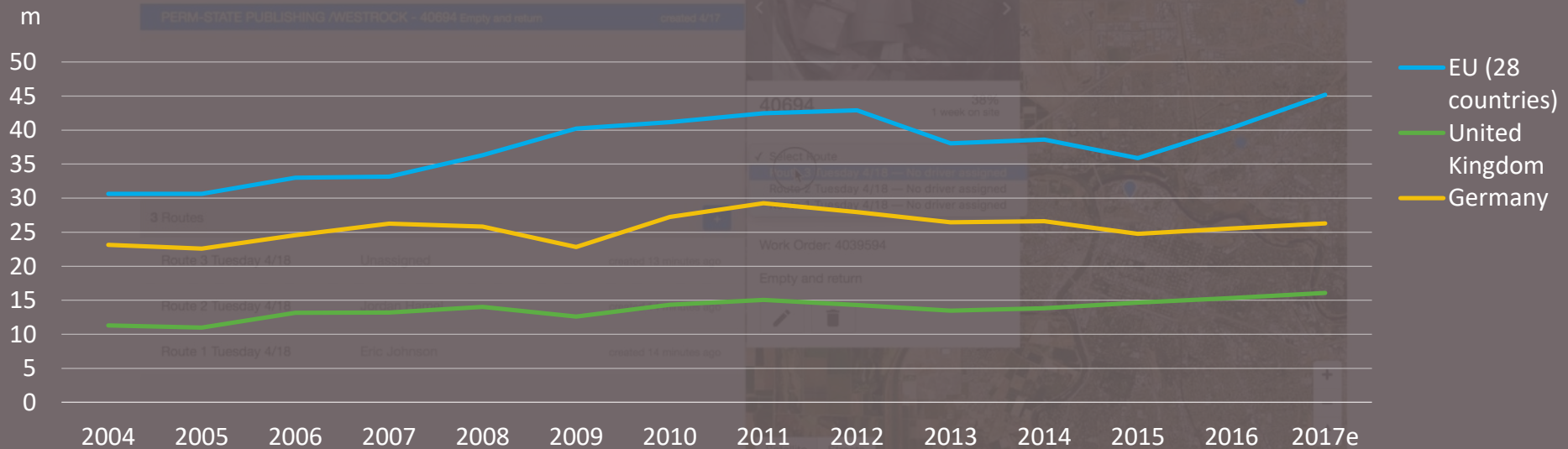
SOURCE: OECD; Generation

The by-products of economic activity are being treated in a more sustainable way



More materials are being reused in the production process

Trade in recyclable raw materials*, tonnes per year



SOURCE: Eurostat; Generation. *Waste products and by-products that can be re-used



The by-products of economic activity are being treated in a more sustainable way



Reusing materials can in some cases prove to be lucrative

Depending on how sophisticated the method, turning discarded materials into something new can create added value

Level of aggregation

Discarded polyethylene terephthalate (PET) bottles, profit on PET production, \$/metric ton

Waste tyres socioeconomic benefit generated, \$/metric ton

Electronic waste, value extracted, \$/metric ton

Basic

-105

-145
Energy recovery

15

10

Metal recovery through burning

2,280

1,375

Backyard metal recovery (China)

Advanced

315

155

Polyester recovery

130

75

Tire-derived fuel

5,420

4,955

Best-in-class hydrometallurgical

Full

590

360

Bottle-to-bottle recycling

295

165

Crumbing

4,850

3,850

Best-in-class melting

■ Low estimate
■ High estimate

SOURCE: McKinsey

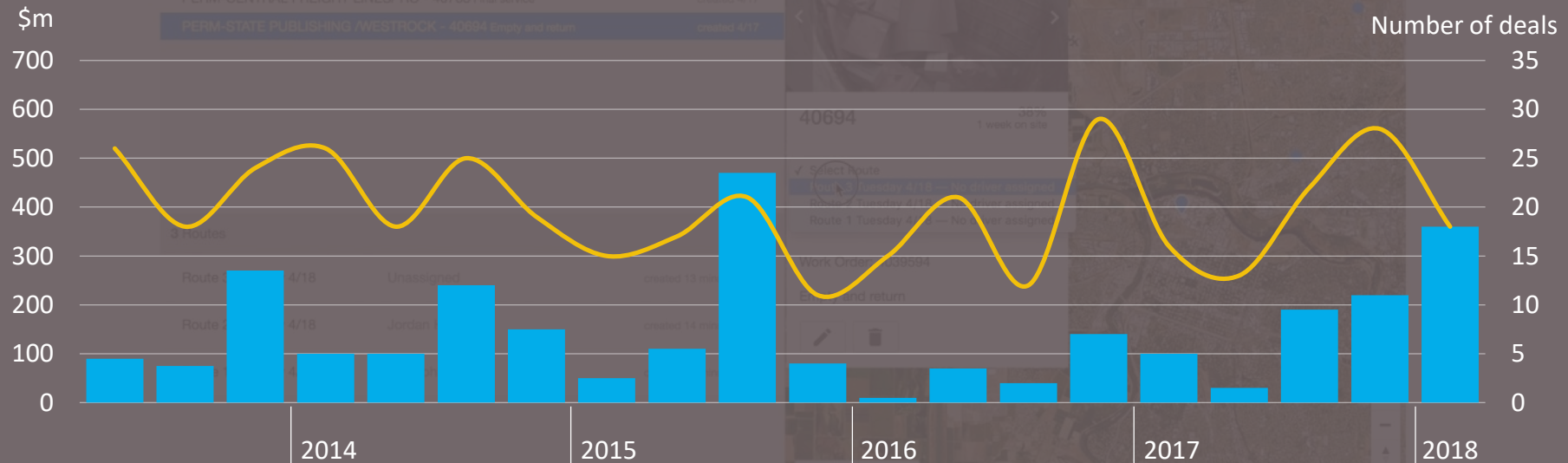


The by-products of economic activity are being treated in a more sustainable way



Investment in recycling and waste companies signals potential further progress

Corporate and venture capital deals in recycling and waste industries*, global



SOURCE: I3 Connect. *Technologies, services, and related business models contributing to the reduction, reuse, or recycling of waste streams

The global plastics system is a cause for serious concern



MATERIAL

RECYCLED MATERIAL by Pentatonic



PENTATONIC TURNS SMARTPHONE, CANS AND CIGARETTE BUTTS INTO FLAT-PACK FURNITURE. IN ADDITION THE CHAIRS AND THE TABLES ARE DESIGNED TO BE ASSEMBLED WITHOUT THE NEED FOR TOOLS (NO TOXIC GLUES OR RESINS EITHER).



www.CNTFACTORY.com
images via: www.pinterest.com

IMAGE: Pentatonic
Consumer consciousness around material inputs help create a fully closed loop for consumer goods

The global plastics system is a cause for serious concern



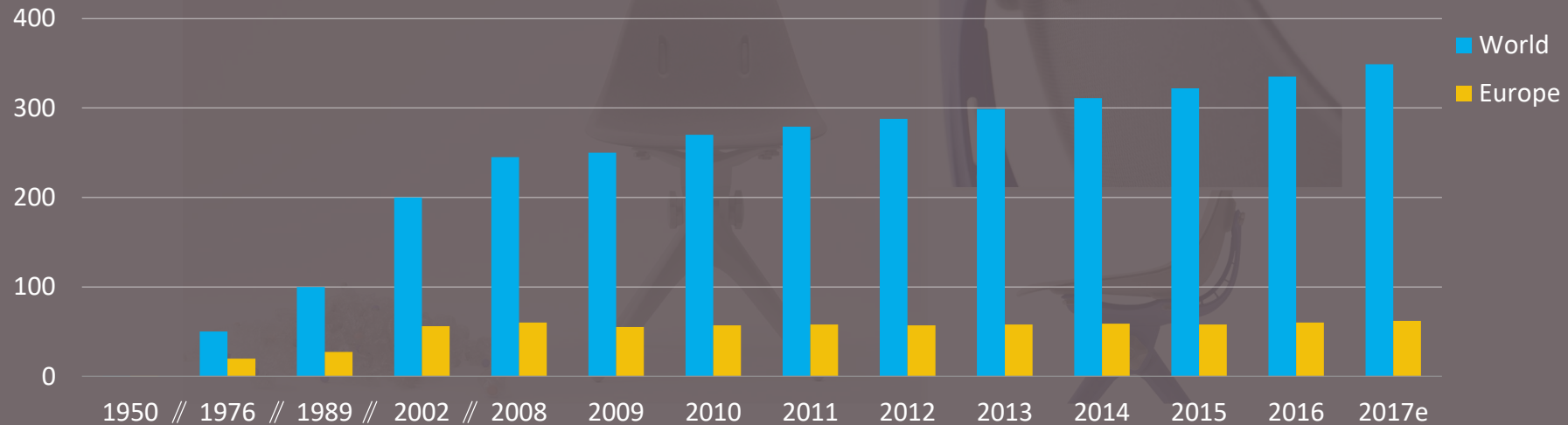
Global plastics production has reached new, unsustainable heights

RECYCLED MATERIAL by Pentatonic



Global plastic production, 1950-2017e

Production volume in metric tons (m)



SOURCE: Statista, Generation

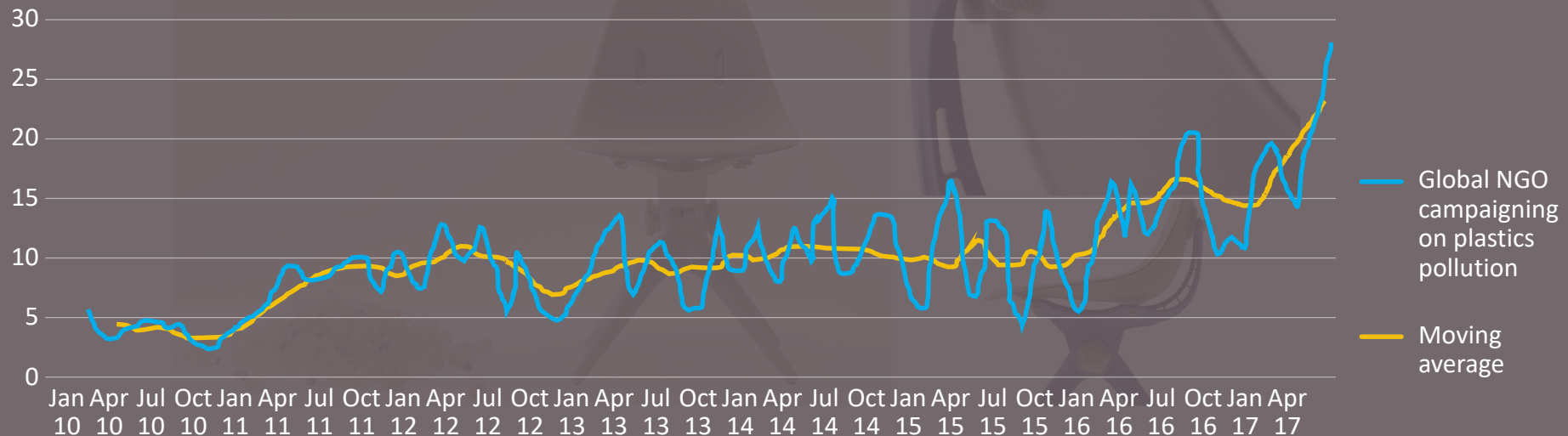
The global plastics system is a cause for serious concern



But public concern with plastics pollution is growing rapidly, which could force change

NGOs are campaigning more vigorously on the issue of plastic pollution

Metric of NGO campaigns concerning plastic



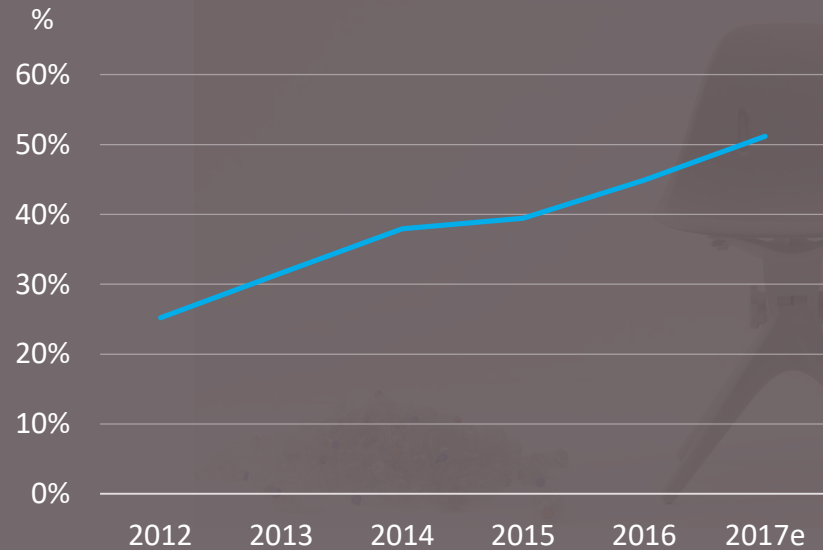
SOURCE: SIGWATCH

The global plastics system is a cause for serious concern

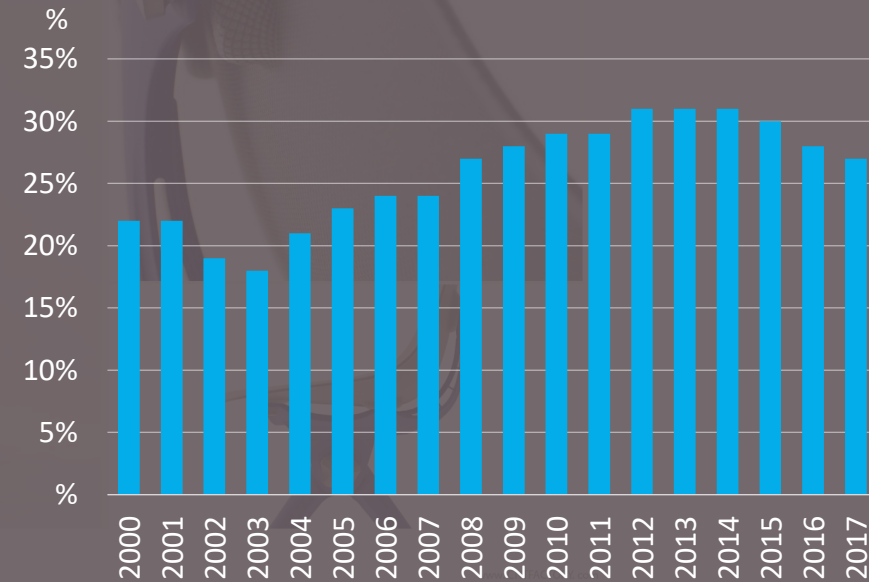


There is mixed progress in improving recycling rates of plastic

Share of plastic waste that is recycled, UK



Gross recycling rate of bottles in the US



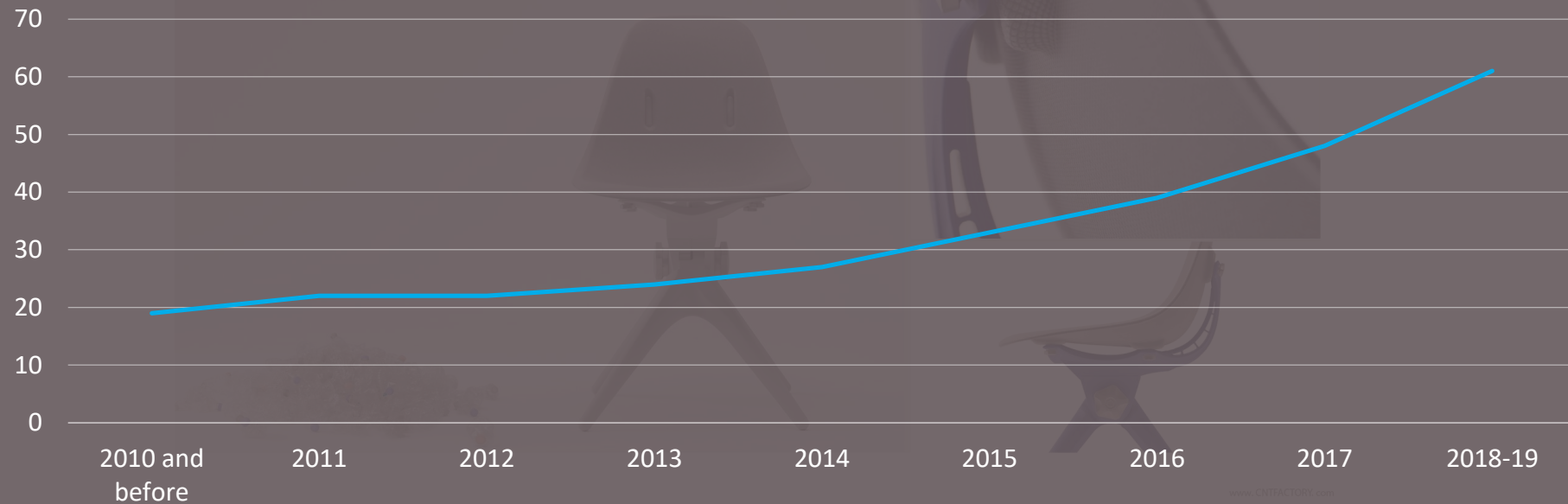
SOURCE: UK Department for Environment, Food and Rural Affairs (DEFRA); Generation; Statista

The global plastics system is a cause for serious concern



Actions by governments to discourage use of plastic may have some effect on behaviour. Within the next year more than 60 countries will have introduced plastic-bag bans or charges

Number of countries that have introduced plastic-ban bags and/or charges



SOURCE: Generation estimates

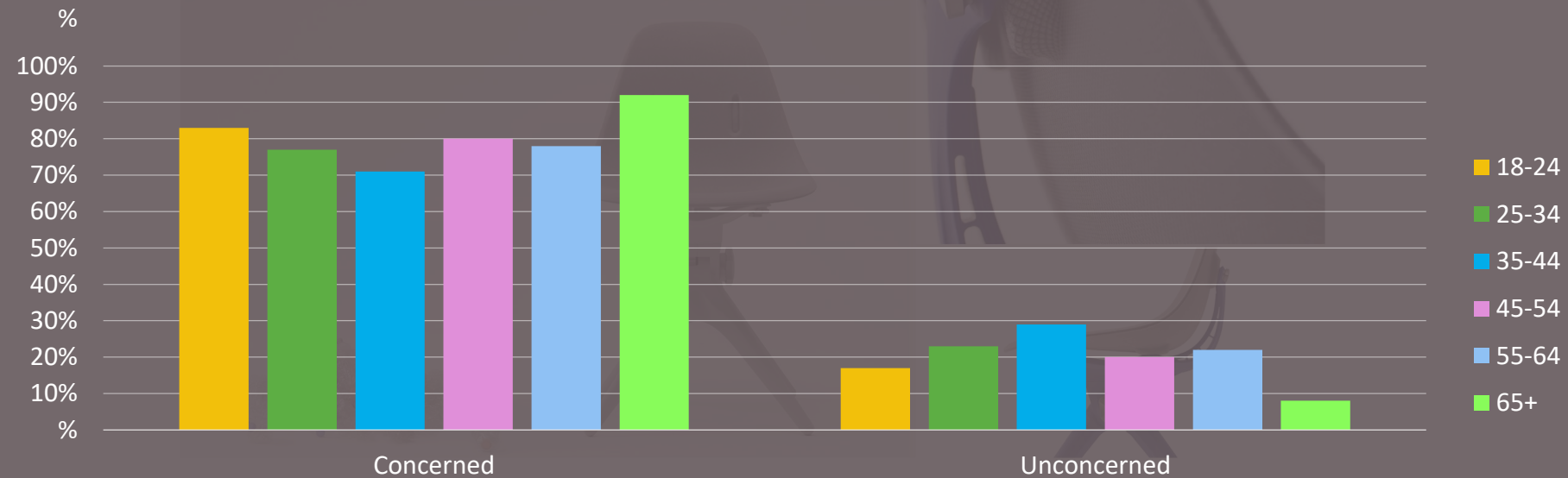
The global plastics system is a cause for serious concern



This concern about plastics is generationally ubiquitous: this may bode well for the future

RECYCLED MATERIAL by Pentatonic

Are you concerned or unconcerned about the amount of plastic packaging that is thrown away in the UK?



SOURCE: Populus, 2017



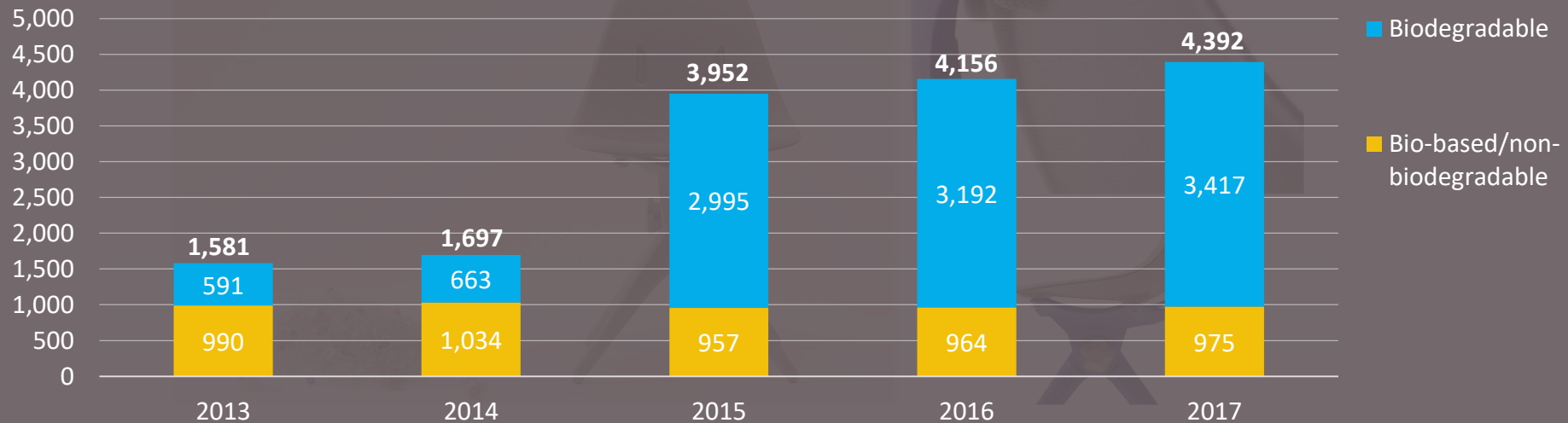
The global plastics system is a cause for serious concern



Biodegradable plastics are one innovation to reduce the damage caused by plastic waste

Global production capacities of bioplastics are rising

In 1,000 tonnes



SOURCE: European Bioplastics; Nova Institute; Generation



Food systems are slowly becoming more sustainable

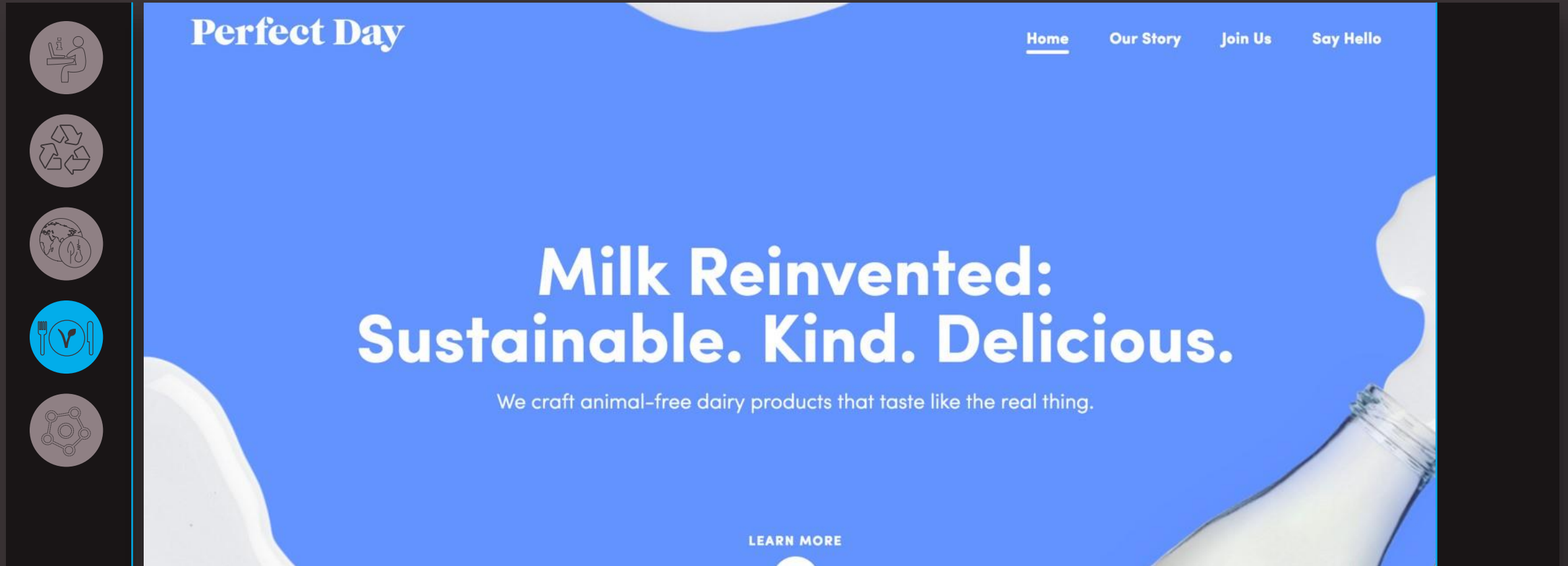


IMAGE: Perfect Day

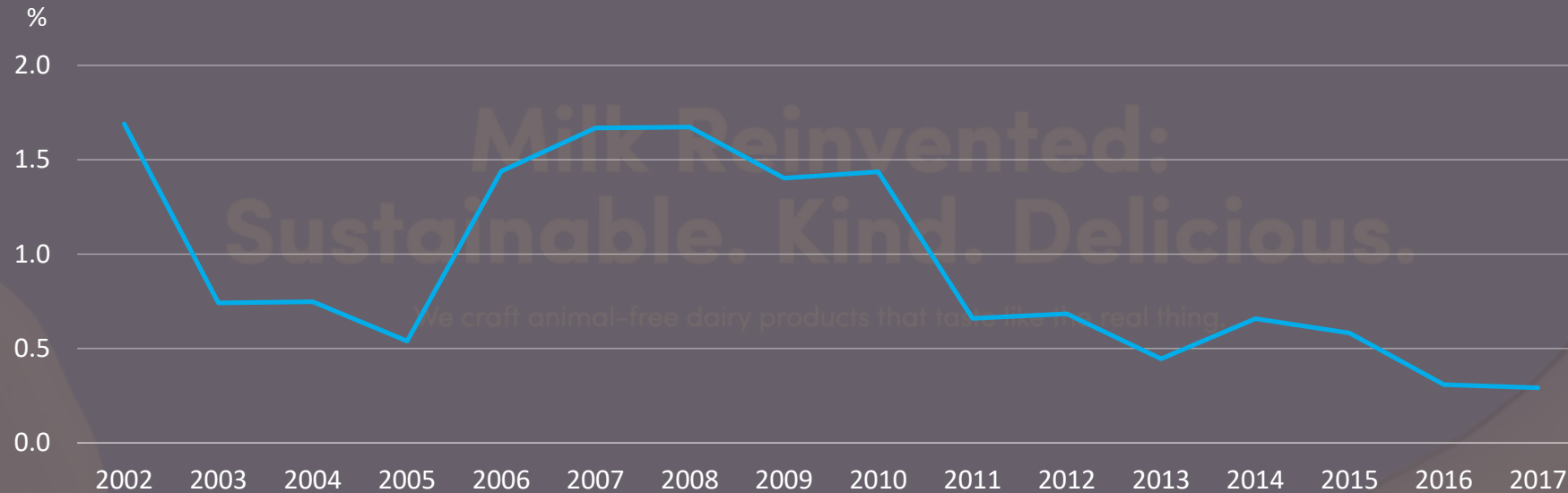
Sustainable innovations in food and agriculture are making it increasingly easy to forgo animal products and still have an enjoyable diet

