



Cleantech Forum **Europe** | Stockholm

# Looking Back, Looking Forward: the Best is (Still) Yet to Come



## Looking Back, Looking Forward: the Best is Yet to Come

A Commemoration of 10 Years of  
Cleantech Forum Europe: 2005-14



Looking Back,  
Looking Forward:  
the Best is Yet  
to Come

**Patience, perseverance and a long-term perspectives are required**

**2014 has some similarities to 2005 – there are some major differences too**

**Context is ever-changing – keep exploring new areas, keep awatch on key secular trends**

MAY 2014

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The future never works out as we think. Innovation waves are multi-decade affairs

**2014 has some similarities to 2005 – there are some major differences too**

2019 isn't 2014: the "railroads" are more progressed

2019 isn't 2014: the ecosystem is more robust, more mature

2019 isn't 2014: the signals of mainstreaming are getting clearer and stronger

**Context is ever-changing – keep exploring new areas, keep awatch on key secular trends**

2019+: some topics to look out for (at this Forum and beyond)

MAY 2014

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The future never works out as we think. Innovation waves are multi-decade affairs.



## We tend to overestimate the effect of a technology in...

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Looking Back,  
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to Come