Food systems are slowly becoming more sustainable



The growth of per capita meat consumption is slowing

Growth rate of global per-capita meat* consumption in kg, three-year moving average, 2001-17



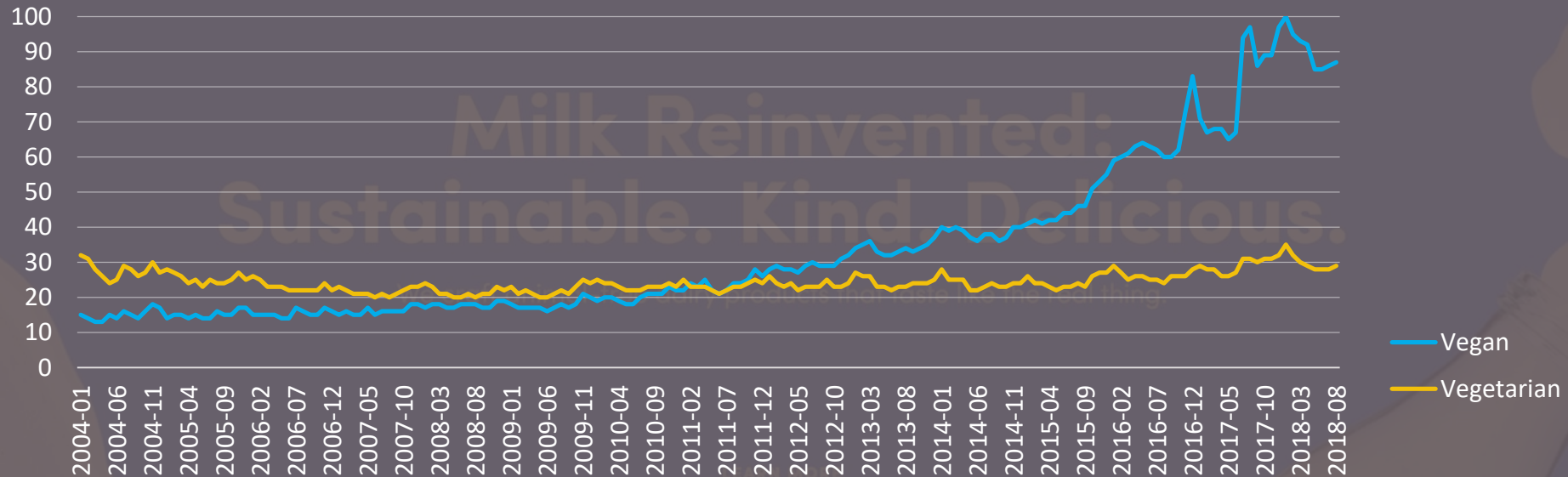
SOURCE: OECD; FAO; Generation. * "Meat" comprises sheep, pig, beef and poultry

Food systems are slowly becoming more sustainable



Consumers are increasingly interested in veganism and vegetarianism

Popularity of global Google searches for "Vegan" and "Vegetarian"



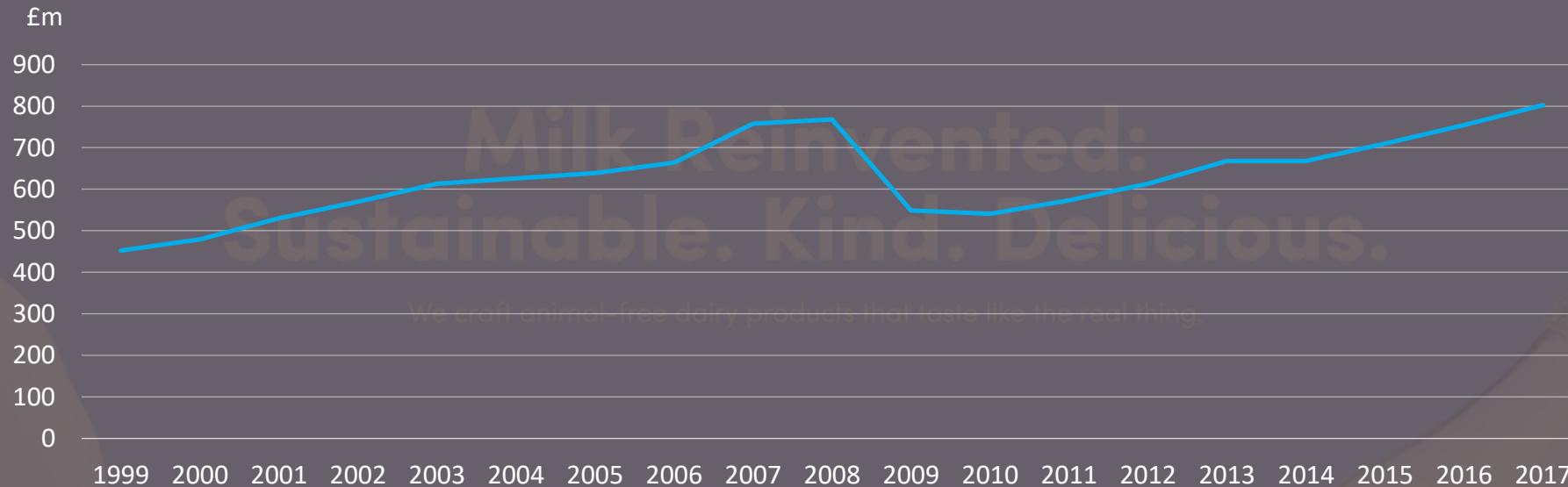
SOURCE: Google Trends

Food systems are slowly becoming more sustainable



Yet though consumers are seeing the benefits of a diet based less on meat, alternatives were still under 5% of overall meat sales in 2017

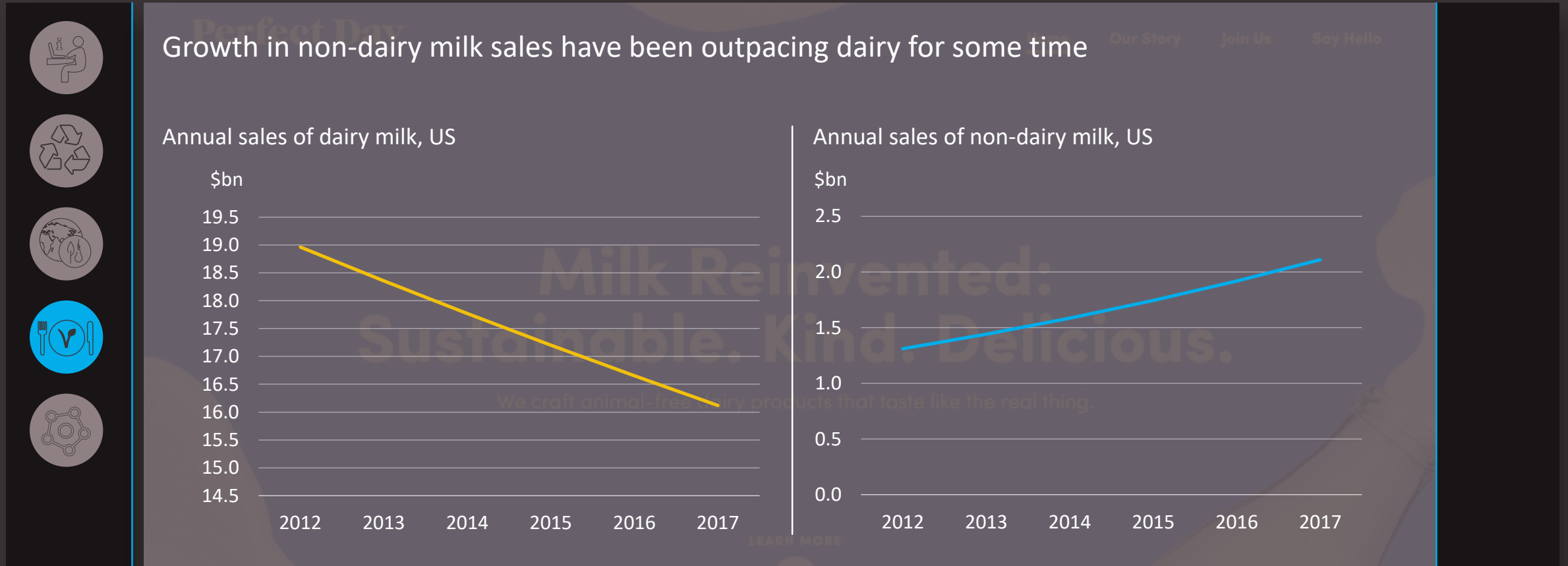
Annual sales of vegetarian meat alternatives, UK, 1999-2017



SOURCE: DEFRA; ONS; Generation



Food systems are slowly becoming more sustainable



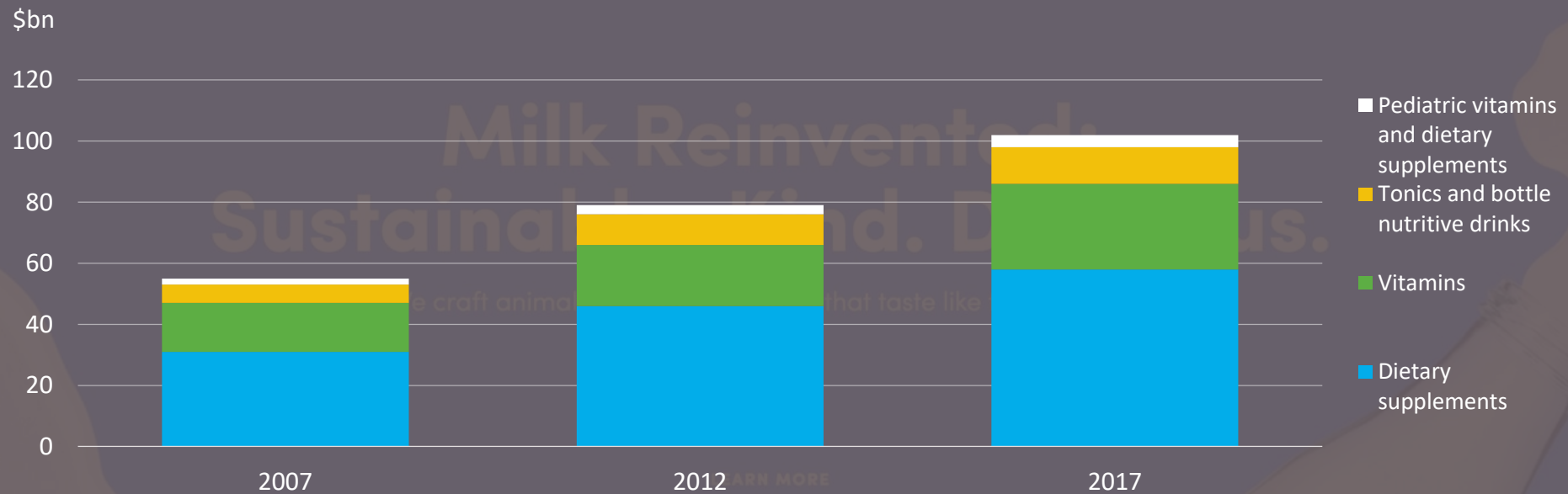
SOURCE: Mintel; Generation

Food systems are slowly becoming more sustainable



People are also proactively looking elsewhere for more viable forms of nutrients

Size of the vitamin, mineral and supplement market worldwide, 2007-2017



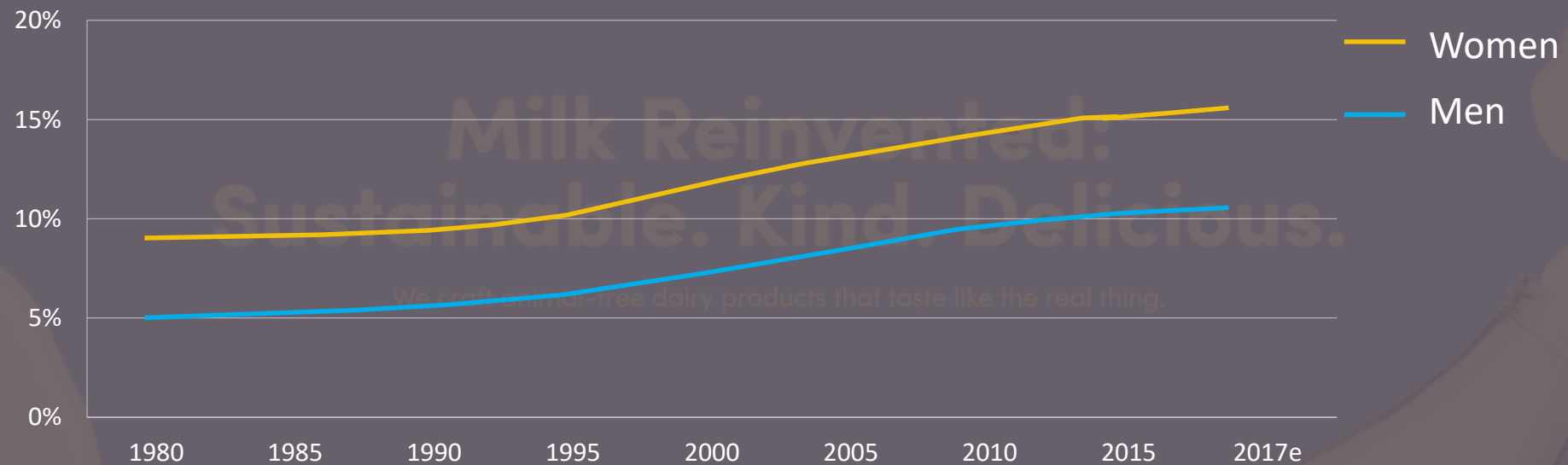
SOURCE: Statista

Food systems are slowly becoming more sustainable



Yet, despite much progress around nutrition, the rate of obesity continues to rise. It is now estimated that there are more obese people than underweight

Global obesity rate, %



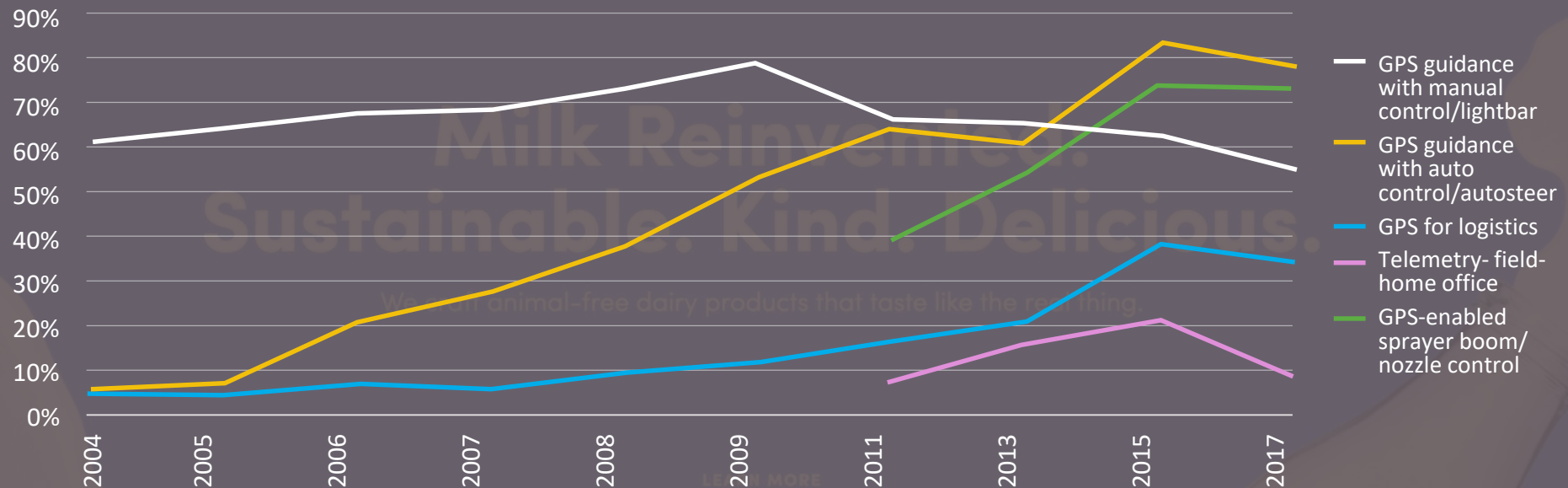
SOURCE: Institute for Health Metrics and Evaluation; National Center for Health Statistics; National Institutes of Health; National Health Service; Generation

Food systems are slowly becoming more sustainable



Additional focus is also being paid to the sustainability of food inputs, as agricultural and earth observation technologies see heightened capital investments and increased use cases

% of ag dealers offering technologies, US*



SOURCE: Union for Concerned Scientists; Croplife. *The technologies shown in this chart are some of the most important production technologies used in high-productivity farming



Businesses are enabling consumers to switch to more sustainable choices by being open and accountable



The screenshot displays the FoodLogiQ dashboard interface. At the top left is the FoodLogiQ logo. Below it is a navigation menu with categories like Dashboard, Connections, Suppliers, Reports, Master Data, Products, Locations, Documents, Events, Chain Management, 2nd Party Audits, 3rd Party Audits, Assessments, Workflows, Quality Management, Incidents, Investigations, and Withdrawals. The main content area features a search bar, a date filter for 'Incident Date: Last 60 days', and three data visualizations:

- Incident Timeline:** A line graph showing the number of incidents from Jan 31, 2017, to Mar 13, 2017. The y-axis ranges from 0 to 20. There are several small peaks in early February and a significant double peak in late February/early March, reaching nearly 20 incidents.
- Incidents by Location:** A map of the Southeastern United States (Alabama, Georgia, South Carolina, North Carolina, Tennessee) with colored dots indicating incident locations. A blue dot is prominent in Alabama, and a yellow dot is in North Carolina.
- Incidents by Type:** A pie chart showing the distribution of incident types. The legend includes: Test image kind (green), Mold (dark blue), Foreign Object (purple), Packaging issue (pink), General Only (orange), Test photo upload (light green), Default setup (light blue), Confirm Receipt of Email (light purple), and Mold - other supplier (magenta).

IMAGE: FoodLogiQ
Innovations in supply chain technology will make it ever-easier to assess food sustainability and provenance

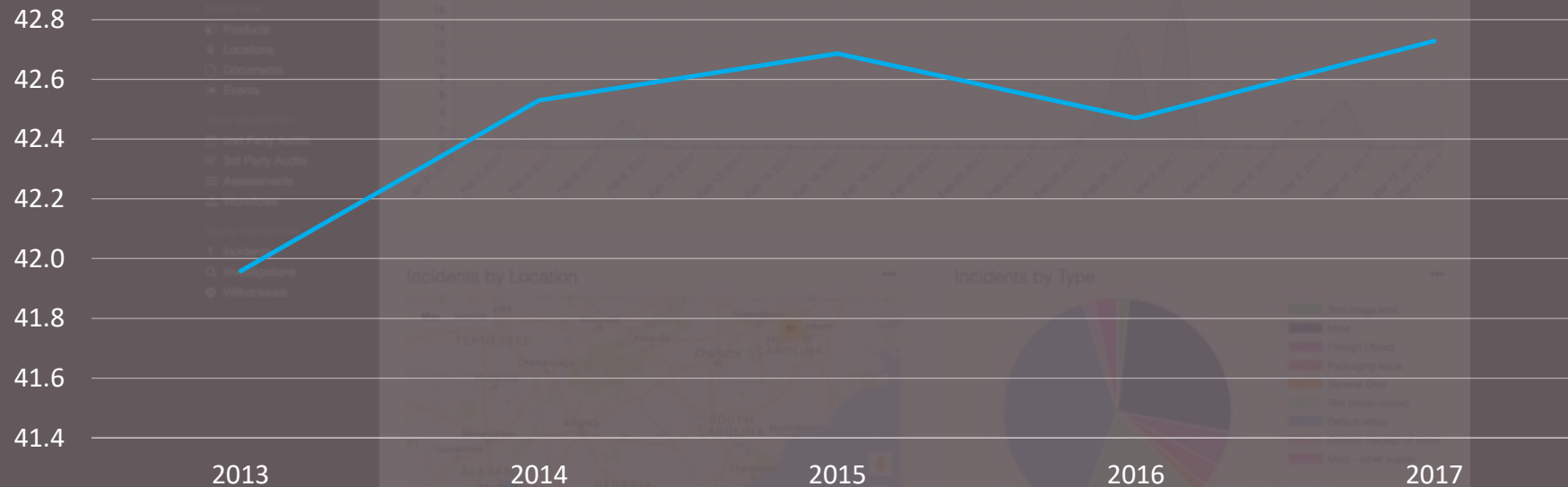


Businesses are enabling consumers to switch to more sustainable choices by being open and accountable



Businesses are becoming more transparent, enabling consumers to make the right choice. This may, however, be threatened by rising protectionism

Average global corruption-perceptions index, global*



SOURCE: Generation analysis of Transparency International data.

*For this index a higher score is better.

Businesses are enabling consumers to switch to more sustainable choices by being open and accountable









Innovations in blockchain* technology may make supply chains more transparent







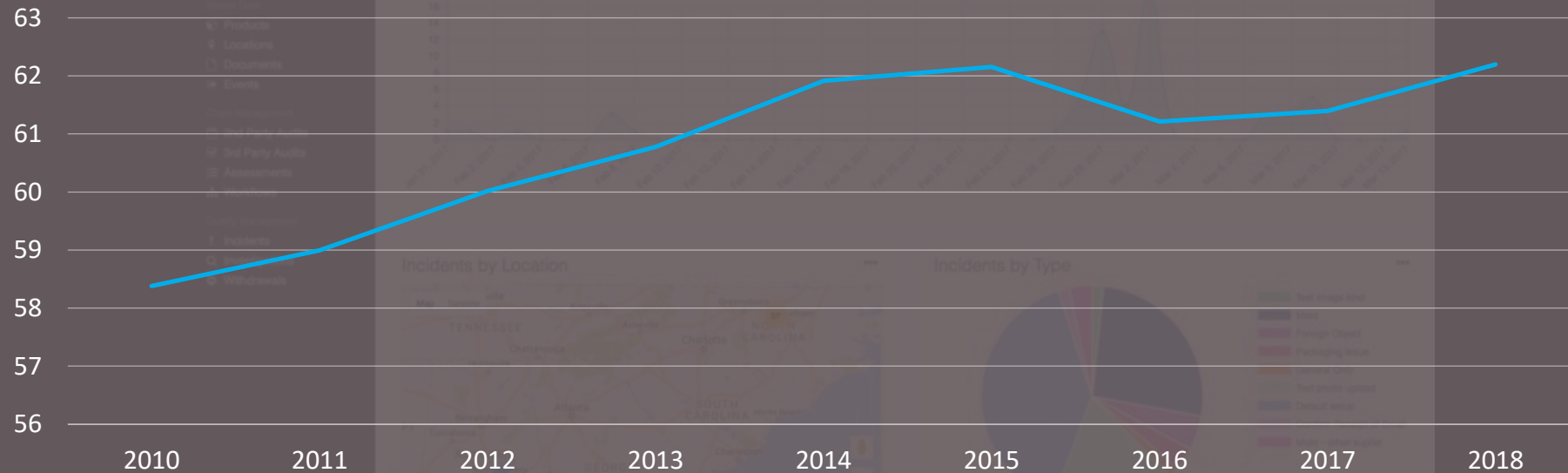
*Supply chains represent a strong use-case for blockchain technology given that they can span hundreds of stakeholders, geographies and stages over time

Businesses are enabling consumers to switch to more sustainable choices by being open and accountable



Governments are becoming more open and accountable, which makes it easier for businesses to comply with regulation

The average Doing Business score across the world has been rising



SOURCE: Generation analysis of World Bank data. Only those countries with data for every year in 2010-18 are used in the calculations. A Doing Business score assesses how easy it is to do a range of different commercial tasks, including paying taxes and complying with regulations

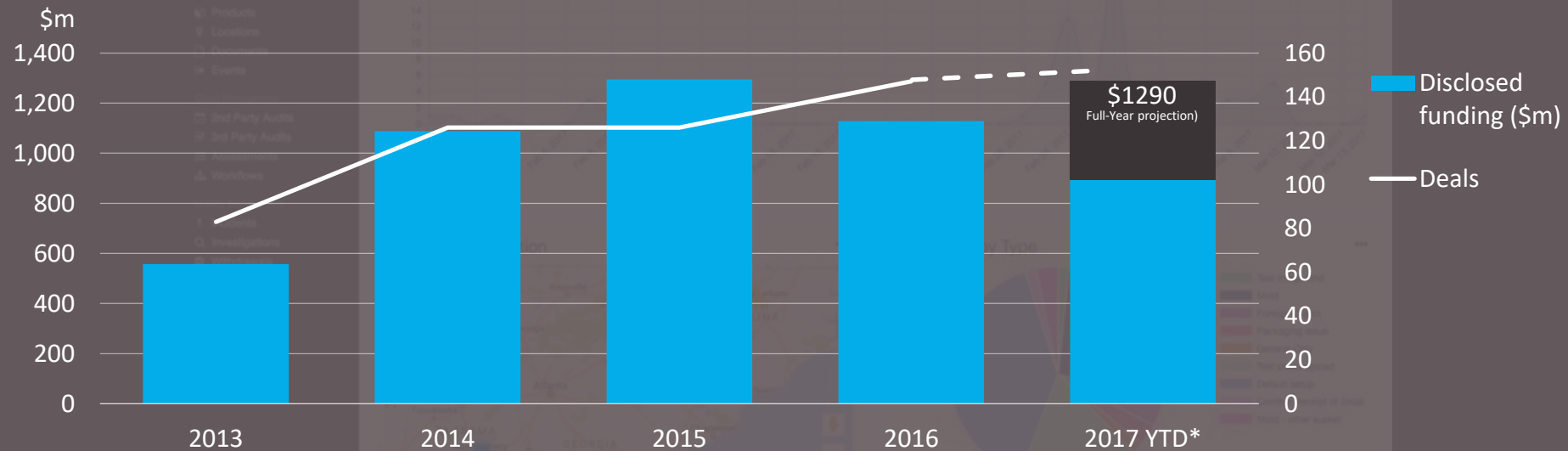


Businesses are enabling consumers to switch to more sustainable choices by being open and accountable



The market encouraging company compliance with regulation is growing

“RegTech” – or “compliance technology” – annual deal count and value, global



SOURCE: CB Insights *To autumn 2017

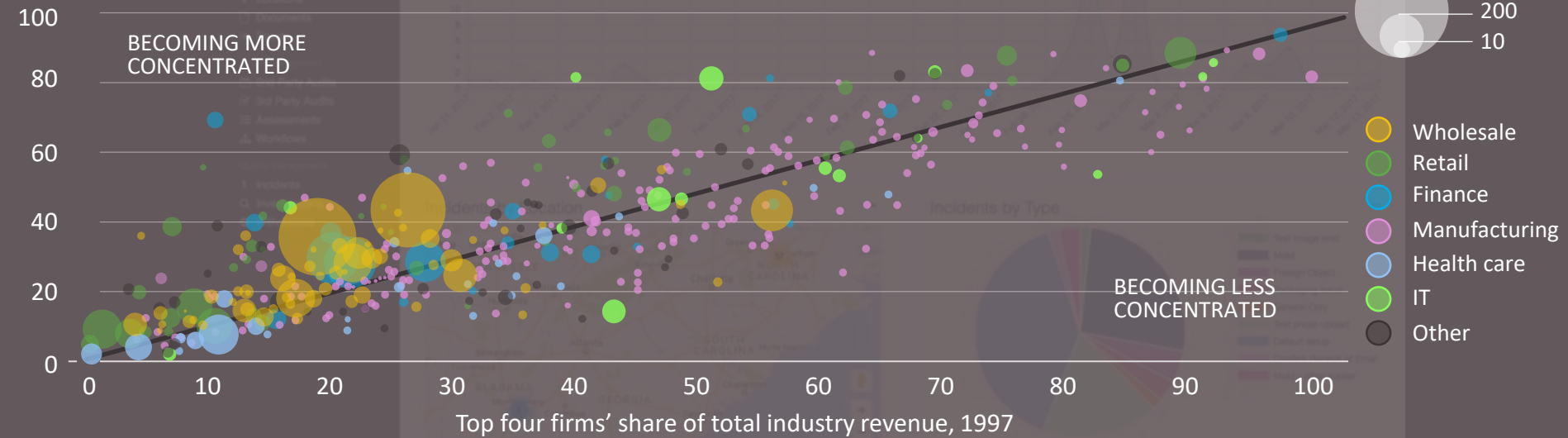
Businesses are enabling consumers to switch to more sustainable choices by being open and accountable



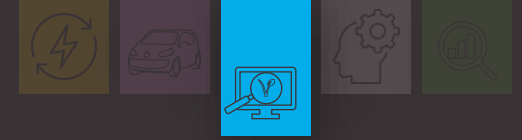
Yet there is growing concern that capitalism is becoming less competitive

Top four firms' share of total industry revenue, %
United States, 893 industries, grouped by sector

Top four firms' share of total industry revenue, 2012



SOURCE: US Census Bureau; *The Economist*. The larger the circle, the larger the industry. *Latest available data, 2007 or 2012

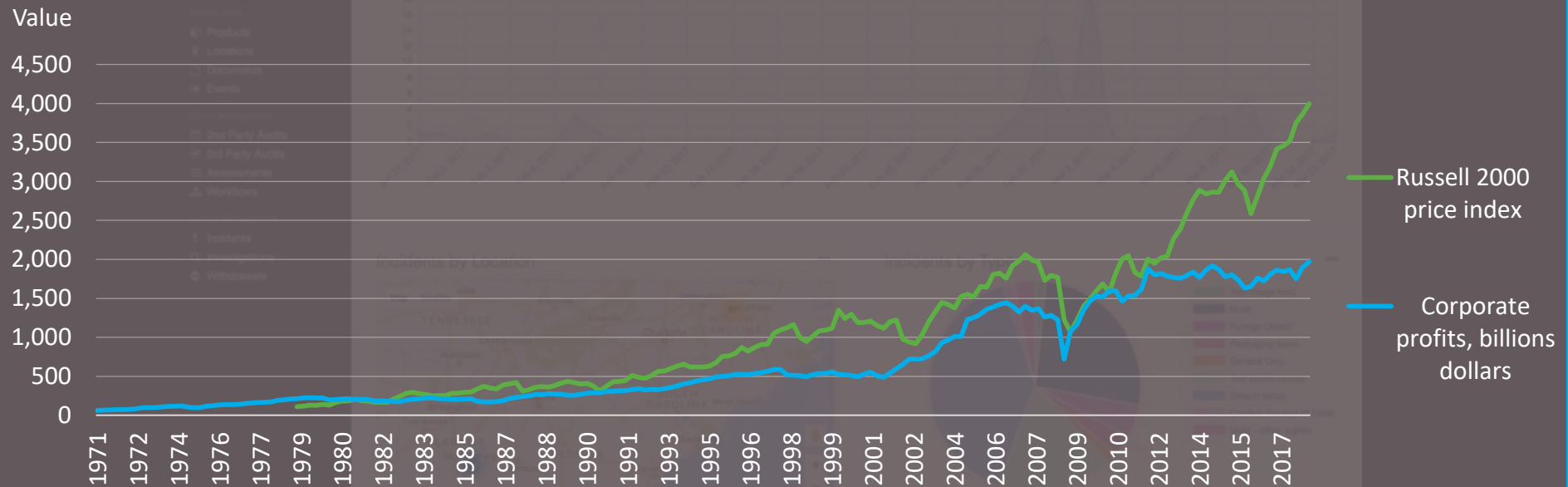


Businesses are enabling consumers to switch to more sustainable choices by being open and accountable



A symptom of weakened competition may be high corporate profitability, as companies are able to extract higher rents

Corporate profits & stock market indices, 1971-2017



SOURCE: Federal Reserve Bank of St Louis. The Russell Index comprises largely domestically oriented firms (in America).

Trends we continue to track



New business models related to the “circular economy”



The localisation of food chains, comprising everything from farmers’ markets to urban agriculture



Consumer demand for transparency and sustainable products in the long-term



Progress towards zero-deforestation supply chains



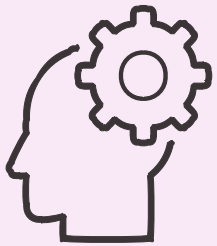
Whether public and private sectors face increased questioning about the current model of short-termist capitalism



Whether “conspicuous consumption” begins to take on a negative connotation among a growing percentage of millennials and centennials



And others...



Health and wellbeing



Section summary

Mortality rates around the world continue to fall, especially those associated with communicable diseases. Cancer survival rates are improving, though deaths from other non-communicable diseases have risen.

Pressure on healthcare costs are only set to increase. But consumers are assuming more responsibility for taking care of their own health. And private investment in health care is rising.

But there is much more to be done. The private sector invests little in some important diseases. And some health measures are worsening.

Sustainable human wellbeing
is characterised by:



Ubiquitous
positive health
outcomes



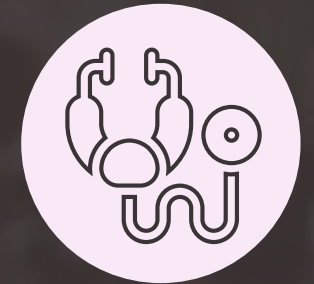
Strong social
safety nets
and improved
health-care
efficiencies



Emphasis on
prevention
as well as cure



Proactive
responsibility for
one's health



Breakthroughs in
new medical
technologies



There is mixed progress in improving physical and mental health



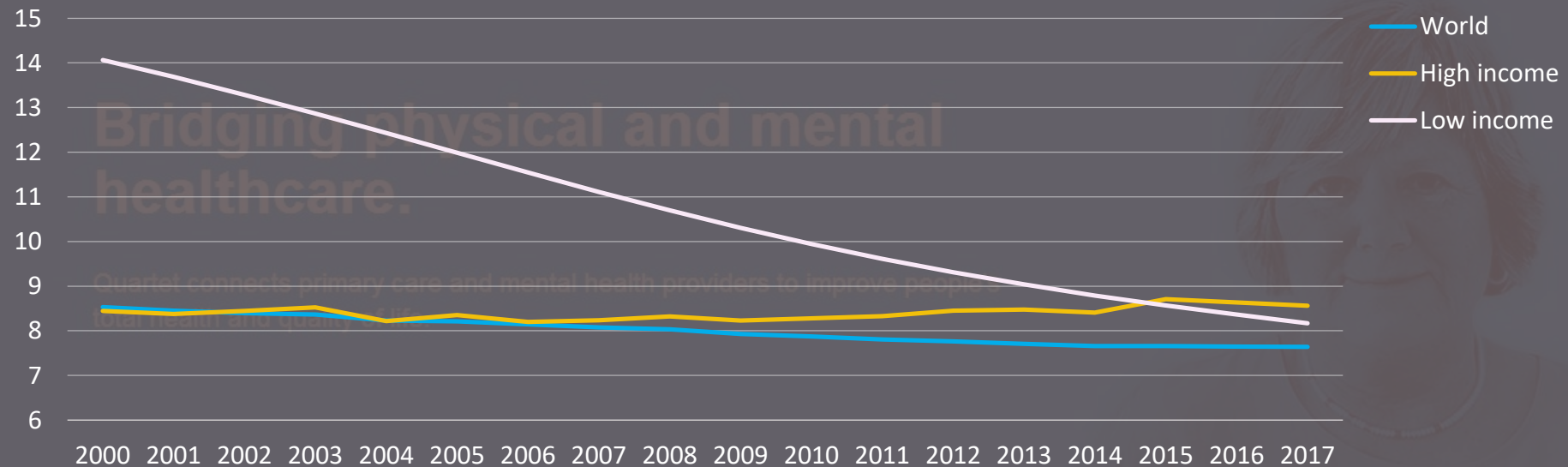
IMAGE: Quartet Health
It is early days yet, but more solutions are emerging to bridge mental and physical care

There is mixed progress in improving physical and mental health



Global mortality rates are declining, driven by improved survival rates in many diseases

Mortality rate, crude, per 1000, 2000-2017



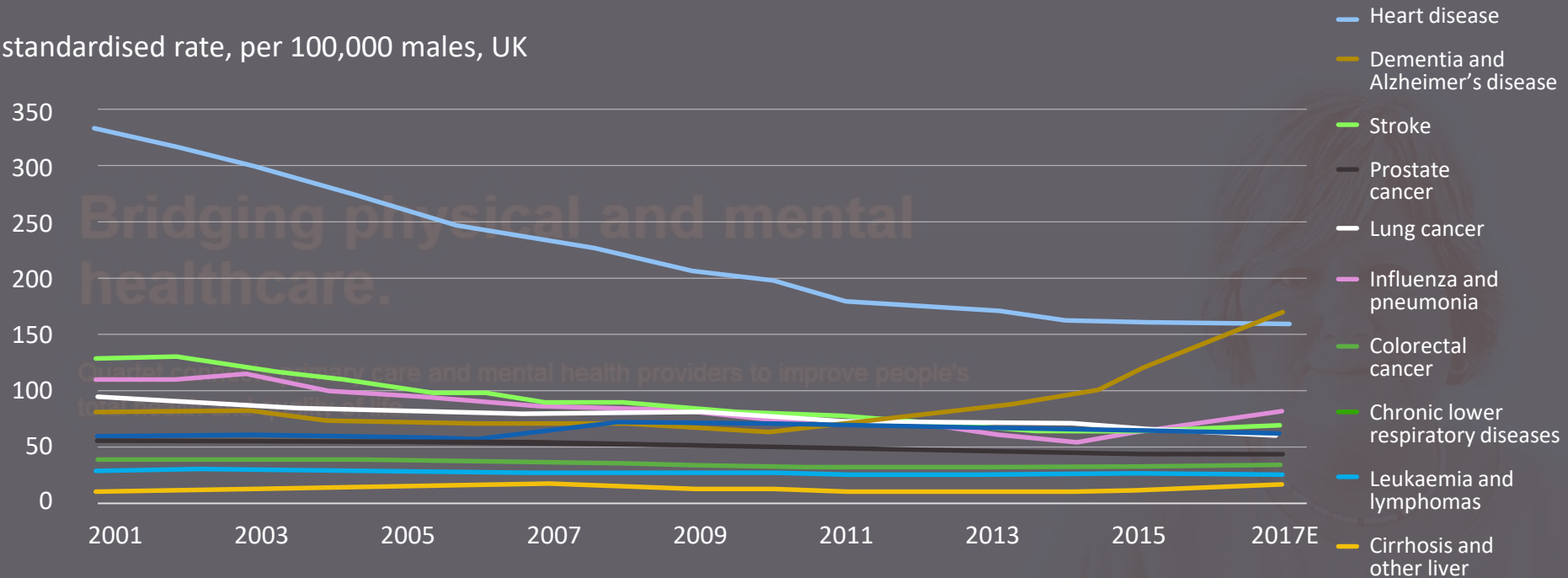
SOURCE: World Bank. Angus Deaton's work has documented rising mortality among middle-class white Americans in recent years

There is mixed progress in improving physical and mental health



In developed countries, mortality rates for many non-communicable diseases are on the decline, offset by a notable increase in deaths from dementia and Alzheimer's

Age standardised rate, per 100,000 males, UK



SOURCE: Public Health England; UK ONS

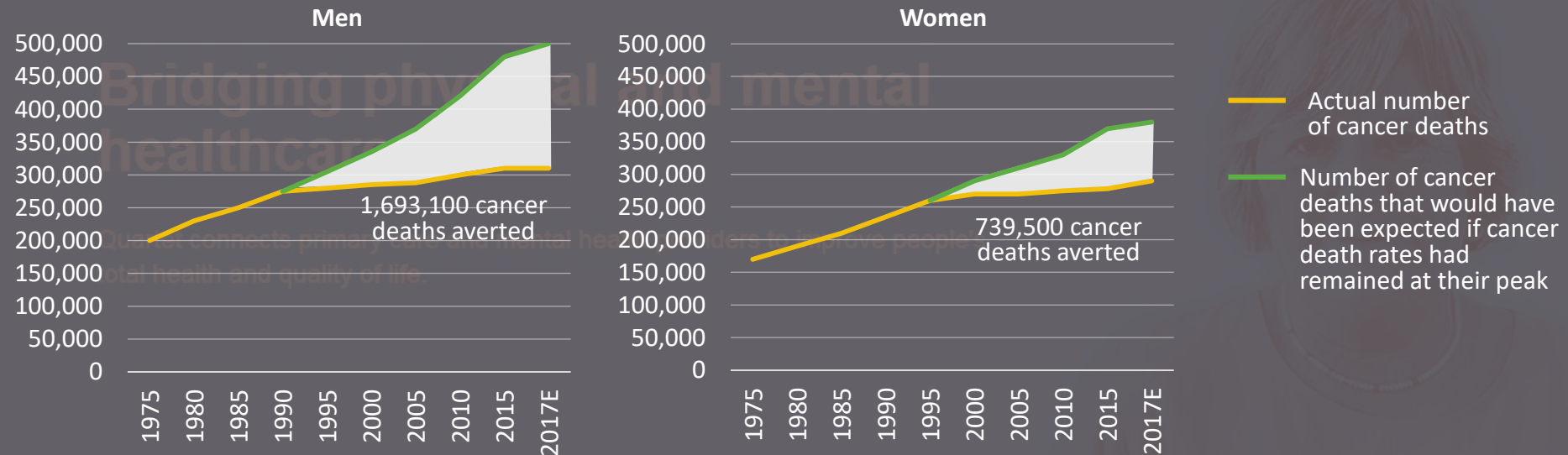
There is mixed progress in improving physical and mental health



In particular, innovation in cancer therapy has driven notable improvements in cancer survival rates

Total number of cancer deaths averted from 1991 to 2017 in men and from 1992 to 2017 in women, US

Number of deaths



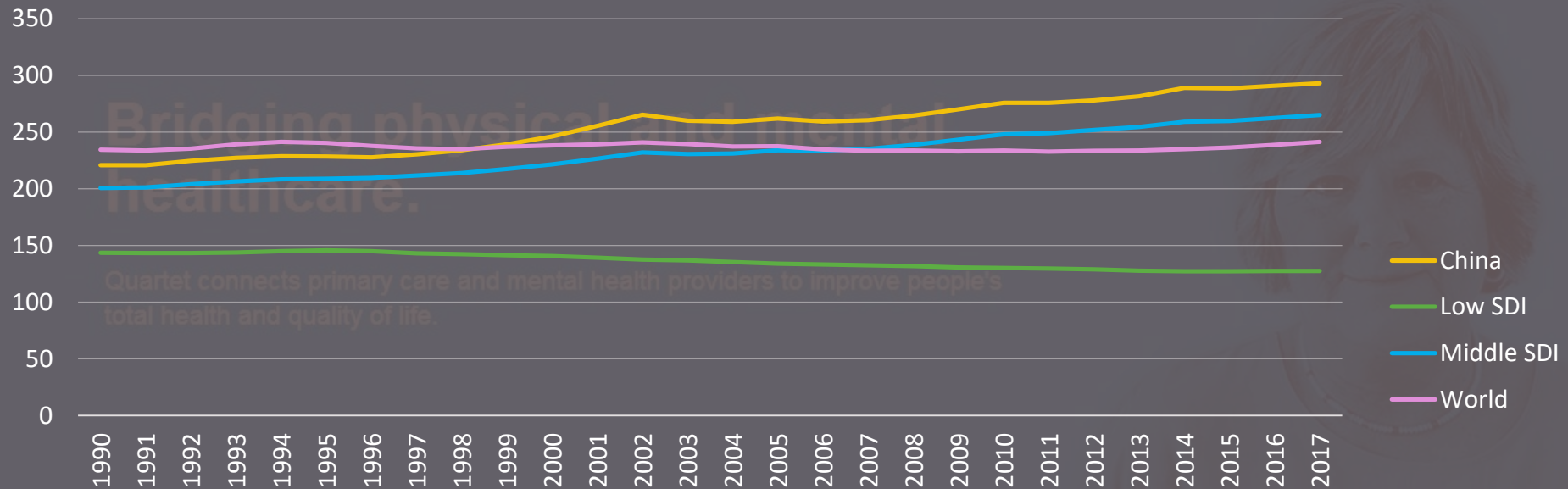
SOURCE: Siegel, R. L., K. D. Miller, and A. Jemal. "Cancer statistics, 2018 CA: a cancer. J Clin 68: 7–30." (2017); CDC; Generation

There is mixed progress in improving physical and mental health



In the developing world, economic development is driving the rise of non-communicable diseases, such as cardiovascular disease

Cardiovascular disease, death rate per 100,000



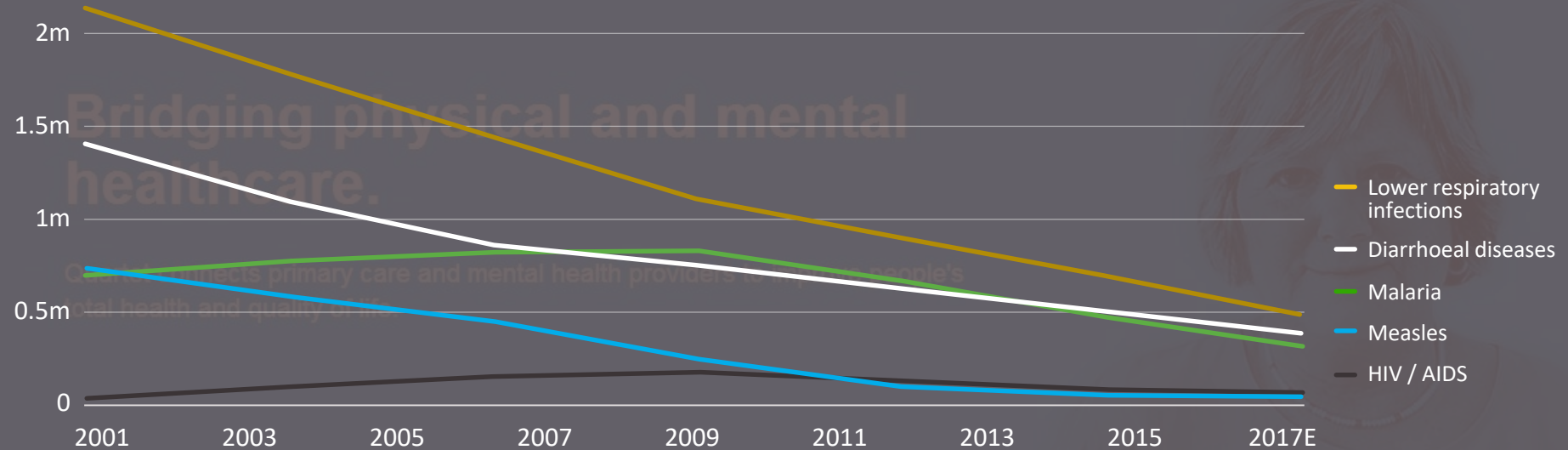
SOURCE: IHME, Global Burden of Disease

There is mixed progress in improving physical and mental health



Though death rates from many communicable diseases have tumbled in recent years ^{US}

Childhood deaths from the five most lethal infectious diseases worldwide



SOURCE: IMHE, Global Burden of Disease

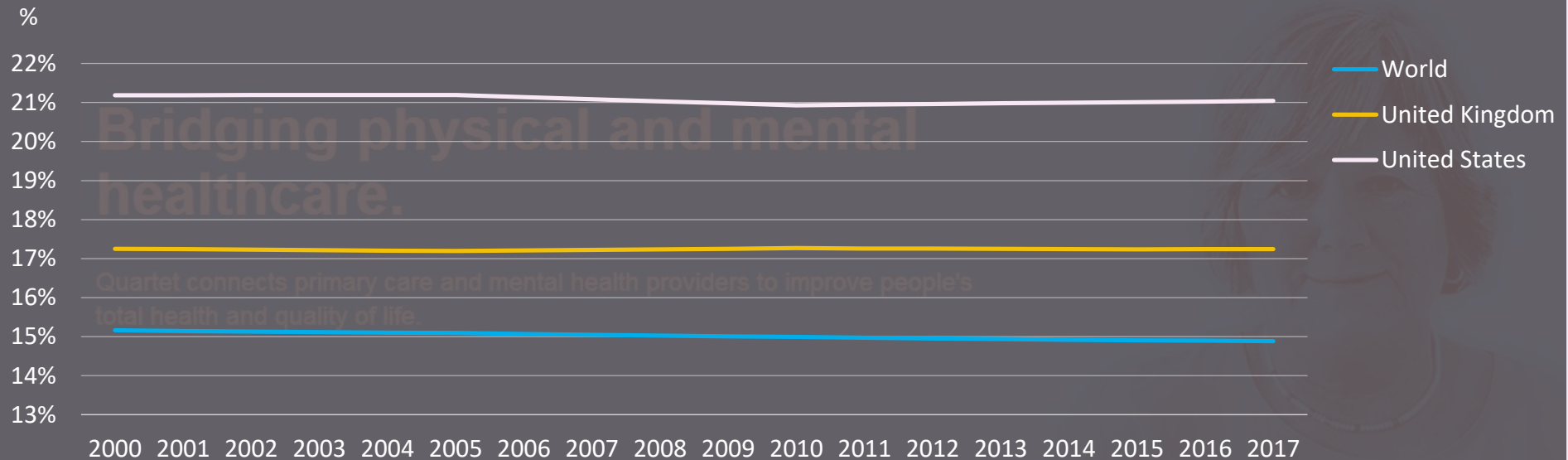
There is mixed progress in improving physical and mental health



But global rates of mental illness have not fallen

[For Plans](#) [For Patients](#) [About](#) [Blog](#) [Contact Us](#)

Share of population with any mental health or substance use disorder, global



SOURCE: IHME, Global Burden of Disease (GBD)

There is mixed progress in improving physical and mental health



And the gap in life expectancy between different social classes is growing

[Blog](#)

[Contact Us](#)

How many more years rich men can expect to live than poor men, 1987-2017, UK



SOURCE: UK Office for National Statistics; Generation. "Class 1" groups are those in higher professional and managerial occupations. "Class 7" groups are those in routine occupations

Pressure on health-care spending is only going to rise

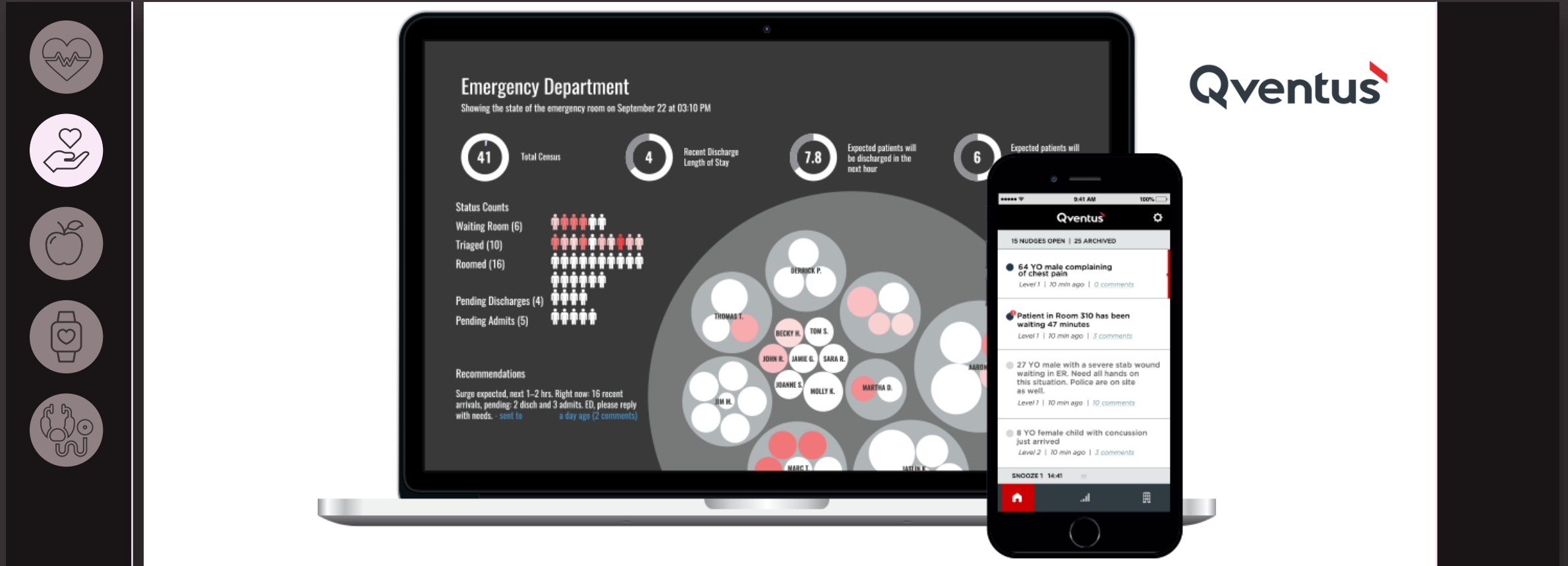


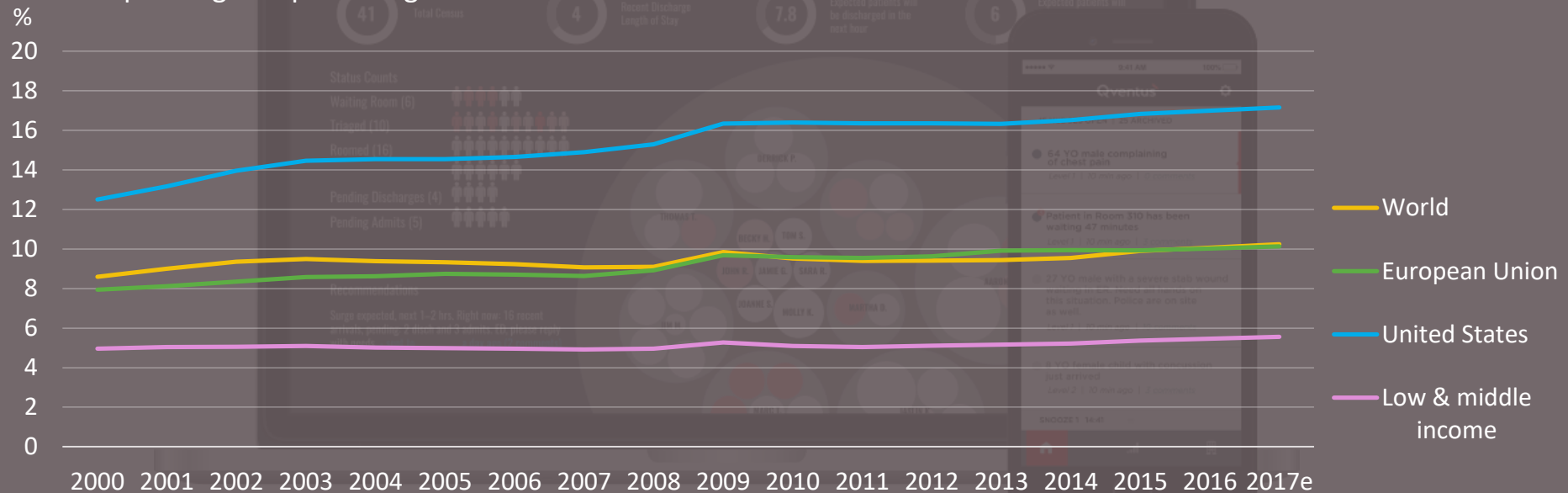
IMAGE: Qventus
New interventions to support hospital operations management may help alleviate inefficiencies in the system

Pressure on health-care spending is only going to rise



Overall health-care spending as a share of GDP continues to rise globally

Health-care spending as a percentage of GDP



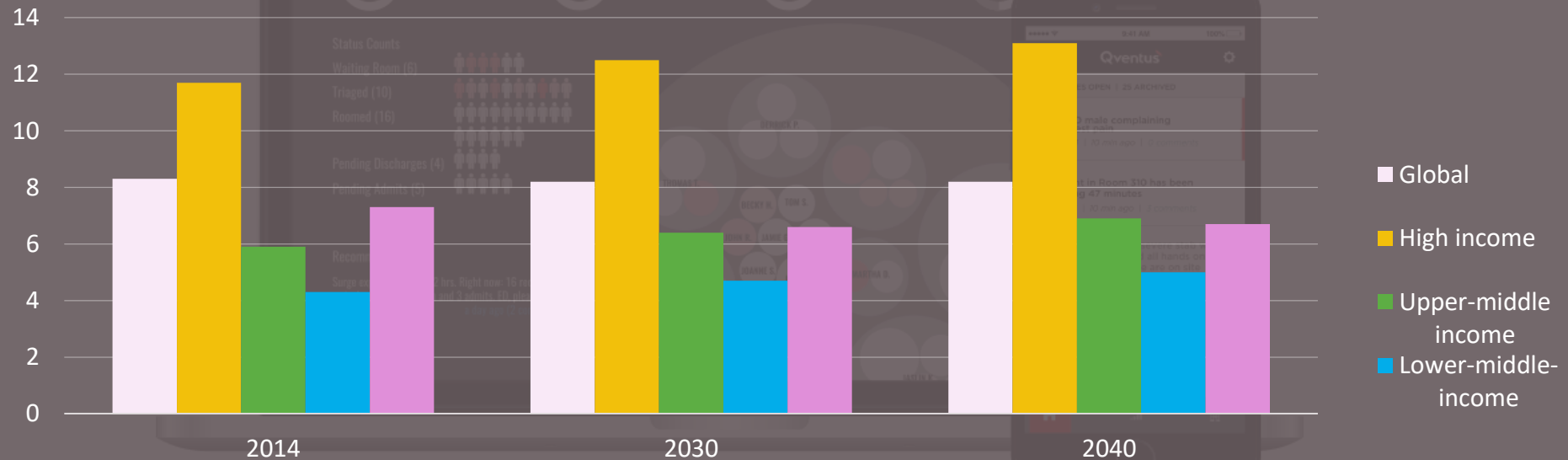
SOURCE: World Bank; Generation

Pressure on health-care spending is only going to rise



This is expected to continue

Spending on health care as a percentage of GDP



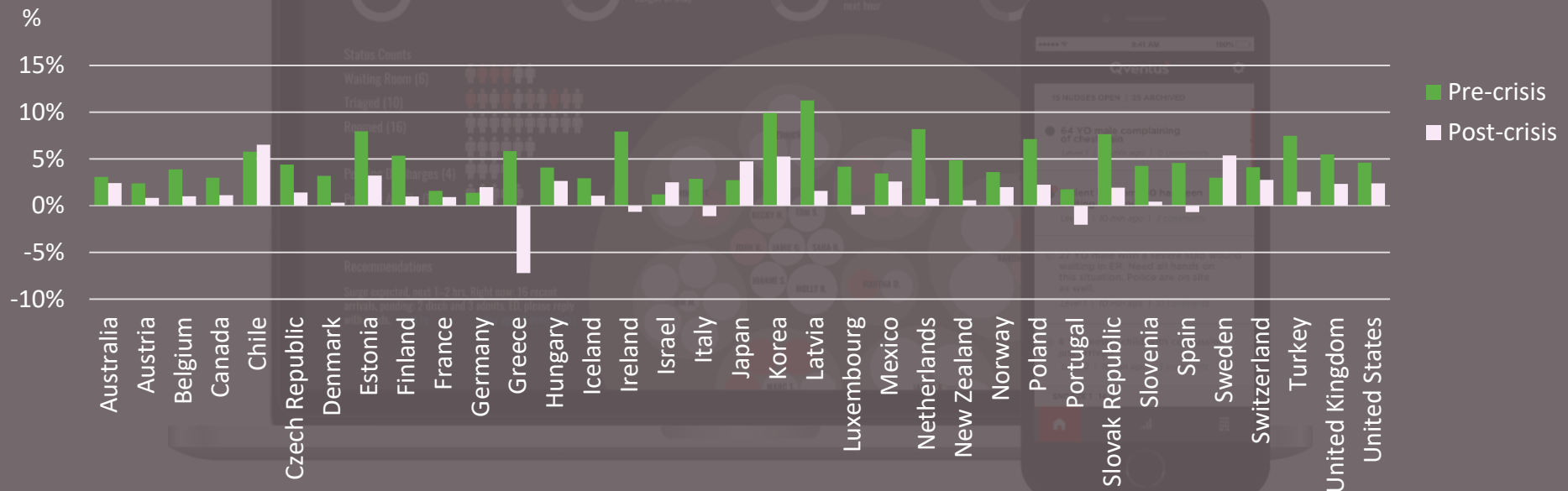
SOURCE: Dieleman, Joseph L., Madeline Campbell, Abigail Chapin, Erika Eldrenkamp, Victoria Y. Fan, Annie Haakenstad, Jennifer Kates et al. "Future and potential spending on health 2015–40: development assistance for health, and government, prepaid private, and out-of-pocket health spending in 184 countries." *The Lancet* 389, no. 10083 (2017): 2005-2030.

Pressure on health-care spending is only going to rise



But the growth of public health-care spending has slowed as a result of the after-effects of the financial crisis

CAGR of real-terms per-capita growth in public-health spending, pre-crisis versus post-crisis



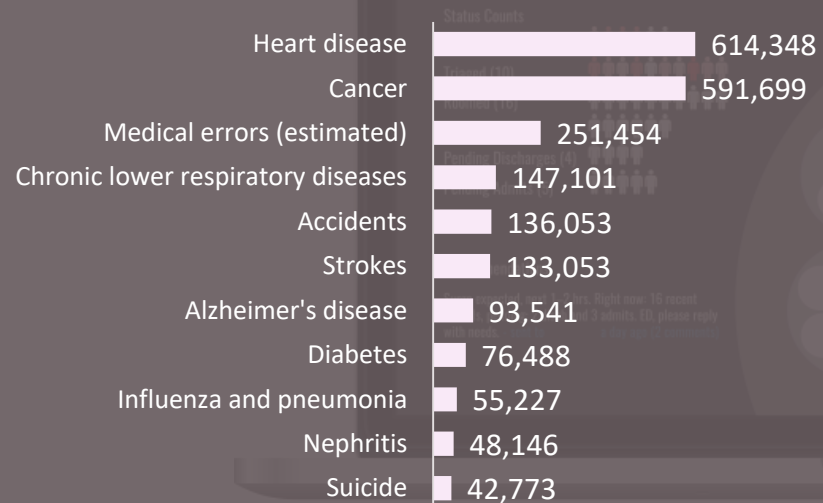
SOURCE: Generation analysis of OECD health-expenditure and financing data. "Pre-crisis" defined as 1998-2008. "Post-crisis" defined as 2008-18.

Pressure on health-care spending is only going to rise

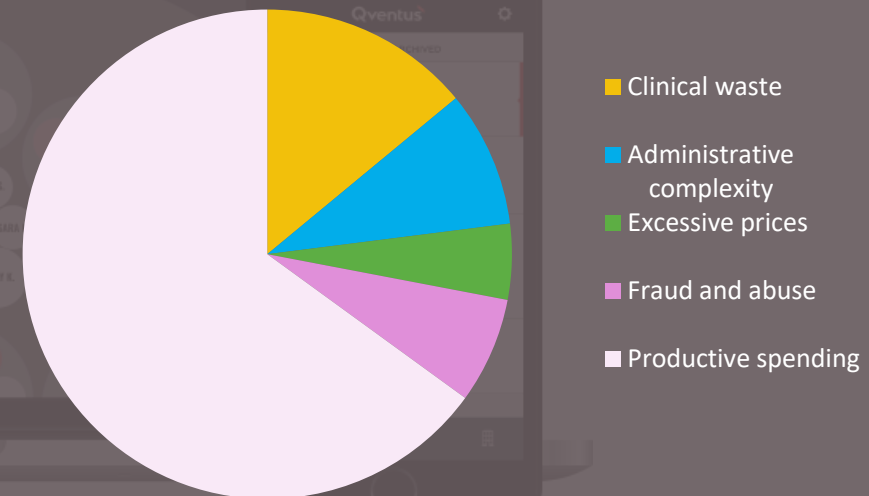


Furthermore, health-care systems continue to be riddled with inefficiencies: wastage and medical errors drive meaningful healthcare costs in the developed world

Medical errors are the third-highest cause of death in America



Over a quarter of health-care spending in America is wasted



SOURCE: Berwick, Donald M., and Andrew D. Hackbarth. "Eliminating waste in US health care." *Jama* 307, no. 14 (2012): 1513-1516; Makary, Martin A., and Michael Daniel. "Medical error—the third leading cause of death in the US." *BMJ* 353 (2016): i2139.

In an era of tight budgets, there are nonetheless innovations in the public-health* field



The screenshot shows the KRY website's main page. At the top left is the KRY logo. To the right are navigation links: Home, How it works, FAQ, About us, and Svenska. The main heading is "We are here for you" in green. Below it is a paragraph: "Our selected physicians and psychologists are seasoned GP's with experience from primary care. In total our doctors speak over 20 languages, for example Arabic, Spanish, Persian and Russian." Below this are four circular profile pictures of physicians, each with their name and title underneath. At the bottom center is the Socialstyrelsen logo.

Name	Title
Johan Flodin	Chief Medical Officer
Shina Kamran Hagh	ST-läkare, akutmedicin
Shapoor Hakimelahi	Leg. Läkare
Susanna Wahlund	Specialist i allmänmedicin

IMAGE: KRY

Technological innovations will hopefully improve access to medicines for typically underserved groups

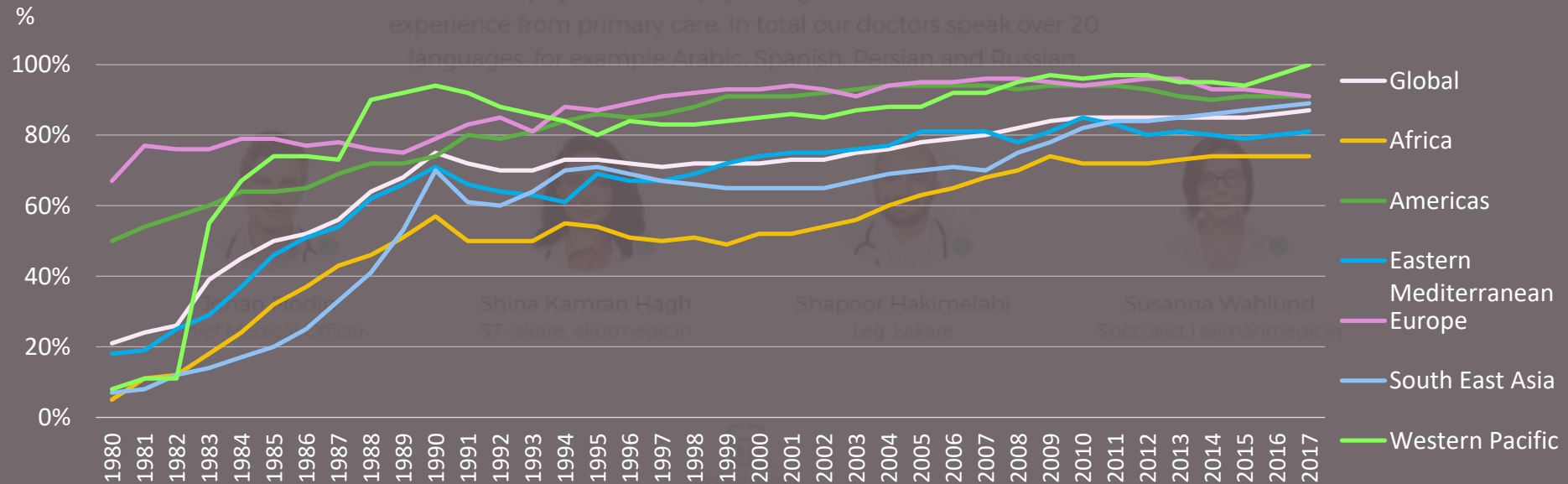
*Public health is defined as measures to improve lifestyles and reduce risk-factors in the population

In an era of tight budgets, there are nonetheless innovations in the public-health field



The coverage of immunisations has been rapidly increasing across the world

Global and regional immunisation coverage of diphtheria, pertussis and tetanus, 1980-2017



SOURCE: World Health Organisation; Generation

In an era of tight budgets, there are nonetheless innovations in the public-health field



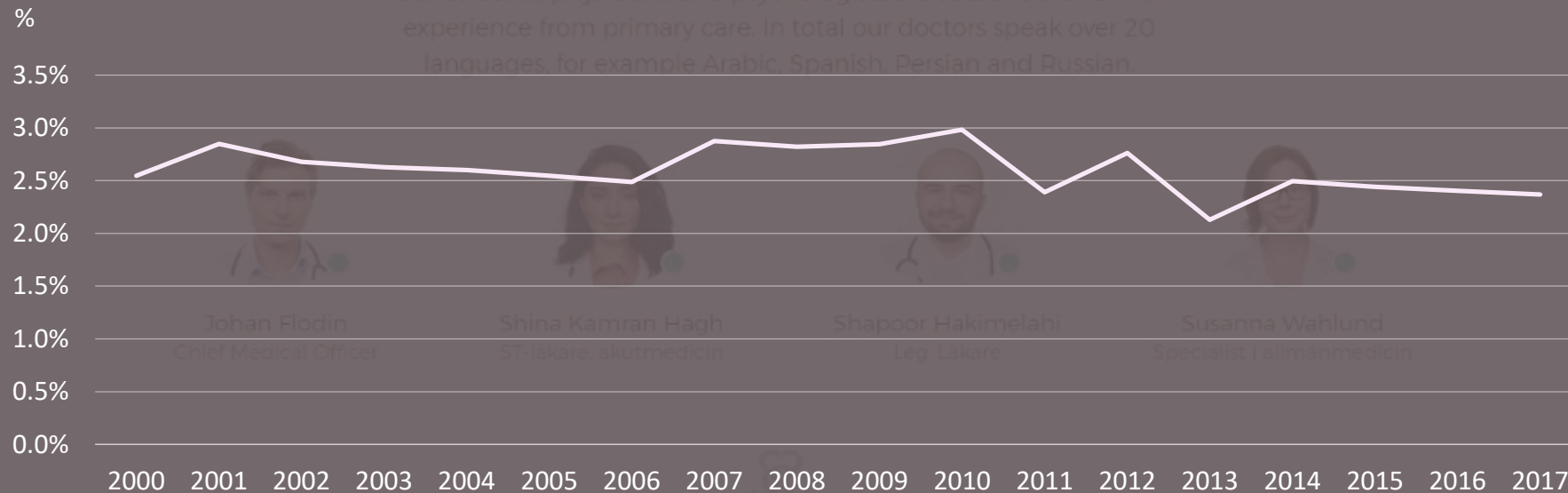
Though less money is being spent on prevention

Home How it works FAQ About us Svenska

We are here for you

Our selected physicians and psychologists are seasoned GP's with experience from primary care. In total our doctors speak over 20 languages, for example Arabic, Spanish, Persian and Russian.

Share of total health-care expenditure put towards prevention, OECD countries



Johan Flodin
Chief Medical Officer

Shina Amran Hagh
ST-läkare akutmedicin

Shapoor Hakimelahi
Lag Läkare

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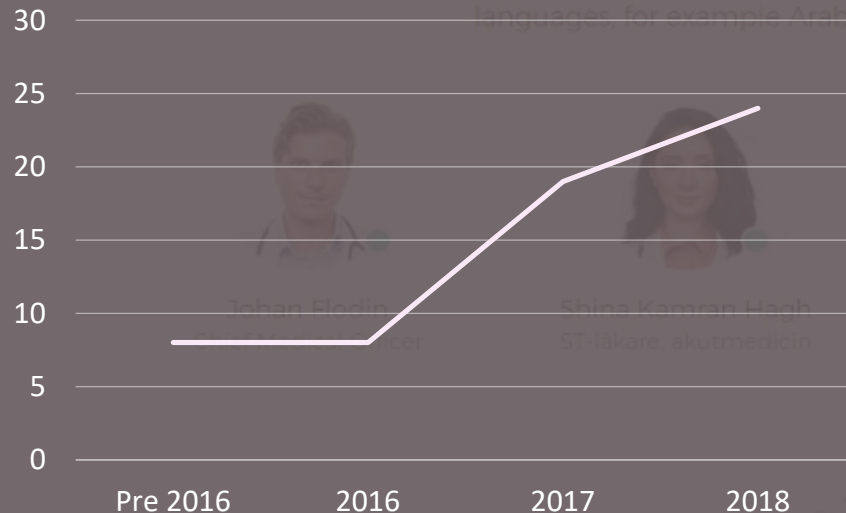
SOURCE: Generation analysis of OECD health-expenditure and financing data

In an era of tight budgets, there are nonetheless innovations in the public-health field



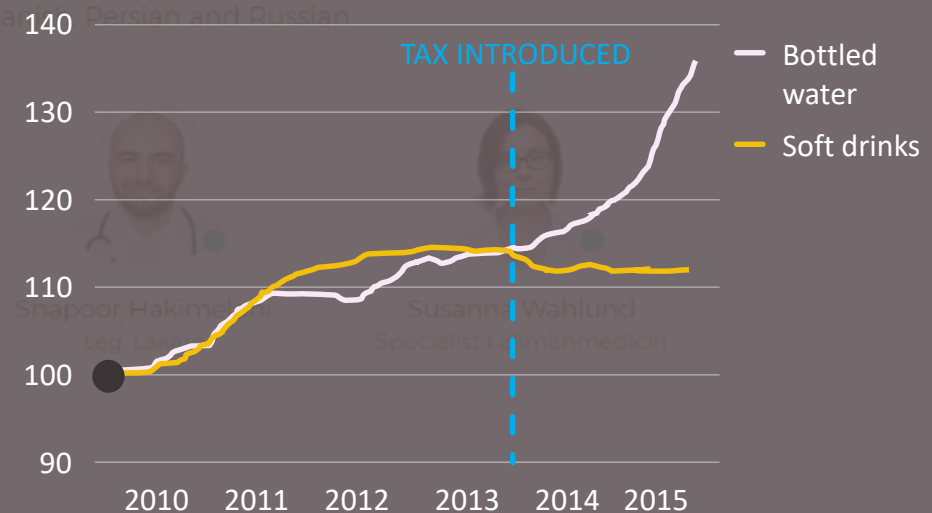
Instead, governments are seeking to improve public health through less costly measures: the number of jurisdictions introducing interventions such as sugar taxes is booming

Number of jurisdictions* worldwide with a sugar tax



The impact of sugar taxes on public health can be pronounced, as the case of Mexico's sugar tax shows

Sales, Jan 2010=100



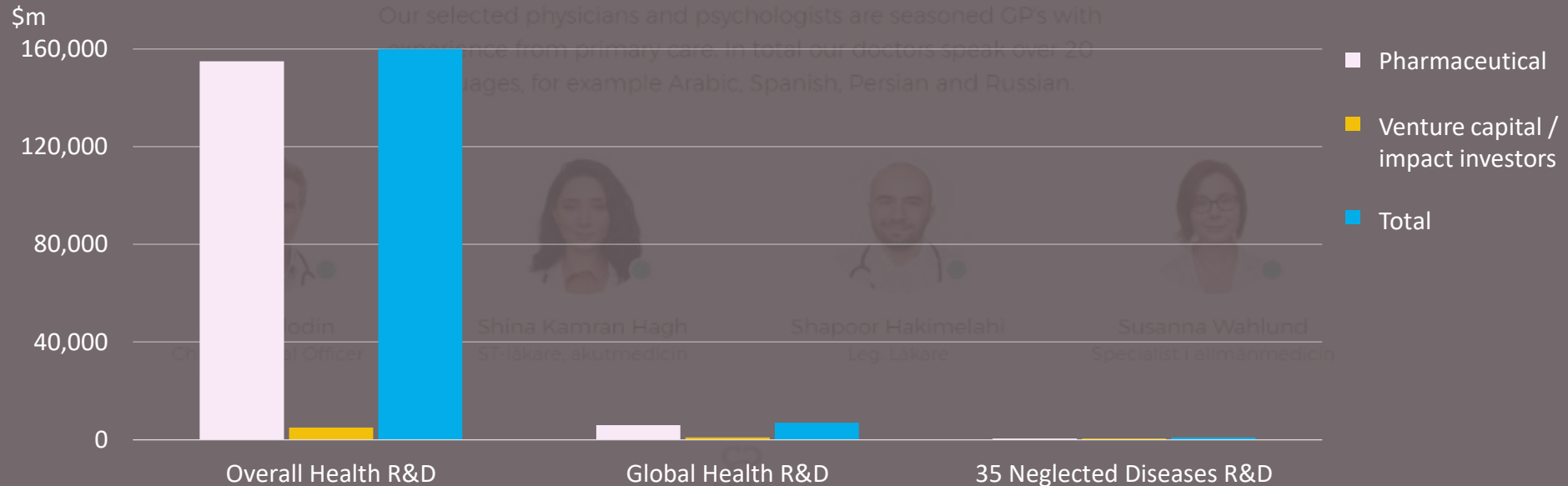
SOURCE: Generation analysis; Instituto Nacional de Estadística y Geografía; *The Economist*. *Defined as country, region or city. Bottled water, of course, has its own implications for sustainability

In an era of tight budgets, there are nonetheless innovations in the public-health field



The private sector is spending more on health-care R&D, though it still spends only a tiny fraction on certain diseases prevalent in the world's poorest countries

Private sector R&D on overall health, global health* and neglected diseases, 2016



SOURCE: Brookings Institution. *Global health emphasises medical treatments in the developing world

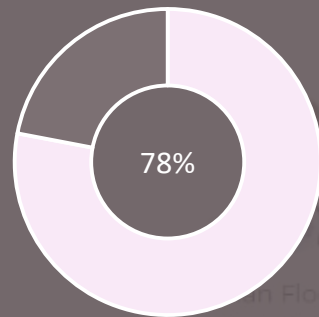
In an era of tight budgets, there are nonetheless innovations in the public-health field



Interventions such as telehealth may also have key implications for global public health through enabling access to regular advice and care

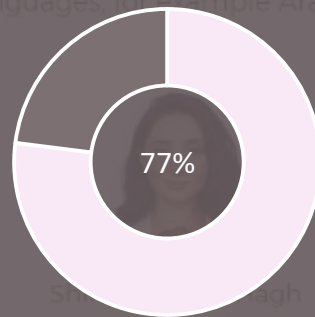
Percentages of health-care delivery organisations that are using video for telehealth or planning to use soon, US

Remote patient monitoring



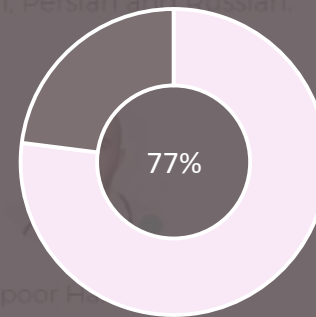
Video allows patients to ask questions so small issues don't become major complications

Virtual interaction



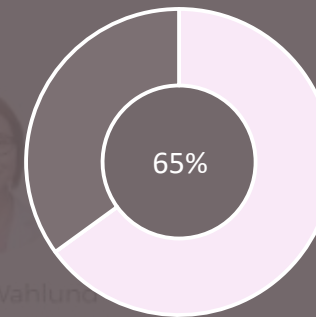
Video builds personal connections between patients, families and care-team members

Mobile health



Mobile video gives patients access to virtual care from any place, at any time

Store and forward



Video allows collaboration between care providers on complex cases

SOURCE: Hanover Research 2018 Trends In Telehealth Survey

Aided by technology, consumers are taking greater care of their health themselves



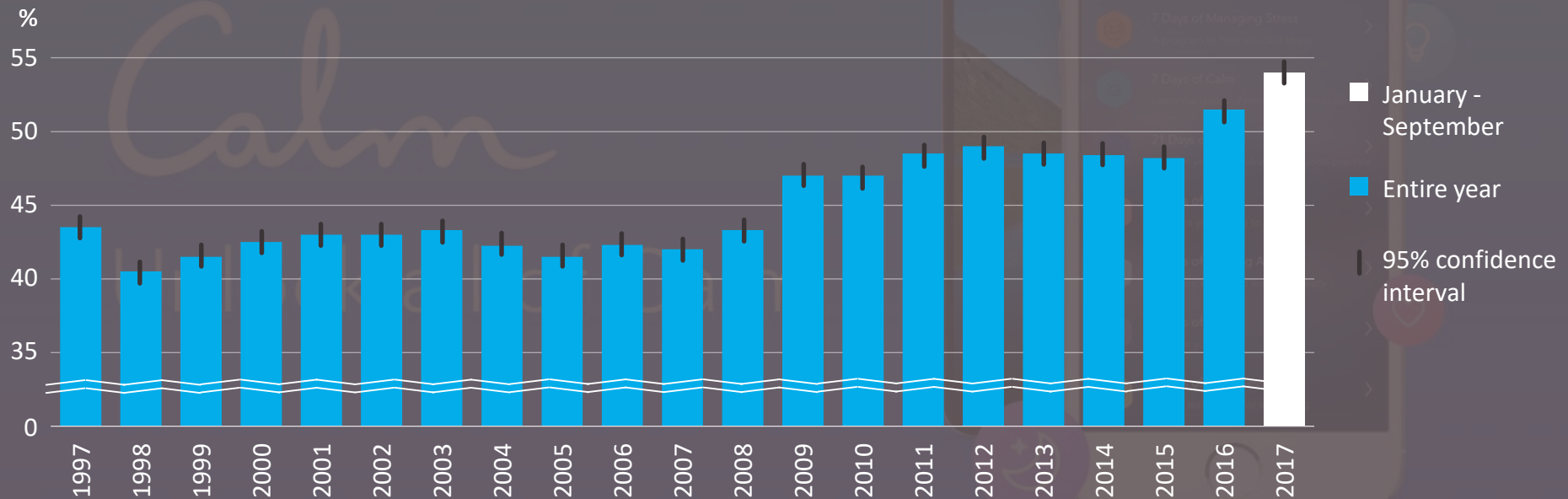
IMAGE: Calm
Telehealth, and other digital medicine tools, are enabling access to care for remote groups

Aided by technology, consumers are taking greater care of their health themselves



More and more adults are exercising regularly

Share of adults engaged in leisure-time physical activity, US



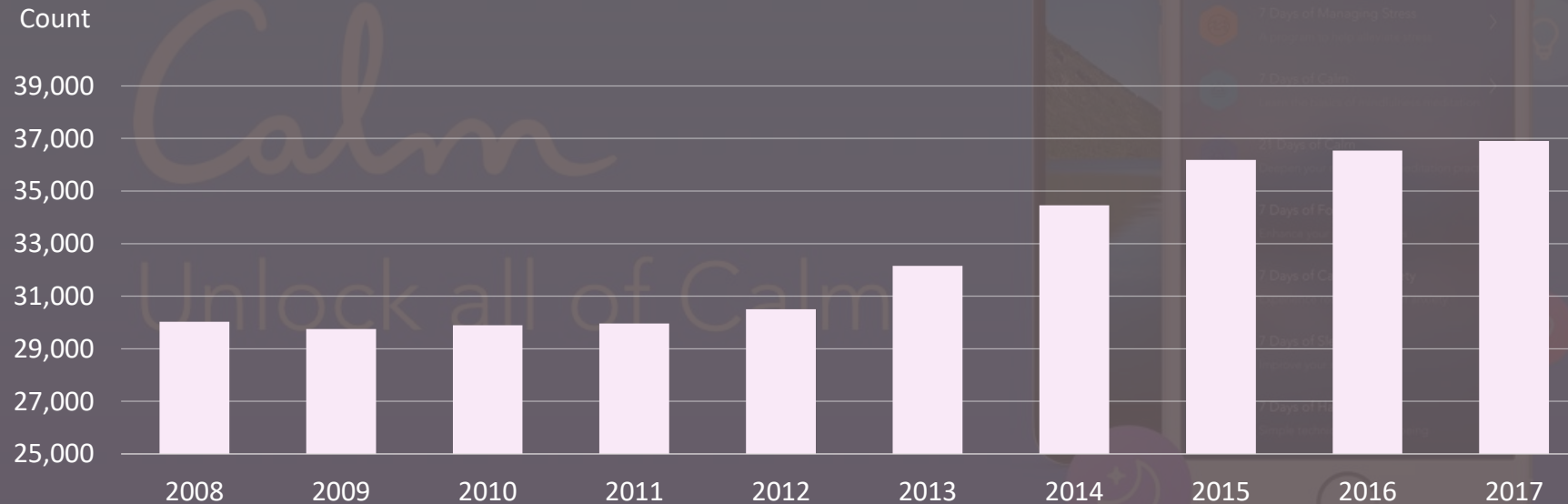
SOURCE: CDC

Aided by technology, consumers are taking greater care of their health themselves



The number of gyms is rising as people embrace healthier lifestyles

Number of gyms, US



SOURCE: Statista

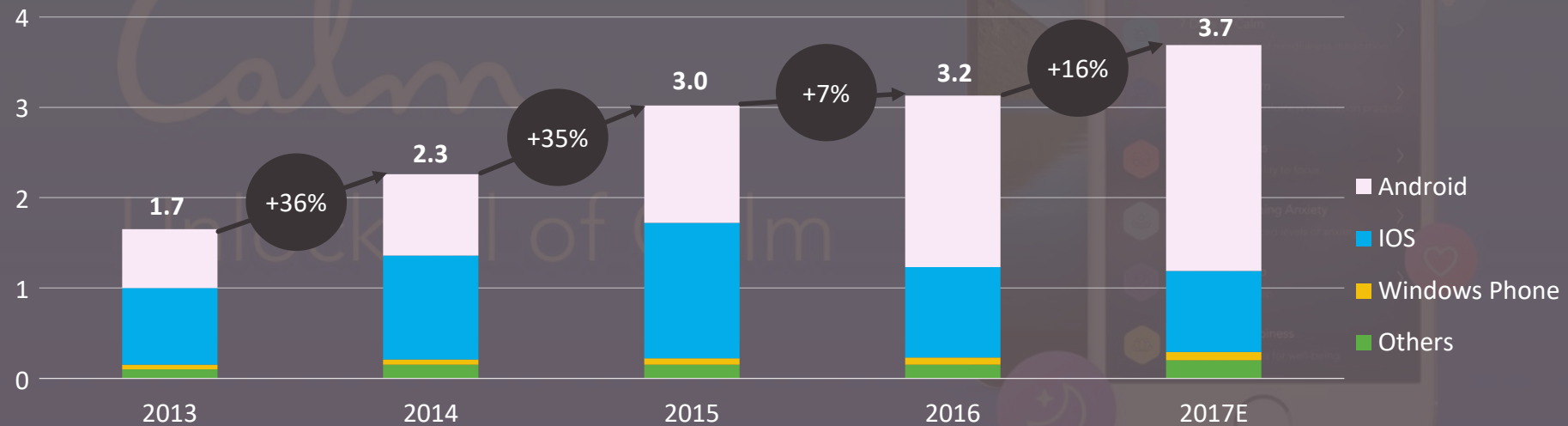
Aided by technology, consumers are taking greater care of their health themselves



People are becoming increasingly comfortable with the idea of health apps

Health apps, global

Number of downloads, billions



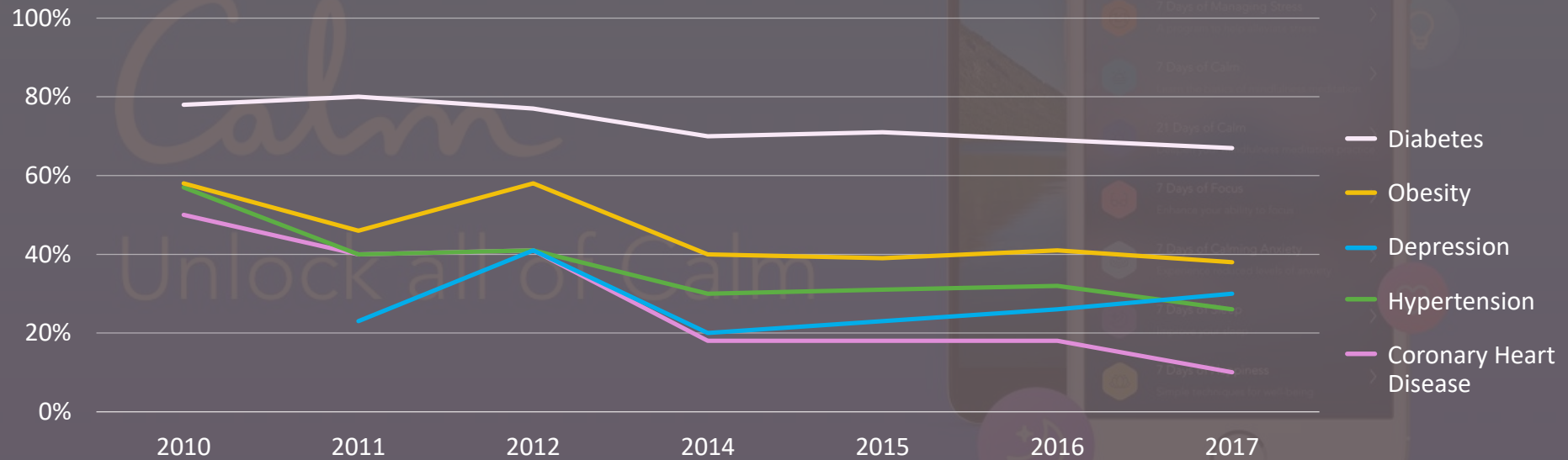
SOURCE: Research2Guidance

Aided by technology, consumers are taking greater care of their health themselves



Health apps are focusing on diseases often experienced by marginalised groups, such as the elderly and the poor

Top three therapy fields with market potential for mobile health (mHealth), survey of developers



SOURCE: Research2Guidance; Generation

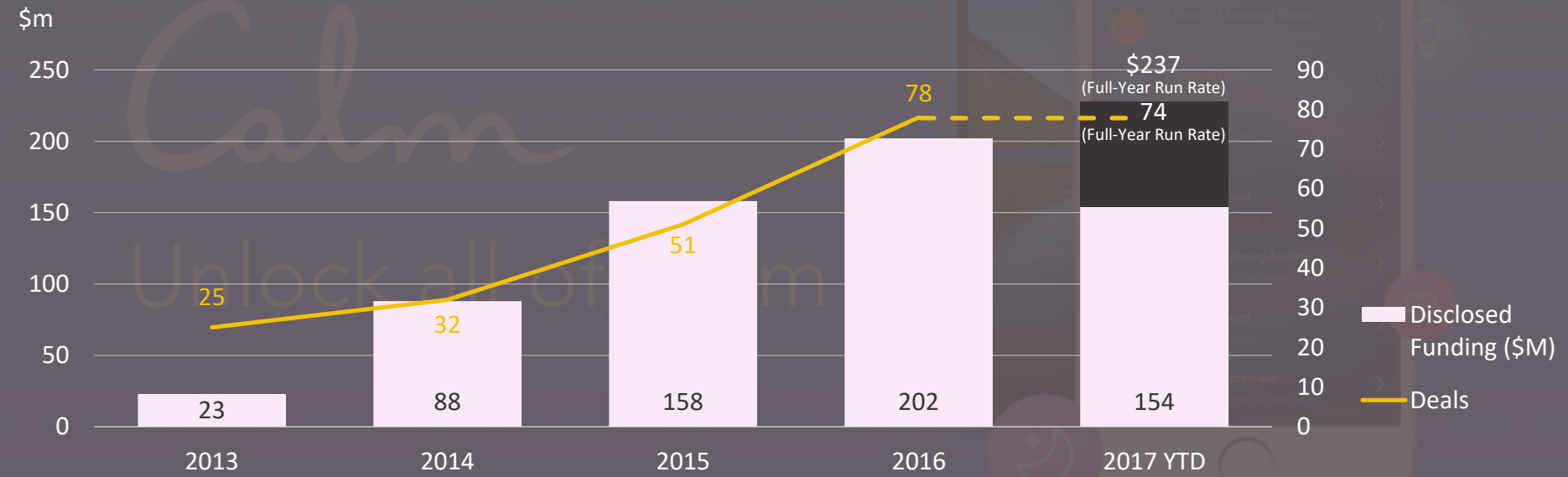


Aided by technology, consumers are taking greater care of their health themselves



Mental health and wellness tech has taken off

Mental health & wellness tech annual global deal history, value and count, global



SOURCE: CB Insights



Aided by technology, consumers are taking greater care of their health themselves



Though in some cases technological innovation can harm wellbeing. Social media may have a negative impact on mental health

Britain, social-media users, 14- to 24-year-olds, reported impact on well-being, 2017



	Instagram	Snapchat	Facebook	Twitter
Sleep	Dark Red	Dark Red	Dark Red	Dark Red
Fear of missing out (FoMO)	Dark Red	Dark Red	Dark Red	Orange
Bullying	Orange	Orange	Dark Red	Orange
Body image	Dark Red	Orange	Orange	Orange
Anxiety	Orange	Orange	Orange	Orange
Depression	Orange	Orange	Orange	Orange
Loneliness	Light Yellow	Light Yellow	Light Yellow	Light Yellow
Access to health advice	Light Yellow	Light Yellow	Light Green	Light Green
Real-world relationships	Light Green	Light Green	Light Green	Light Yellow
Awareness of people's health	Light Green	Light Green	Light Green	Light Green
Community building	Light Green	Light Green	Light Green	Light Green
Emotional support	Light Green	Light Green	Light Green	Light Green
Self-identity	Light Green	Light Green	Light Green	Light Green
Self-expression	Light Green	Light Green	Light Green	Light Green

SOURCE: Royal Society for Public Health; *The Economist*

Rapid technological advancements mean that completely new interventions can be offered

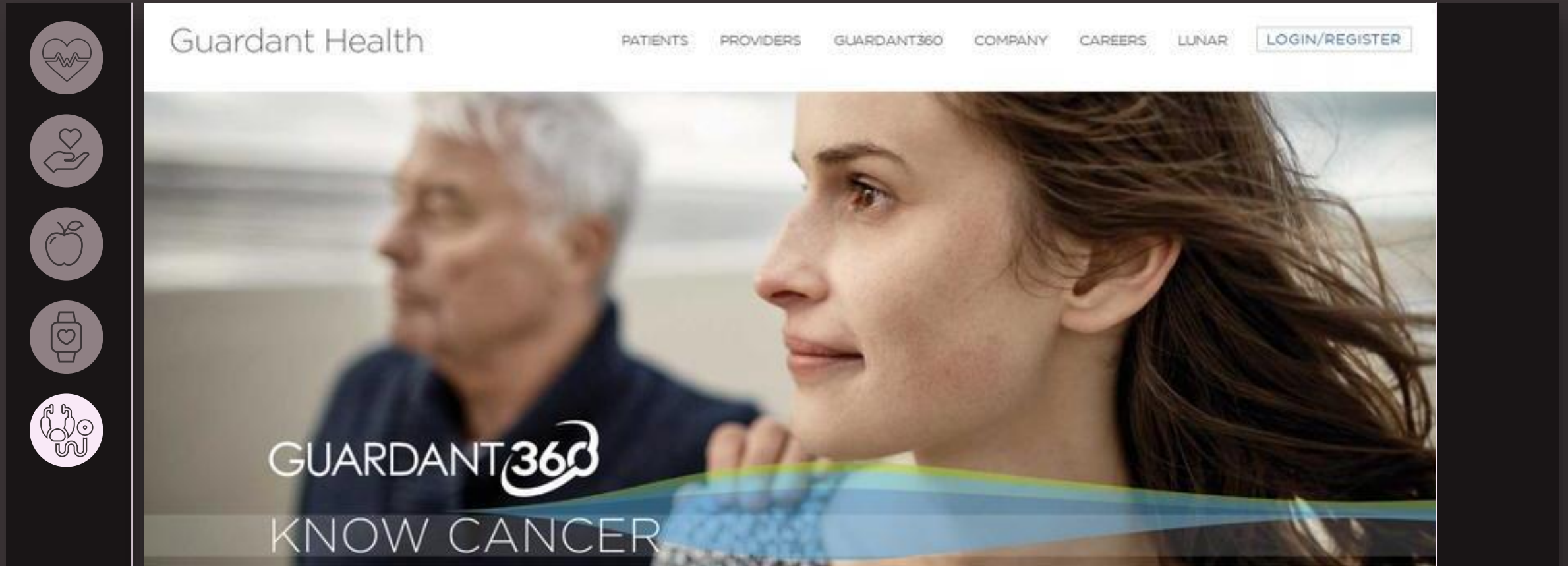


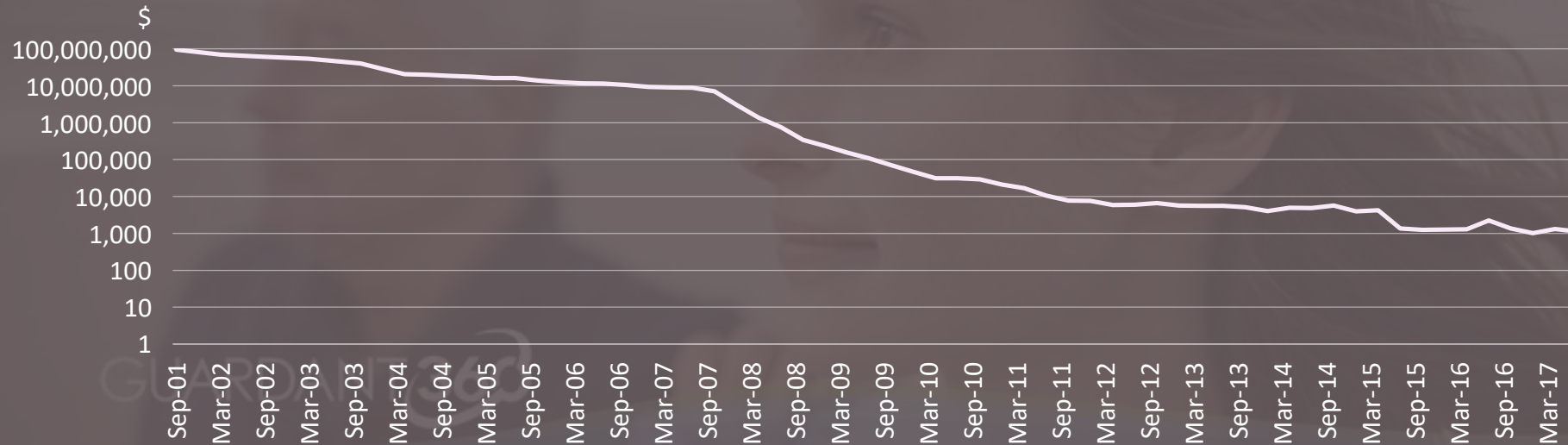
IMAGE: Guardant Health
Bioinformatics solutions are becoming increasingly accessible, facilitating better and more efficient treatment and care

Rapid technological advancements mean that completely new interventions can be offered



Genome sequencing allows people to develop much more targeted and personalised health-care interventions

Cost of sequencing a single human genome, 2001-17



Note: Logarithmic scale

SOURCE: US National Human Genome Research Institute

Rapid technological advancements mean that completely new interventions can be offered

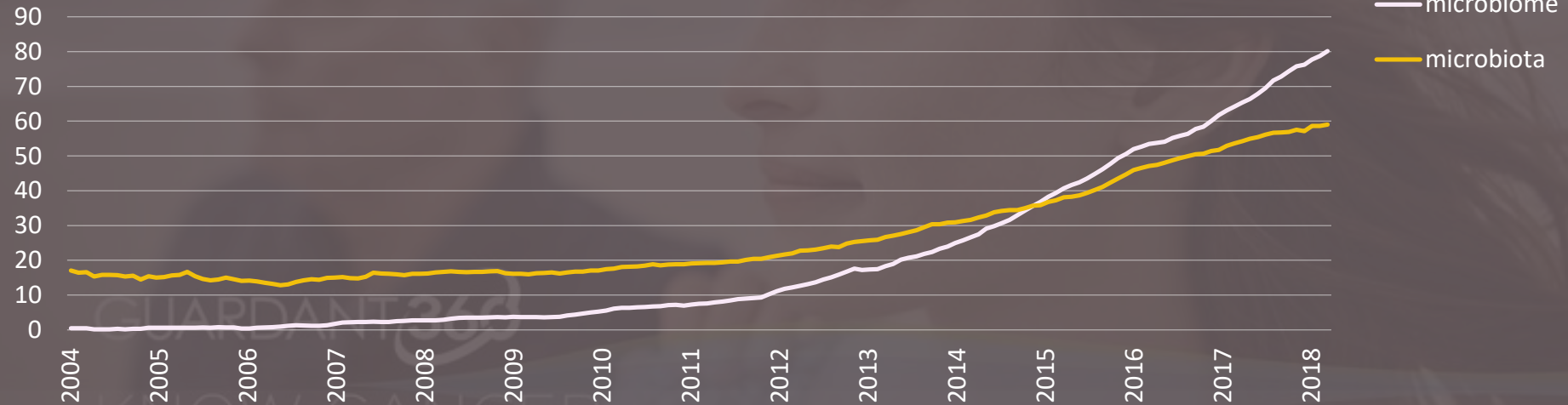


The science of microbiome, conventionally focused on disease prevention, is being increasingly leveraged for more ubiquitous applications in improved nutrition

LOGIN/REGISTER

Global interest in the microbiome is rapidly rising across the world

Standardised measure of Google search popularity



SOURCE: Google Trends

Rapid technological advancements mean that completely new interventions can be offered

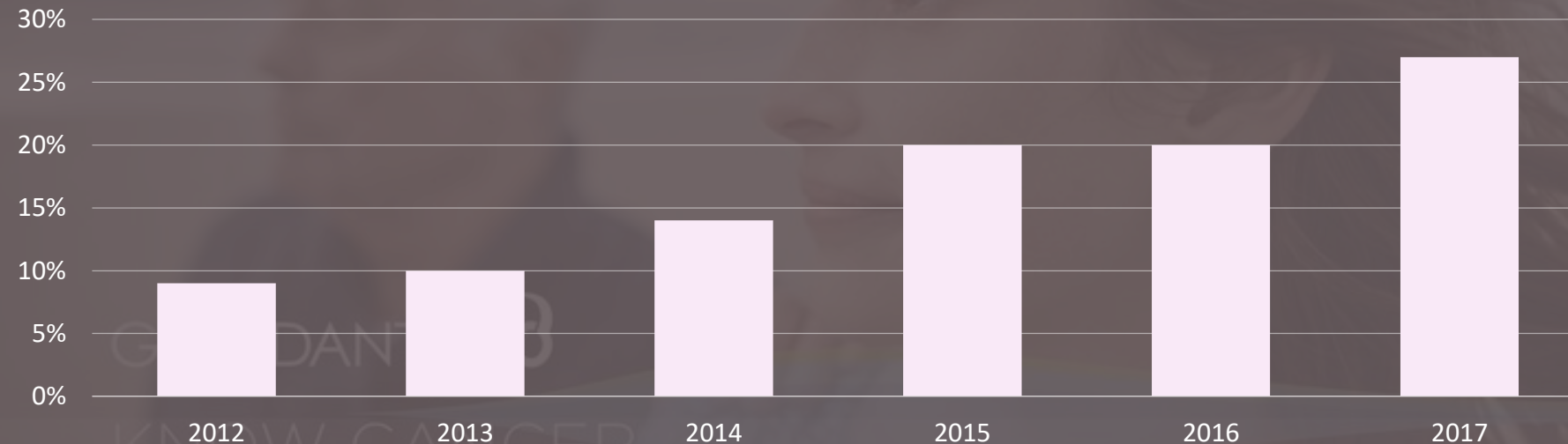


And improved knowledge of the microbiome will allow better targeted health-care interventions

[LOGIN/REGISTER](#)

Clinical trials examining the microbiome, 2012-2017, global

% of clinical trials



SOURCE: GlobalData

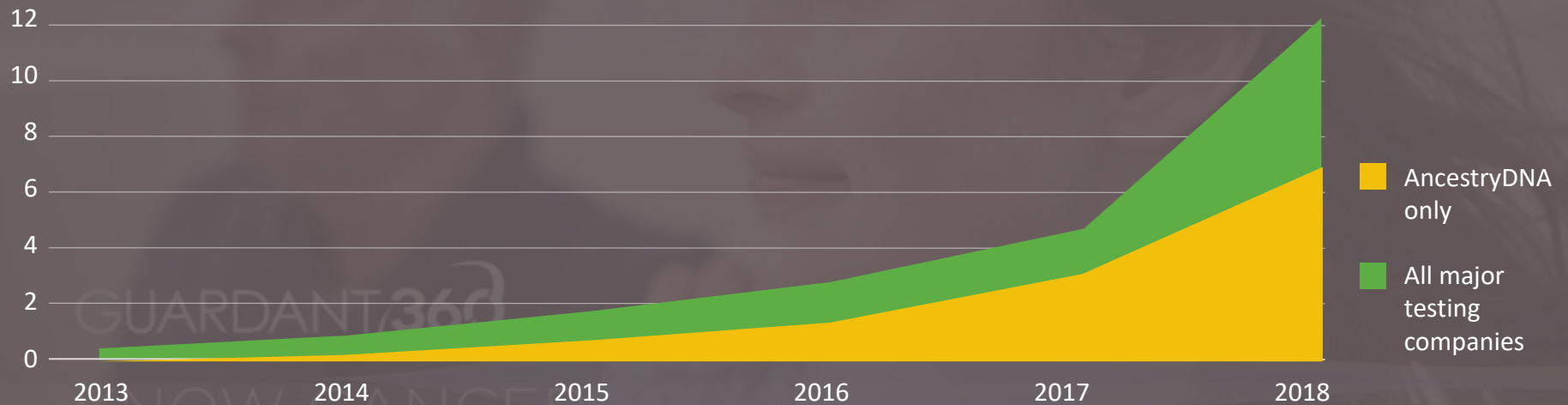
Rapid technological advancements mean that completely new interventions can be offered



More and more people are embracing genetic testing

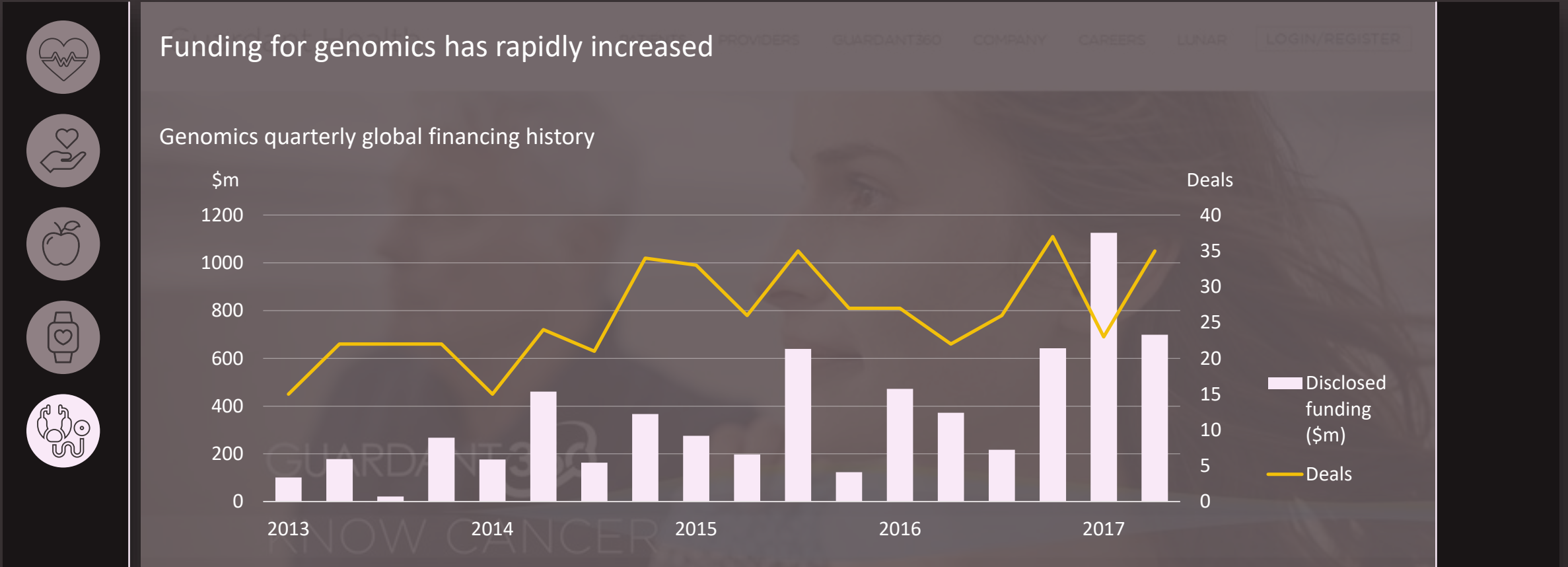
Total number of people tested by consumer genetics companies, global

Millions



SOURCE: ISOGG; Leah Larkin; company reports

Rapid technological advancements mean that completely new interventions can be offered



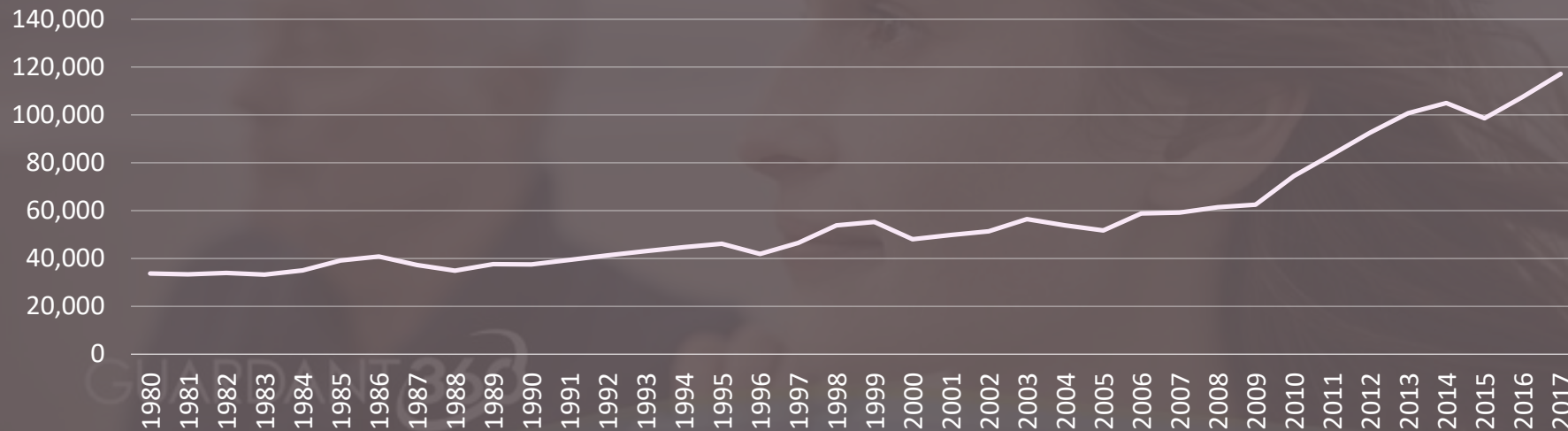
SOURCE: CB Insights

Rapid technological advancements mean that completely new interventions can be offered



A research boom in the medical space means that innovation is set to continue

Number of patents filed associated with medicine*, global



*medicine = analysis of biological materials; medical technology; organic fine chemistry; biotechnology; pharmaceuticals

SOURCE: Generation analysis of World Intellectual Property Organization (WIPO) statistics database

Trends we continue to track



Guardant Health

PATIENTS

PROVIDERS

GUARDANT360

COMPANY

CAREERS

LLNAP

LOGIN/REGISTER



Real-time, fine-grained health data available to both consumers and their medical providers



The rise in “precision medicine” and its manifestation as a consumable good



The development of personalised and improved nutrition



Disease migration, attributable to climatic crises



Whether increased uses of taxes on sugar-heavy products has a positive impact on public health



Will medical innovation out of emerging markets leapfrog that of developed countries?



And others...

GUARDANT360

KNOW CANCER



Future of work

Section summary

Technological change is sweeping over the labour market. That holds promise for many workers. Many can be more autonomous, which not only makes them happier but also more productive.

Some workplaces are becoming more focused on employees' wellbeing. Greater transparency and disclosure also means that longstanding inequalities in the labour market, such as gender pay gaps, are falling, though they remain high.

Technology poses threats to some workers, however. Governments are not doing a good job of preparing their workforce for the coming years. Companies are picking up some of the slack.

A sustainable future of work is characterised by:



Technological innovation that helps both workers and businesses



Comprehensive training for modern skills requirements



Flexibility supplemented by tools to enhance structure



Rigorous employer focus on employee wellbeing



Reduced structural inequality

New business models are addressing the puts and takes of a rapidly changing labour market



IMAGE: Wonolo

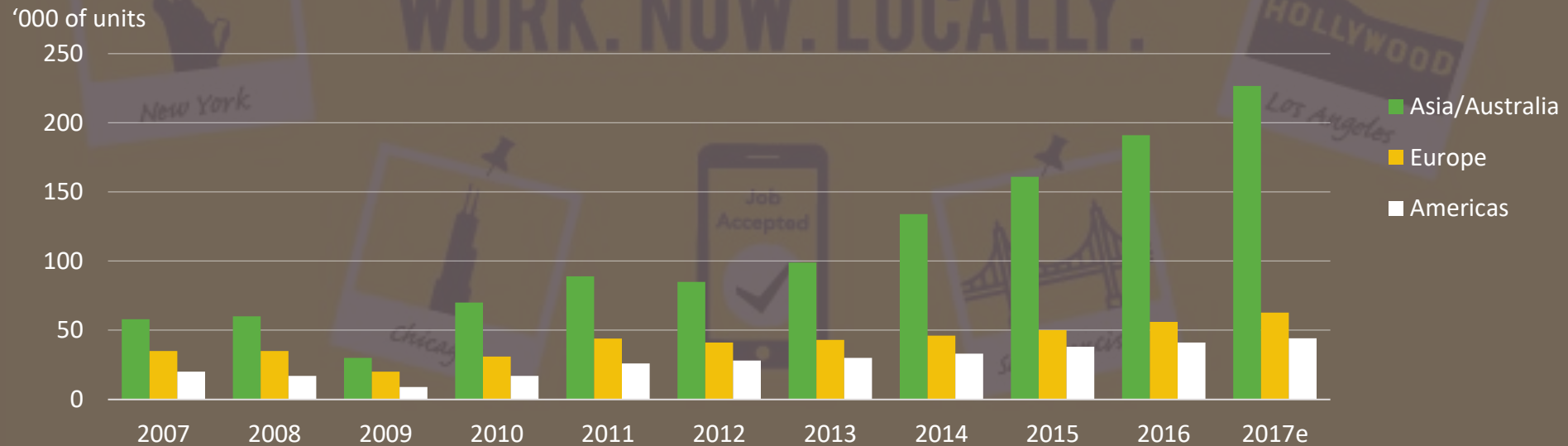
Jobs marketplaces are attempting to redress labour market information assymetries and provide better matching between potential employers and workers

New business models are addressing the puts and takes of a rapidly changing labour market



Large parts of the production process are being automated

Estimated annual shipments of industrial robots by region



SOURCE: International Federation of Robotics. These machines are defined as “an automatically controlled, reprogrammable, and multipurpose [machine]”. Industrial robots are fully autonomous machines that can be programmed to perform several manual tasks such as welding, painting, assembling, handling materials, or packaging.



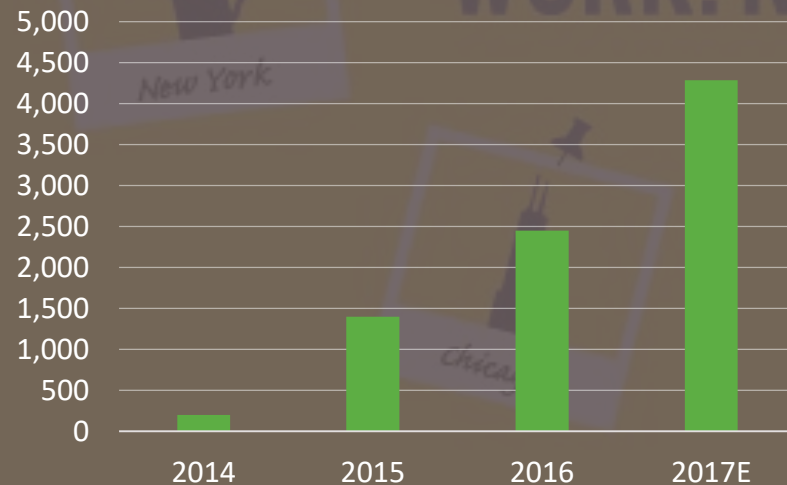
New business models are addressing the puts and takes of a rapidly changing labour market



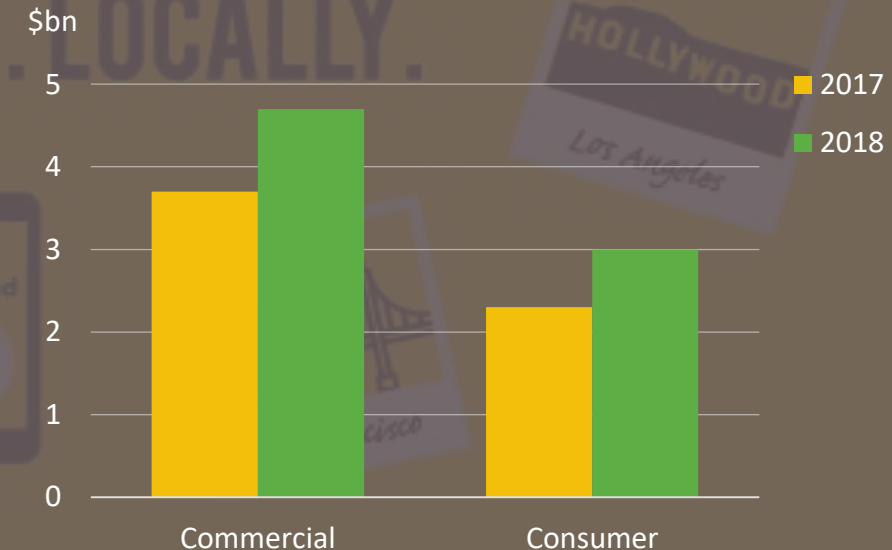
More companies are using artificial intelligence in their production processes. Drones are also seeing increased commercial and consumer relevance



Inquiries to Gartner about AI



Drone revenues, worldwide



SOURCE: Gartner; Bloomberg Intelligence; UBS; Generation

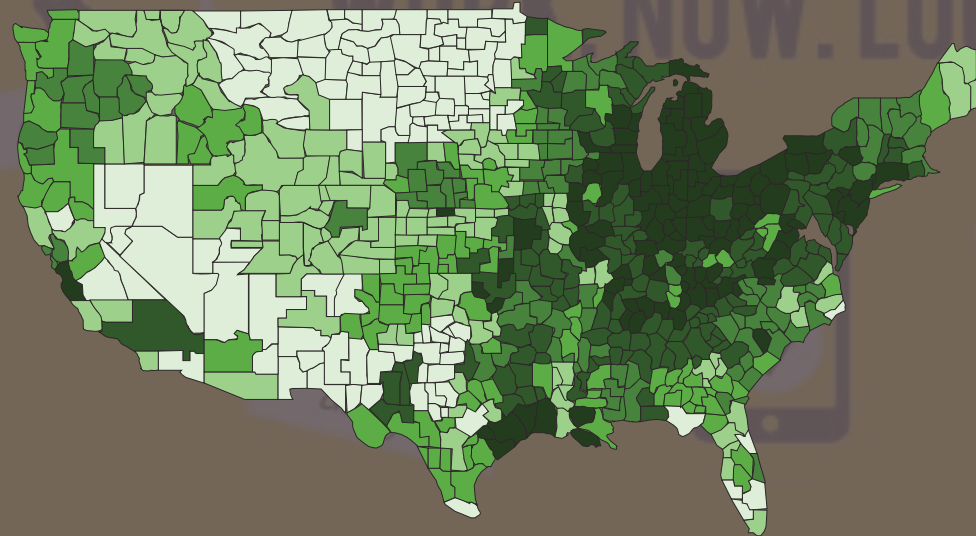
New business models are addressing the puts and takes of a rapidly changing labour market



Automation has proceeded unevenly across America, with factory jobs in the Midwest hardest hit



Increase in exposure to robots by American sub-region, in the 1990s and 2000s



Rise in robots per thousand workers

- 1.00-4.87
- 0.74-1.00
- 0.56-0.74
- 0.45-0.56
- 0.30-0.45
- 0.12-0.30

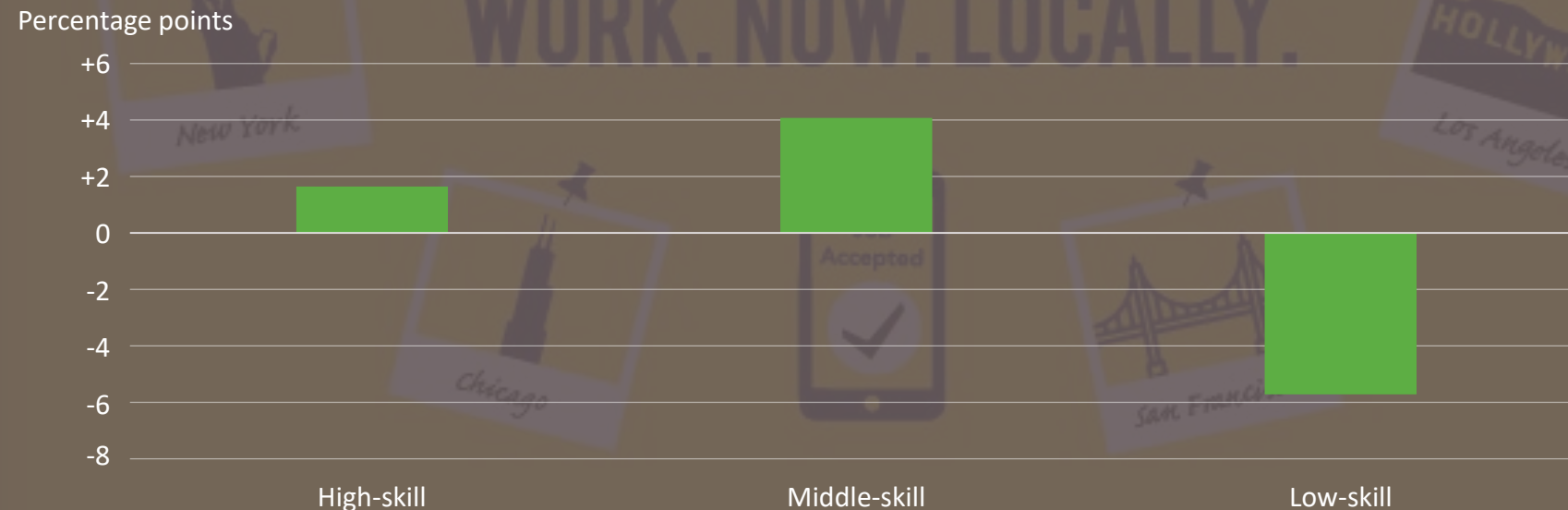
SOURCE: Acemoglu, Daron, and Pascual Restrepo. "Robots and jobs: Evidence from US labor markets." (2017). This is a precise measure of the increase in the number of industrial robots, per 1,000 of all workers, between the years 1993 and 2007. Figures are adjusted to account for endogenous changes in robot density.

New business models are addressing the puts and takes of a rapidly changing labour market



The gains of technological change are not shared equally. There is increasing evidence that automation, driven by robotics, is reducing job opportunities of low-skilled people

Impact of robots on share of work done by different skill groups (percentage points)



SOURCE: Graetz, Georg, and Guy Michaels. "Robots at work" *Review of Economic Statistics* (2018)

New business models are addressing the puts and takes of a rapidly changing labour market



Automation has coincided with large numbers of Americans dropping out of the labour force entirely

Civilian labour-force participation rate, 1948-2018



SOURCE: US Bureau of Labor Statistics

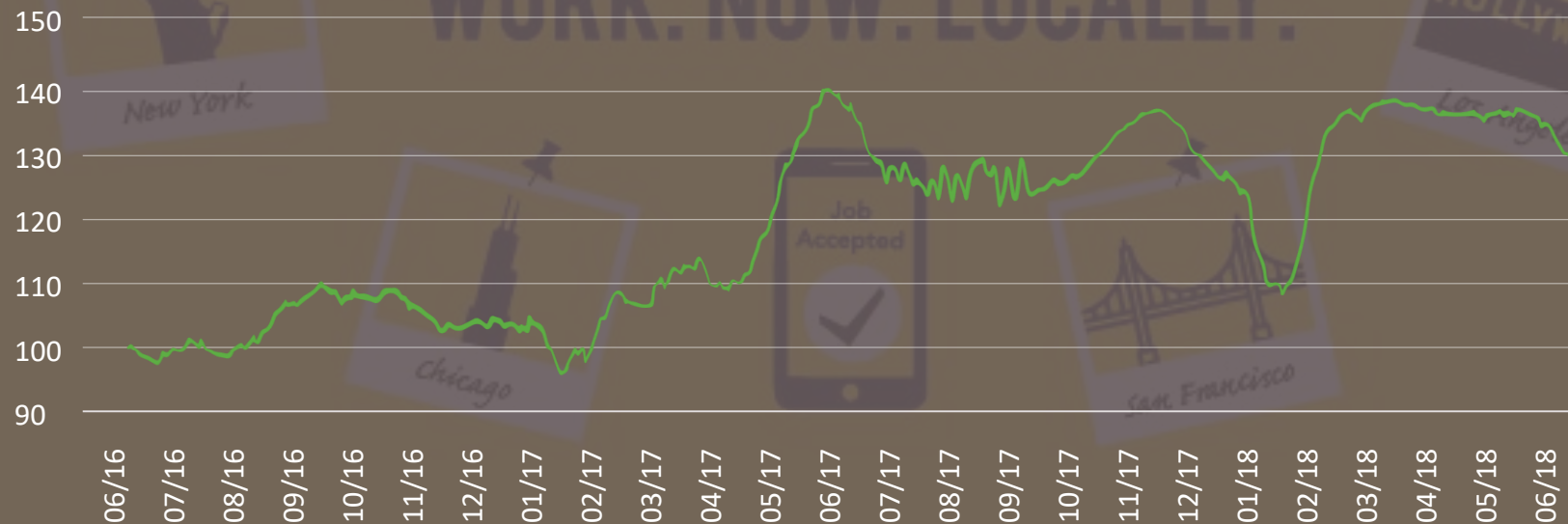
New business models are addressing the puts and takes of a rapidly changing labour market



Online job marketplaces may help mitigate some of these problems by enabling better matching of supply and demand



Online Labour Index, June 2016=100, global



SOURCE: Oxford Internet Institute. The Online Labour Index (OLI) is the first economic indicator that provides an online gig economy equivalent of conventional labour market statistics. It measures the supply and demand of online freelance labour across countries and occupations by tracking the number of projects and tasks across platforms in real time.

Workers are being upskilled to cope with new demands from technology

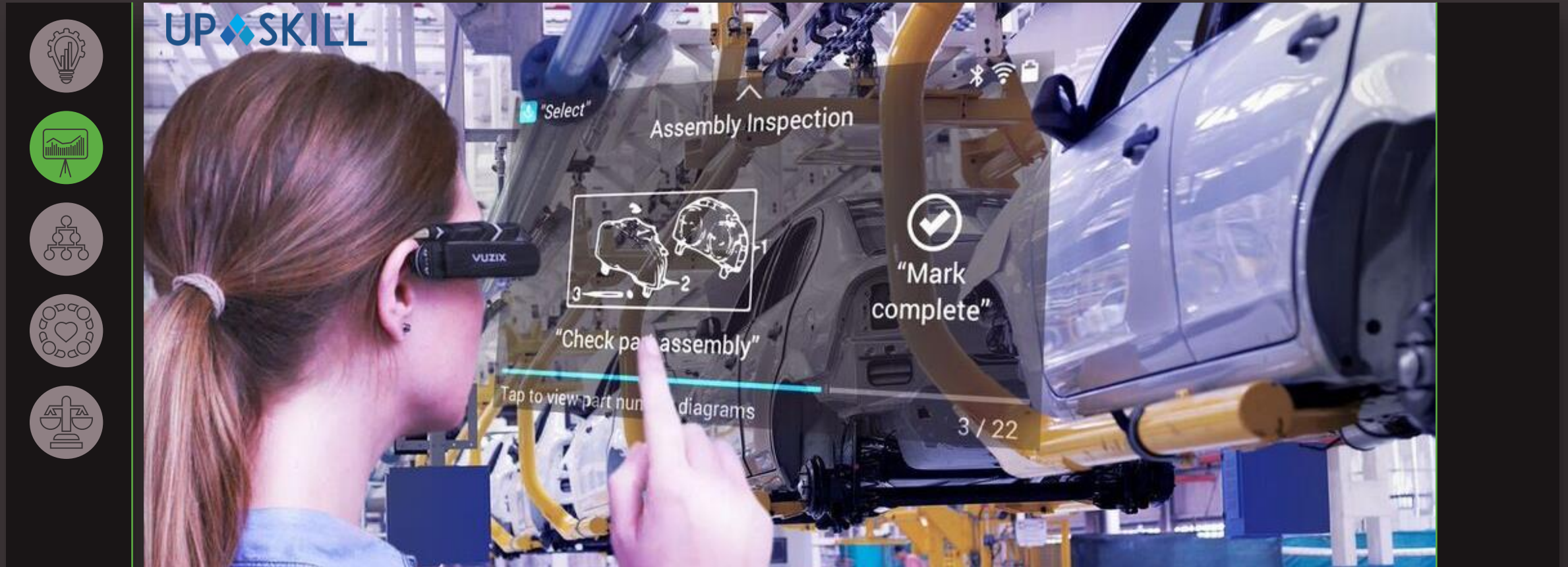


IMAGE: UpSkill
Workplaces are embracing new, sustainable technologies: alternative-and-virtual reality can enhance workers' productivity

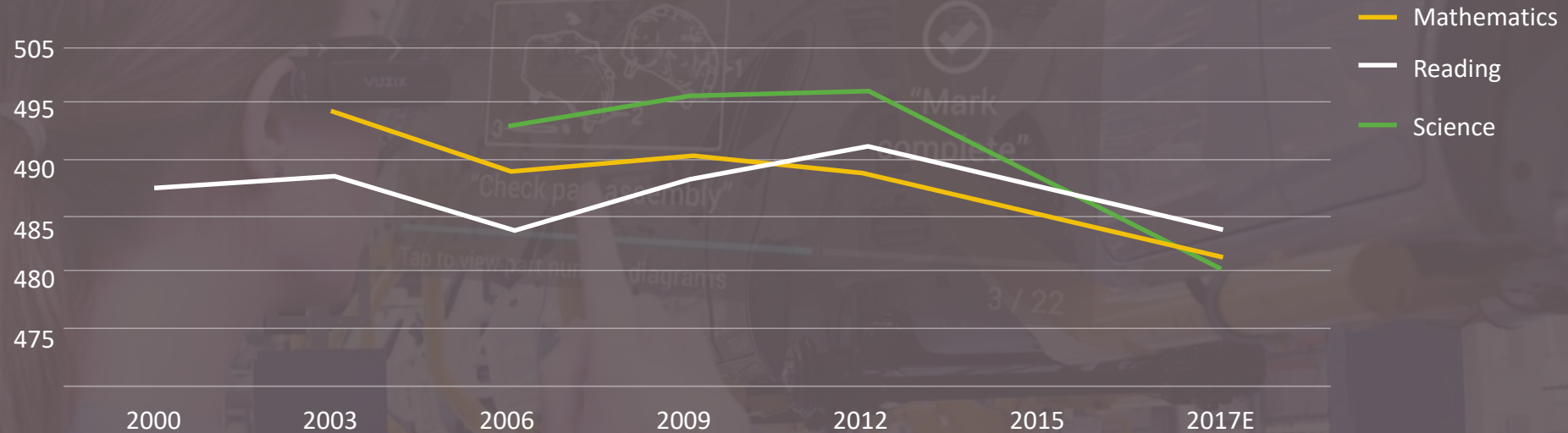
Workers are being upskilled to cope with new demands from technology



Governments could do a better job of educating the next generation of workers

The average PISA score* in the OECD appears to be in decline

Average PISA score



SOURCE: OECD; Generation.

*A PISA score measures attainment at science, reading and mathematics at age 15.

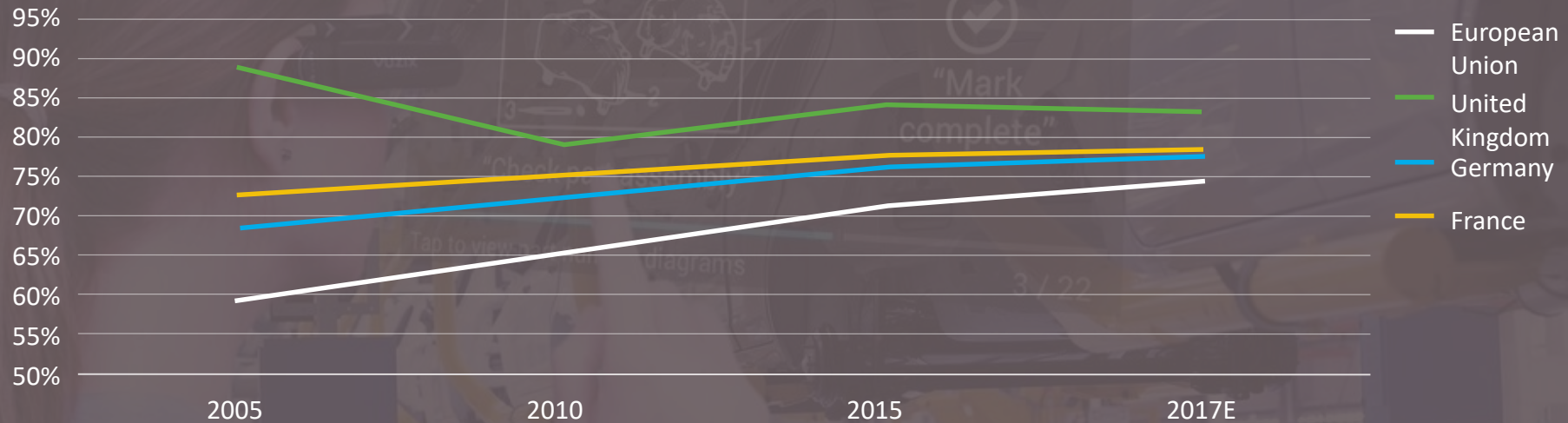
Workers are being upskilled to cope with new demands from technology



Companies have stepped up: rates of private training have risen in many countries

The share of enterprises offering training to their staff appears to be rising

% of enterprises



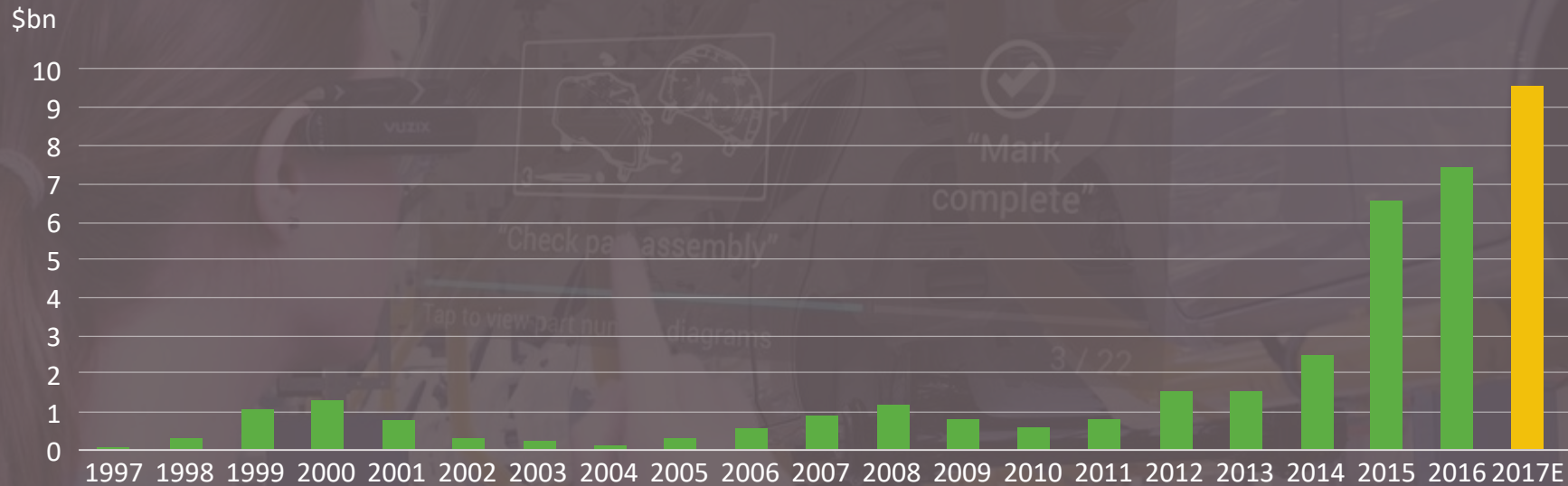
SOURCE: Eurostat; Generation

Workers are being upskilled to cope with new demands from technology



Private investment is also being allocated to improve educational outcomes

Global private investments* made in learning-technology companies



SOURCE: Metaari; Generation. *Investment totals include crowdsourced, seed, angel, venture capital, and private equity. The totals do not include government grants (such as SBIR grants) or corporate foundation grants. Does not include investments made by non-profit educational institutions unless the investments are made to commercial spinoffs.

Workers are being upskilled to cope with new demands from technology



Training interventions are becoming global in nature



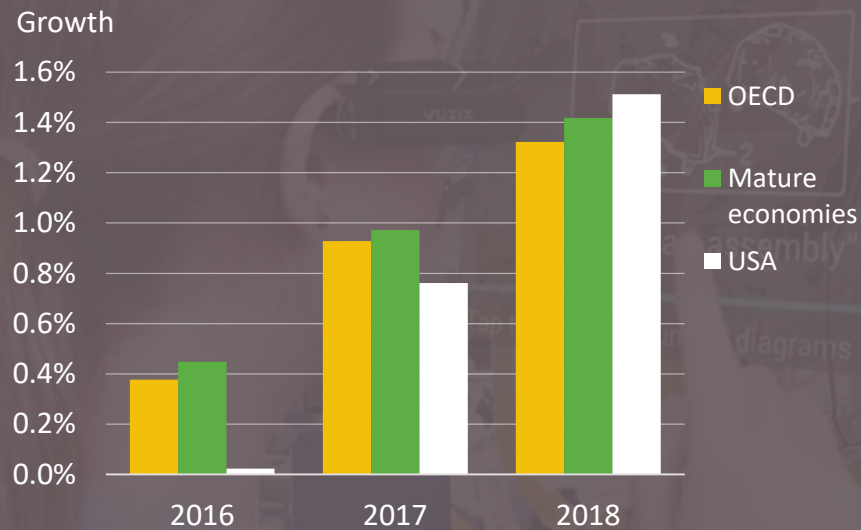
Andela provides companies with access to the top 1% of global tech talent by identifying high-potential developers on the African continent, shaping them into world-class technical leaders, and pairing them with companies as full-time, distributed team members.

Workers are being upskilled to cope with new demands from technology



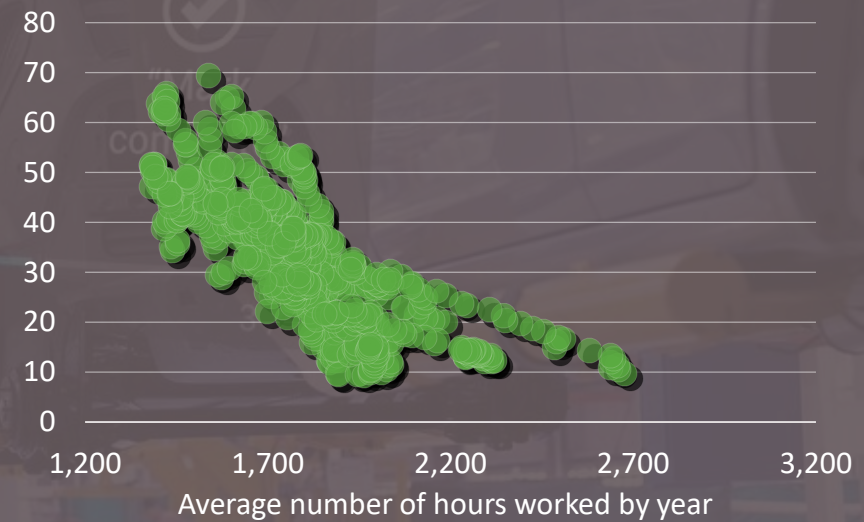
A combination of investment in technology and private training appears to be paying off: labour productivity is improving, which brings numerous wellbeing implications

Annual growth rate in labour productivity, 2016-2018

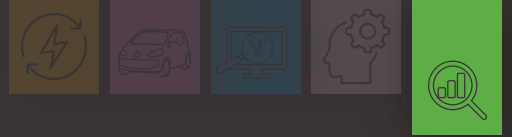


As labour productivity improves, people can work fewer hours

GDP per hour worked, PPP\$



SOURCE: The Conference Board; OECD; *The Economist*; Generation. Data for right-hand chart refer to 1990-2012.



Worker flexibility is increasingly supplemented by structured, effective collaboration

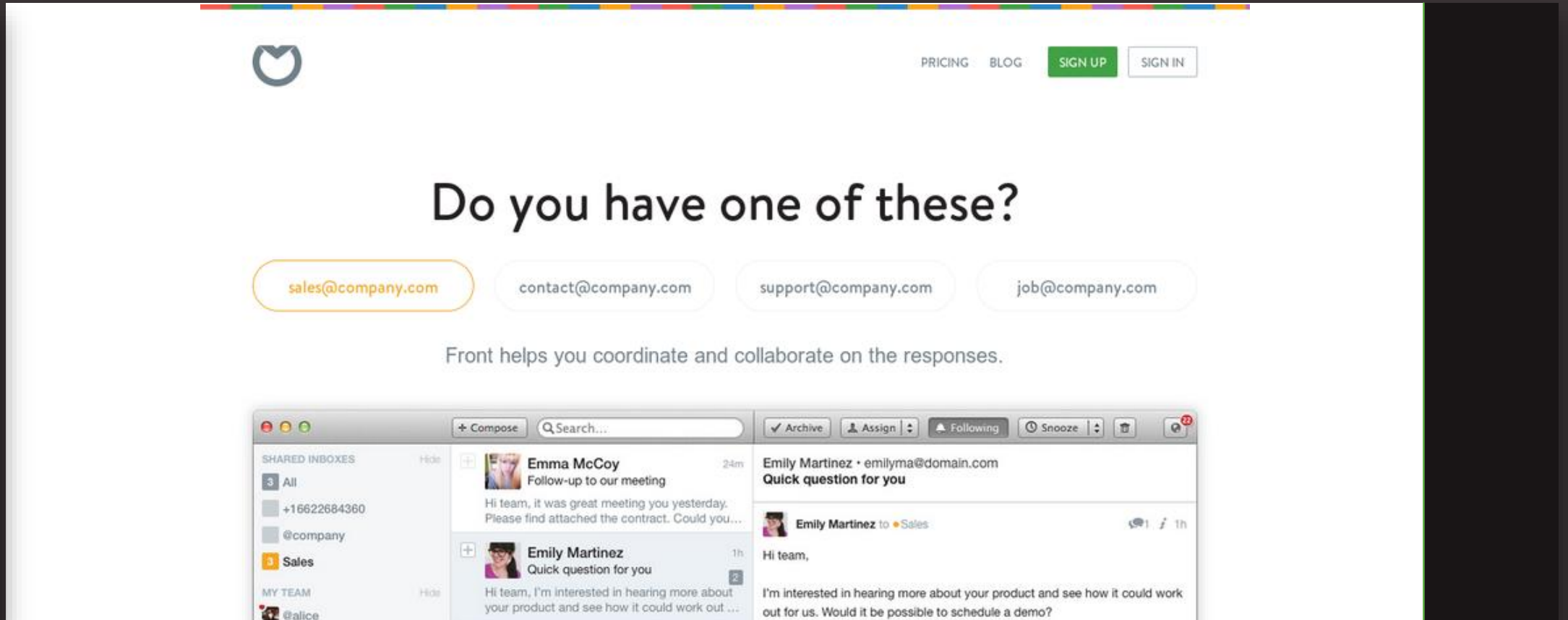
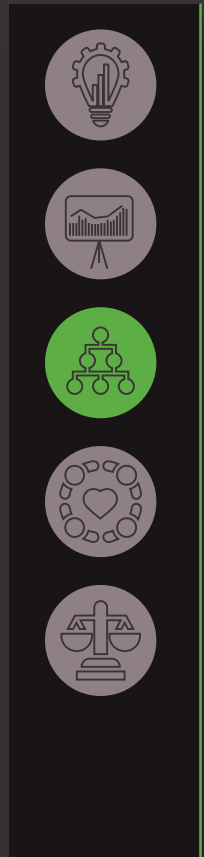


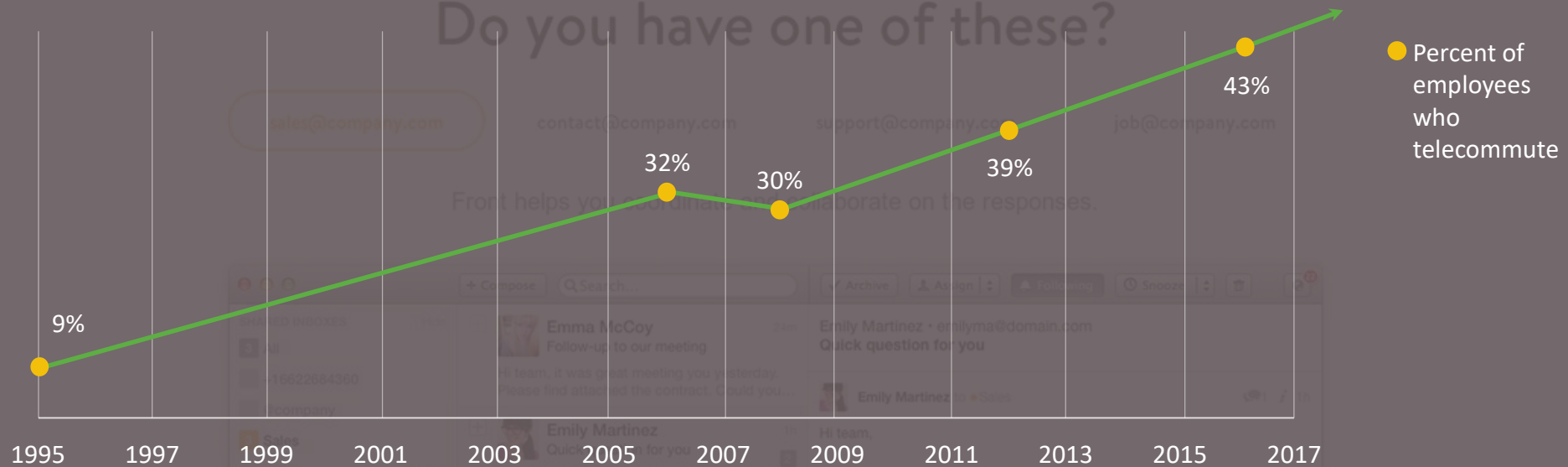
IMAGE: Front
Collaboration software provides teams with the structure and clarity necessary to enhance productivity

Worker flexibility is increasingly supplemented by structured, effective collaboration



Enabled by technology, more employees are being given the option to work from home

Share of workers who telecommute, US



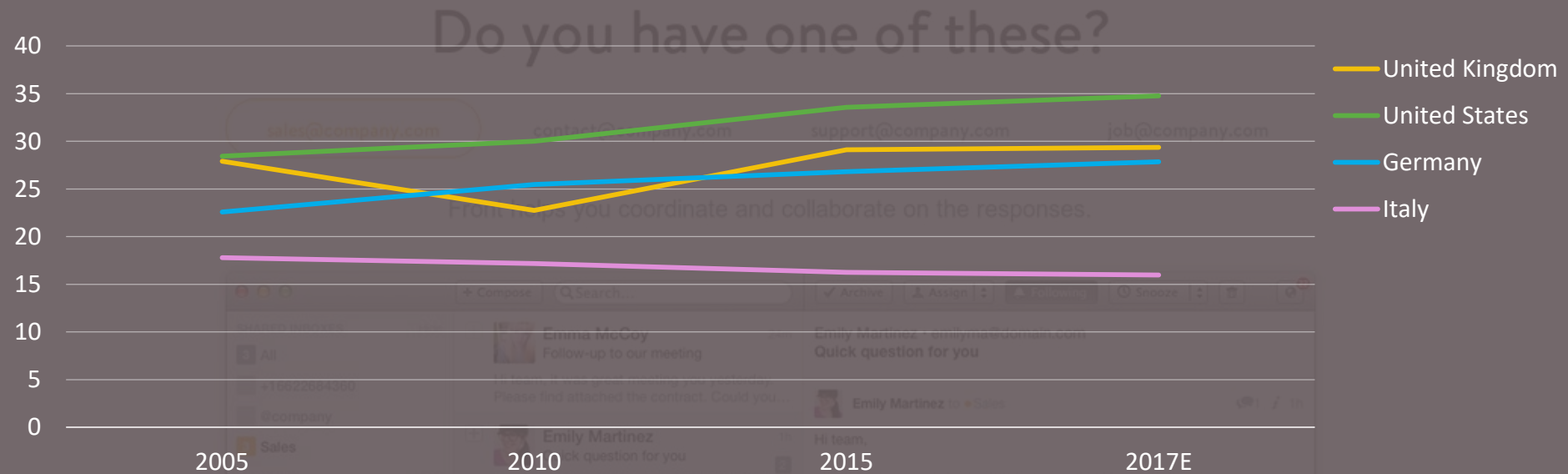
SOURCE: Gallup; fitzsmallbusiness.com

Worker flexibility is increasingly supplemented by structured, effective collaboration



Analysis of working conditions suggests that in many countries people have more control over their time

Index of autonomy at work, 2005-17



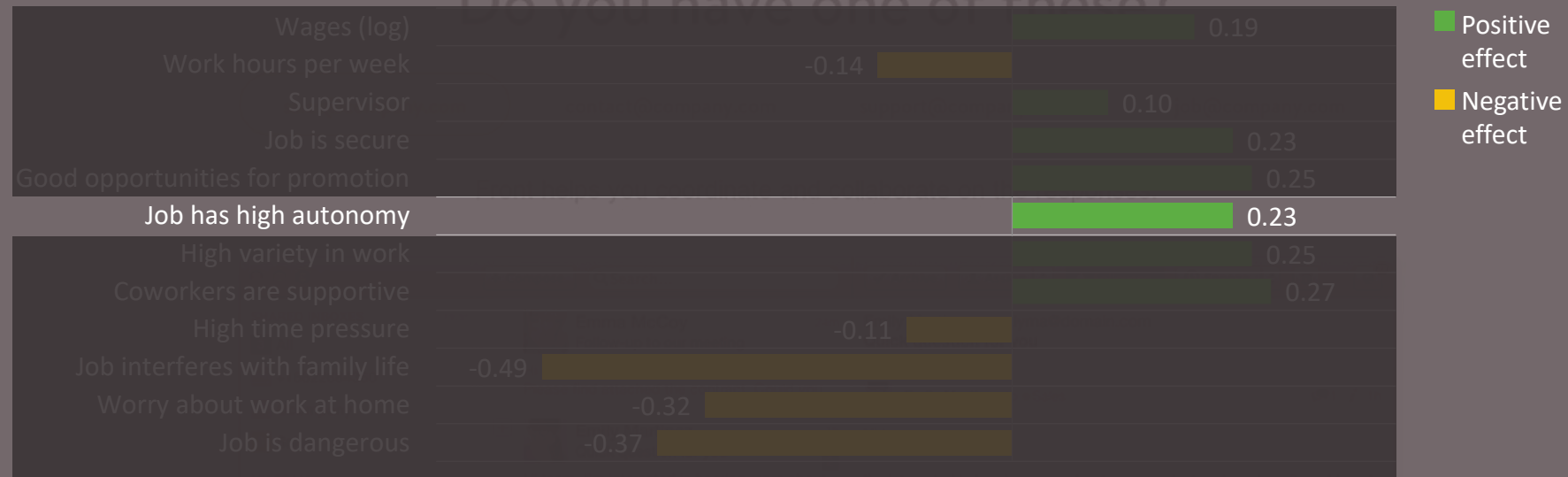
SOURCE: OECD; Generation

Worker flexibility is increasingly supplemented by structured, effective collaboration



The evidence suggests that workplace autonomy is a key determinant of overall wellbeing

How various dimensions of workplace quality affect life-satisfaction (measured on a 0-10 scale)



SOURCE: Clark, Andrew E., Sarah Flèche, Richard Layard, Nattavudh Powdthavee, and George Ward. "The Origins of Happiness." (2018). Standardised (beta) coefficients are shown

A growing share of the population has autonomy in the workplace



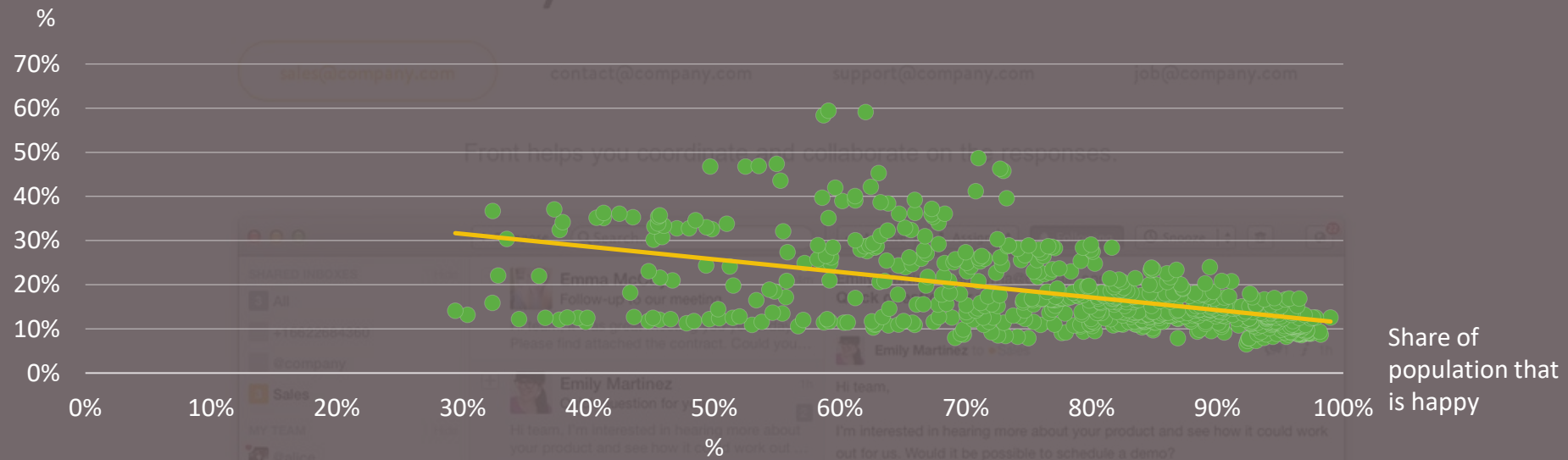
Yet autonomy has its limits. Self-employment and happiness are negatively correlated. That suggests workers need *some* structure



Relationship between happiness and self-employment, Europe



Self-employment, as share of total employment



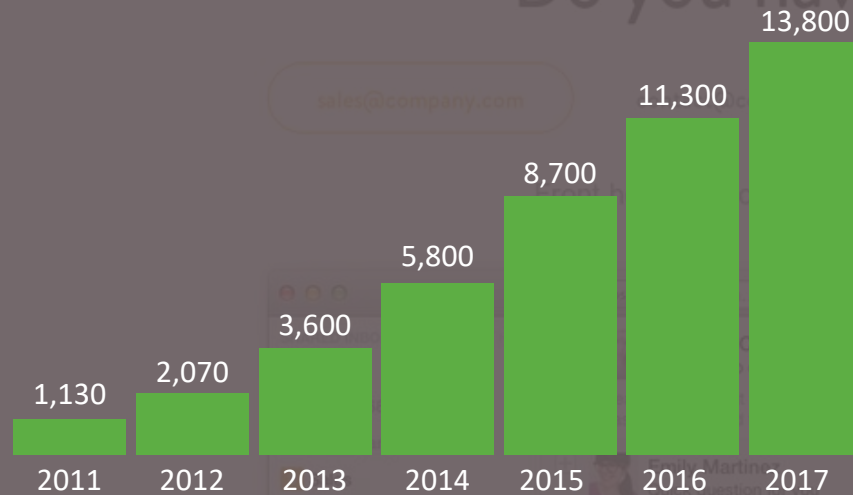
SOURCE: Generation analysis of World Bank and World Values Survey data. Data are for 2000 to 2017.

A growing share of the population has autonomy in the workplace

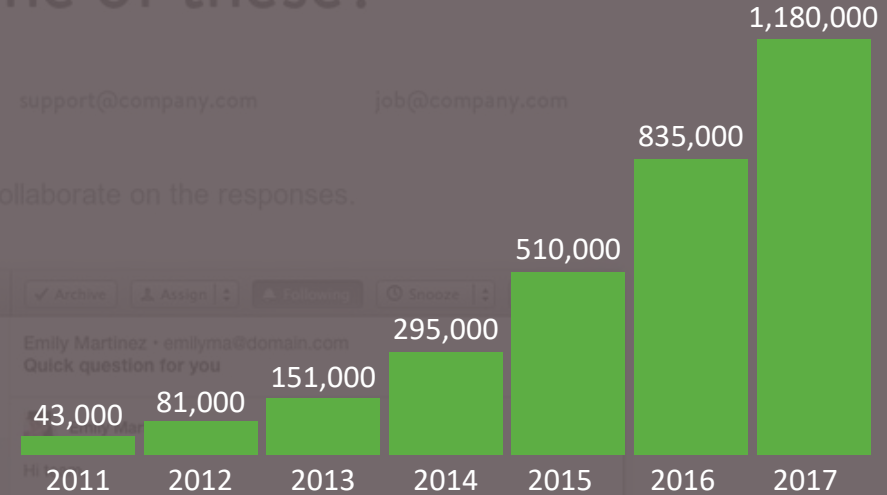


Infrastructure is required to allow workers to work autonomously and effectively

Number of coworking spaces as of October 31 each year, global



Number of members of coworking spaces as of October 31 each year, global



SOURCE: 2017 Global Coworking Survey



Employers are taking employee wellbeing more seriously



GUSTO

- DASHBOARD
- RUN PAYROLL
- PAY CONTRACTORS
- EMPLOYEES
- CONTRACTORS
- PAYROLL HISTORY
- COMPANY
- BENEFITS**
- STAY COMPLIANT
- SETTINGS
- HELP

Health Benefits

Your company's health benefits are managed by Gusto. In this page, you can get detailed information about the medical, dental, and vision benefits you are offering to your employees.

9 [VIEW COMPLETE ENROLLMENT INFO >](#)

Medical

1 **EMPLOYER CONTRIBUTION** | Cover 80% towards employee monthly premiums
Cover 50% towards dependent monthly premiums

3 **EFFECTIVE DATES** | November 01, 2015 - February 12, 2016

4 **NEW HIRE WAITING PERIOD** | no waiting period

2 Policy Name / Carrier	Group #	5 Employees Enrolled	6 Estimated Monthly Premium
Platinum Full PPO 150 OffEx Blue Shield of California		7 2	\$691.76 PLAN DETAILS
Kaiser Permanente Bronze 60 HSA 4500/40% Kaiser Permanente		1	\$691.77 PLAN DETAILS
TOTAL:		8 3	\$1,383.53

IMAGE: Gusto
Democratising benefits plans and payroll solutions will benefit small business growth and enable employee wellbeing

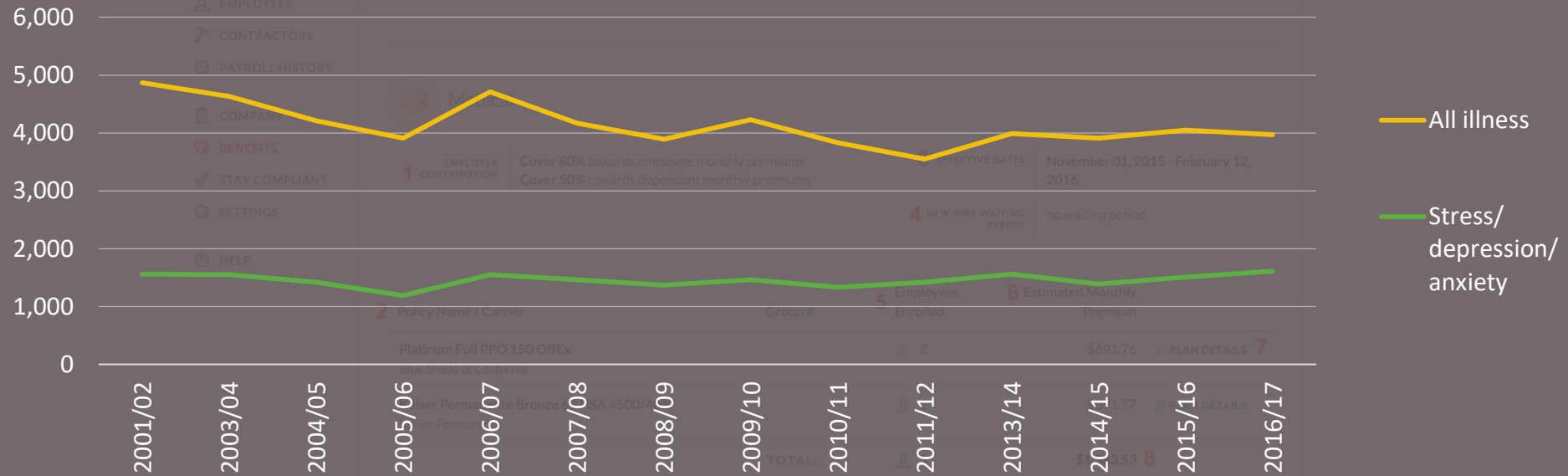


Employers are taking employee wellbeing more seriously



Workplaces are becoming safer, although more needs to be done around mental health

Illness caused or made worse by work*, rate per 100,000 employed, UK



SOURCE: UK Labour Force Survey. * includes injuries

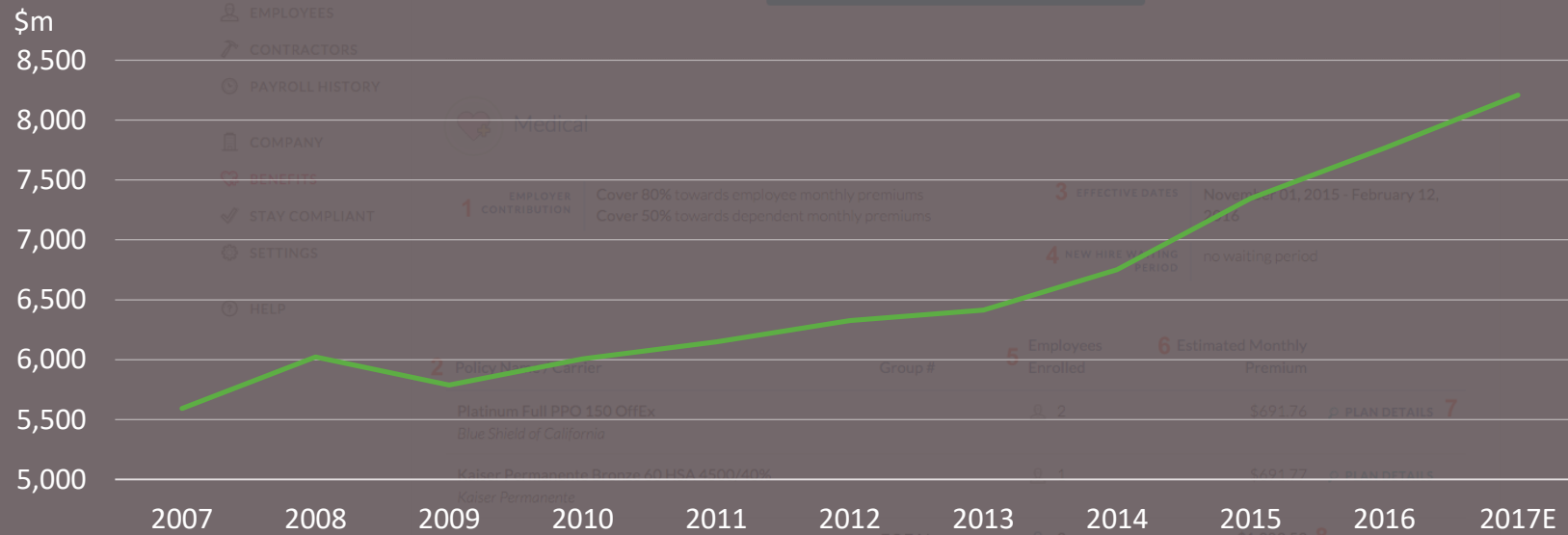


Employers are taking employee wellbeing more seriously



Investment in improving workplace wellness is growing

Market size of corporate-wellness services*, US



SOURCE: IBISWorld, Generation. *Workplace programmes that offer a combination of educational, organizational and environmental activities designed to support behavior that is conducive to the health of employees and their families.

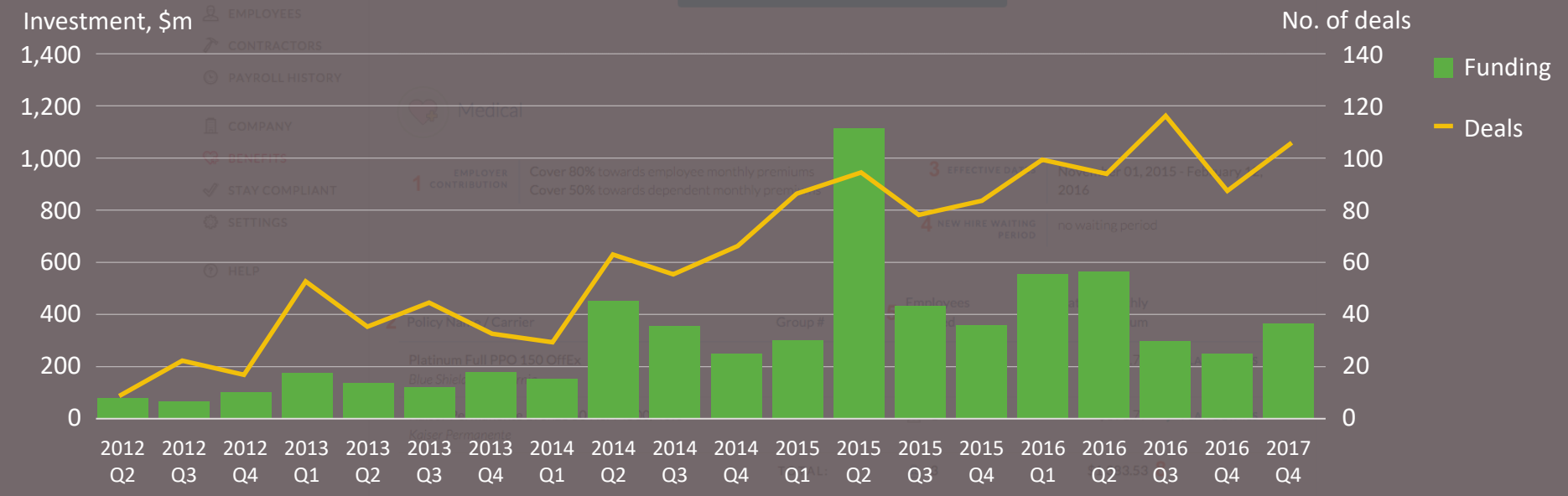


Employers are taking employee wellbeing more seriously



As is improving human-resources management in the workplace more broadly

This graph shows the global deal count and financing in HR tech since 2012



SOURCE: CB Insights



Employers are taking employee wellbeing more seriously



Workers are getting less help from unions. But innovations are emerging to help lobby on behalf of a new type of worker.

US union membership rate



iwgb

Stride
HEALTH

GIGSUPER



SOURCE: US Bureau of Labor Statistics

Overall inequality remains too high



IMAGE: Jopwell

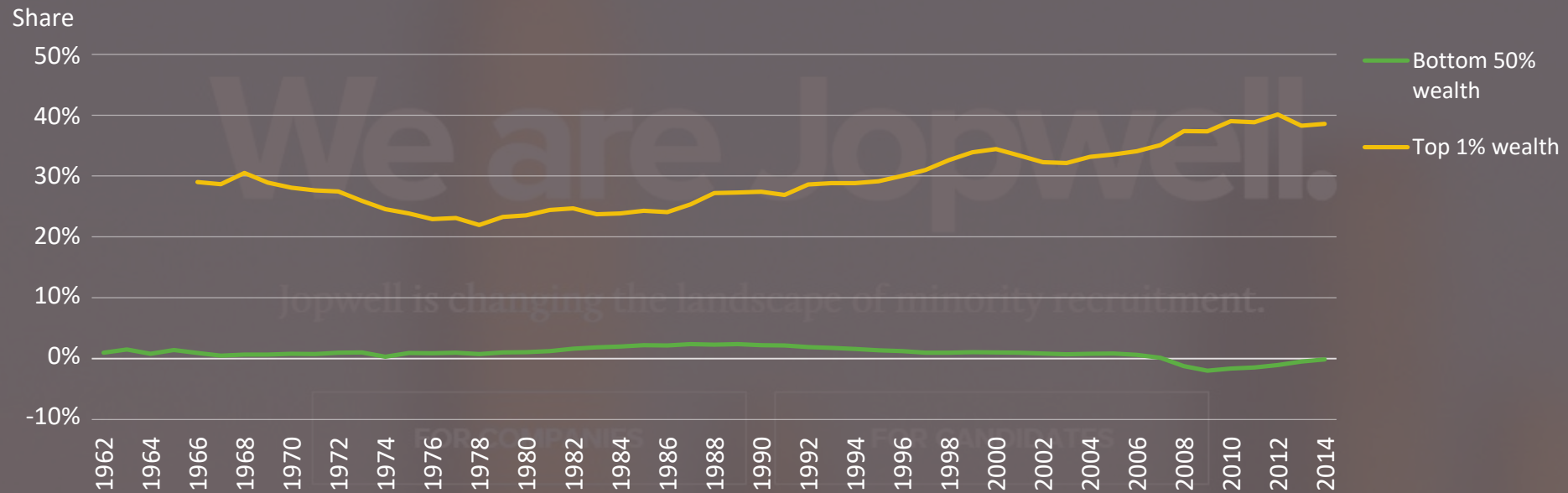
The recruitment landscape is changing with tools that enable improved skills assessments and reduce structural barriers to entry

Overall inequality remains too high



The share of wealth accruing to the top 1% has increased over the past thirty years. The bottom 50% of Americans have zero net wealth

Wealth inequality, USA, 1960-present



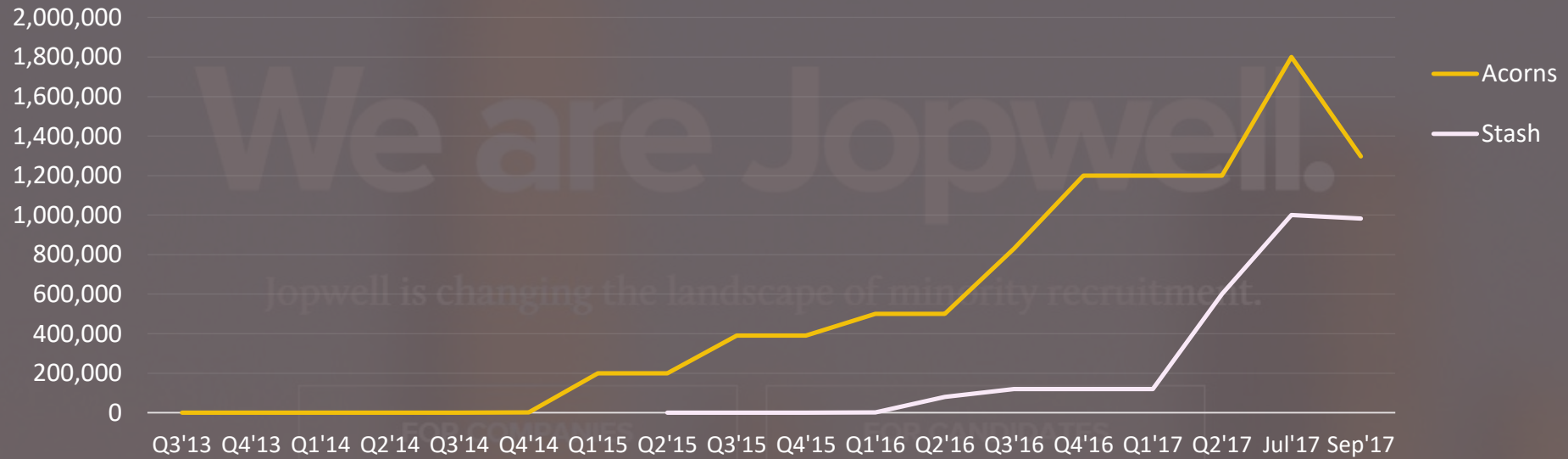
SOURCE: World Inequality Report 2018

Overall inequality remains too high



But new technologies are helping people to manage their money

Acorns vs. Stash* client accounts



SOURCE: CB Insights.

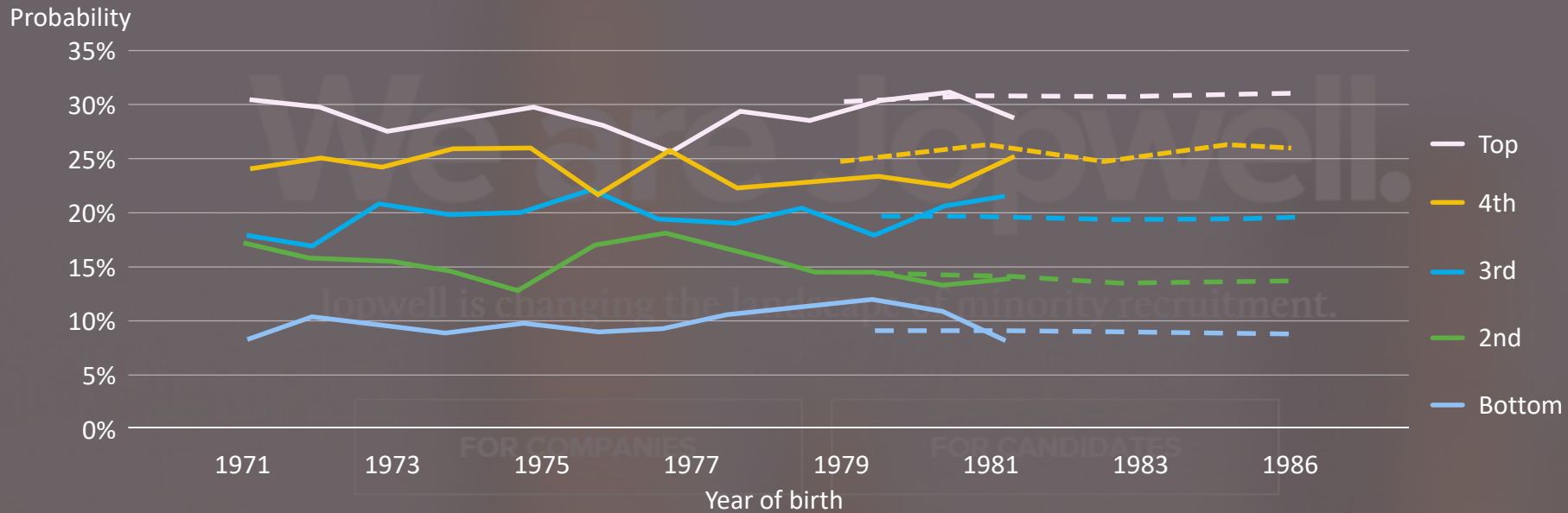
*Acorns and Stash are two companies providing apps which let people invest small amounts of money to begin to grow their wealth.

Overall inequality remains too high



Social mobility does not appear to be falling. However, America still remains highly socially immobile along class and ethnic lines

Probability of reaching top income quintile at age 26 by year of birth and parental income quintile, United States



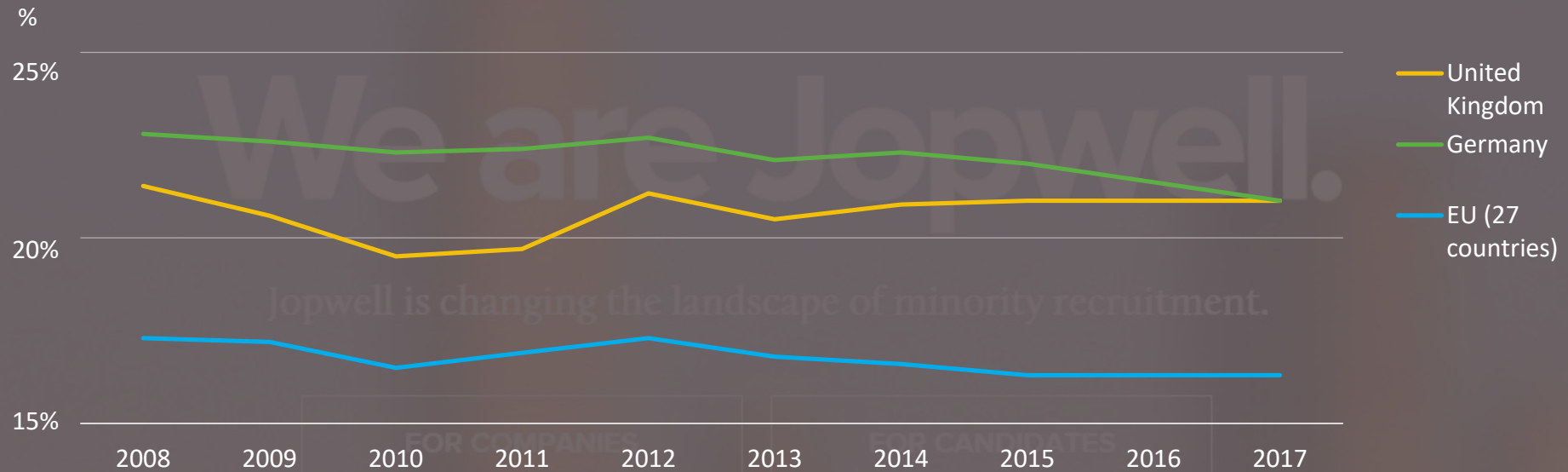
SOURCE: Equality of Opportunity Project; Chetty, Raj, Nathaniel Hendren, Patrick Kline, Emmanuel Saez, and Nicholas Turner. "Is the United States still a land of opportunity? Recent trends in intergenerational mobility." *American Economic Review* 104, no. 5 (2014): 141-47. Chetty, Raj, Nathaniel Hendren, Maggie R. Jones, and Sonya R. Porter. "Race and economic opportunity in the United States: An intergenerational perspective." No. w24441. National Bureau of Economic Research, 2018.

Overall inequality remains too high



Other forms of inequality, including gender pay gaps, are slowly improving across the developed world. But women still get paid considerably less than men

How much lower, in percentage terms, women's earnings are than men's



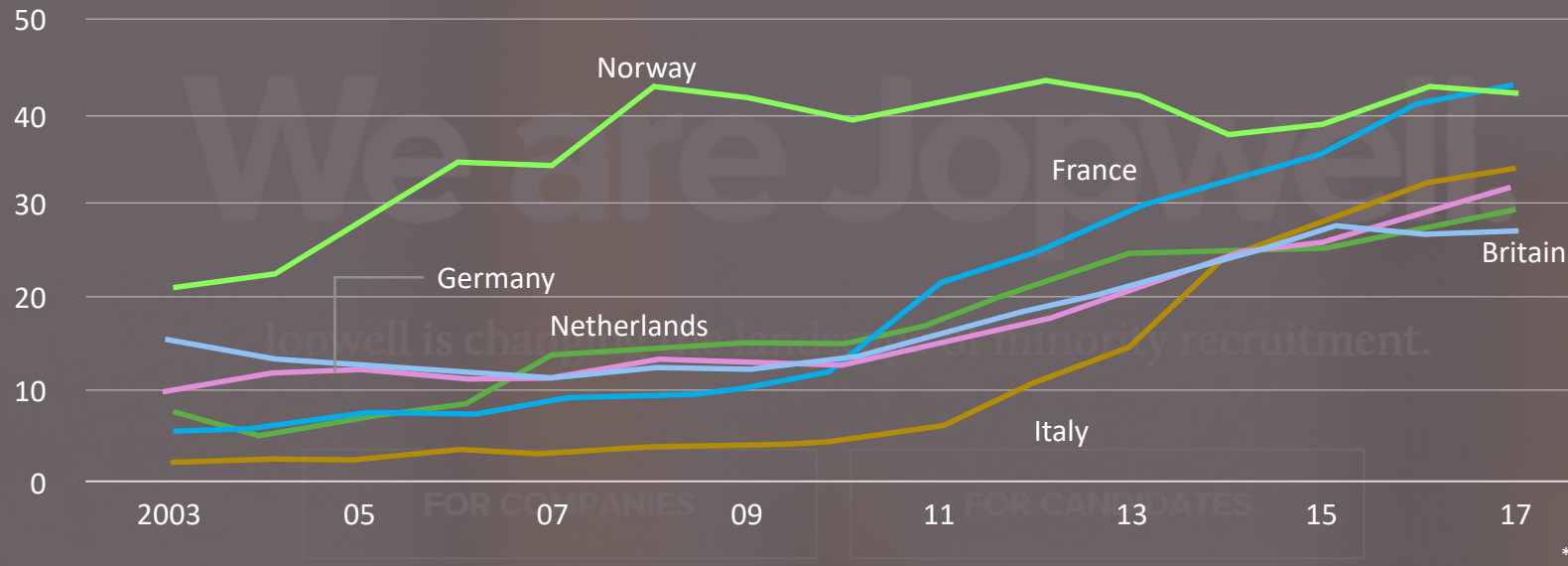
SOURCE: Eurostat

Overall inequality remains too high



Women form an ever-larger share of company boards. But this number is still too low

France has joined Norway with more than 40% of boards comprised of women



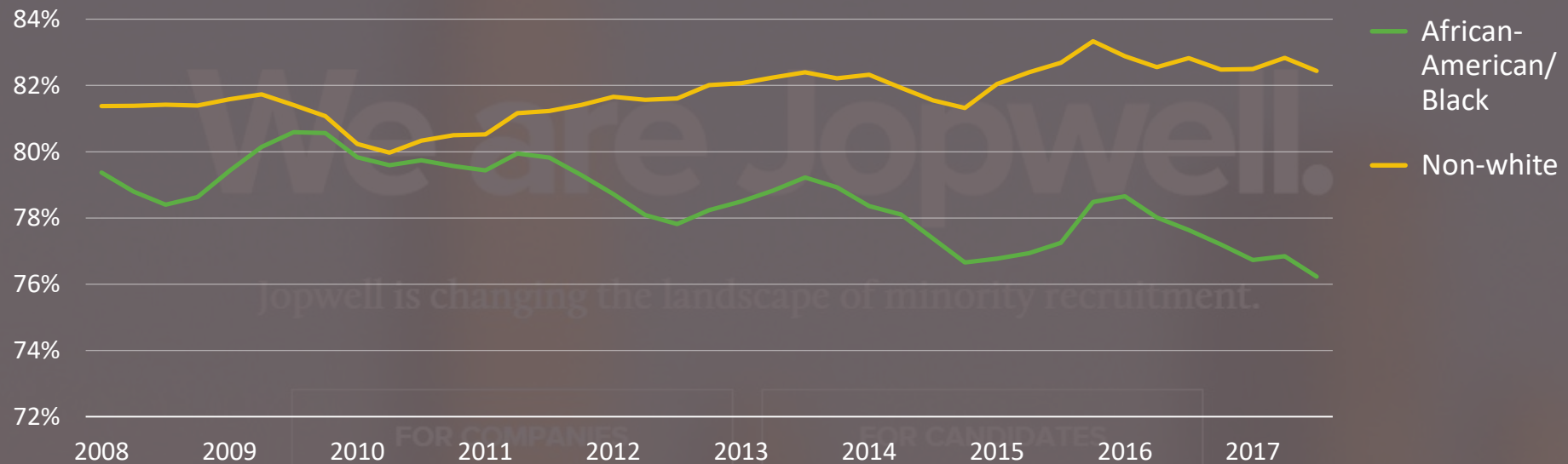
SOURCE: Forbes; European Institute for Gender Equality; *The Economist*

Overall inequality remains too high



As this novel analysis shows, overall ethnic pay gaps are falling, though black/African Americans are faring gradually worse than others

Race / ethnic pay as a percentage of whites' pay, 2008-18



SOURCE: Generation analysis of US Current Population Survey, US Bureau of Labor Statistics. "Non-white": average of Hispanic, African-American/black and Asian-American wages

Trends we continue to track



The pervasiveness of solutions offering financial access, and the response of conventional financial institutions



The impact of new advances in intelligent automation, machine learning and AI



Developing legal norms concerning the “gig economy”, encompassing factors like trade-union representation and minimum wages



The rate which the gender-pay gap closes



The net macroeconomic impact of online labour platforms on variables like unemployment and earnings



The extent to which rising inequality, populism and protectionism threaten the development of sustainable labour markets



Whether cities continue to be affordable places for the median worker to live – the cost of housing and transport are two key considerations



And others...

A sustainable economy requires continued improvement in:



Energy systems



Urban mobility



Consumption patterns



Health and wellbeing



Work environments





We welcome your feedback:

sustainabilitytrends@generationim.com

generation_____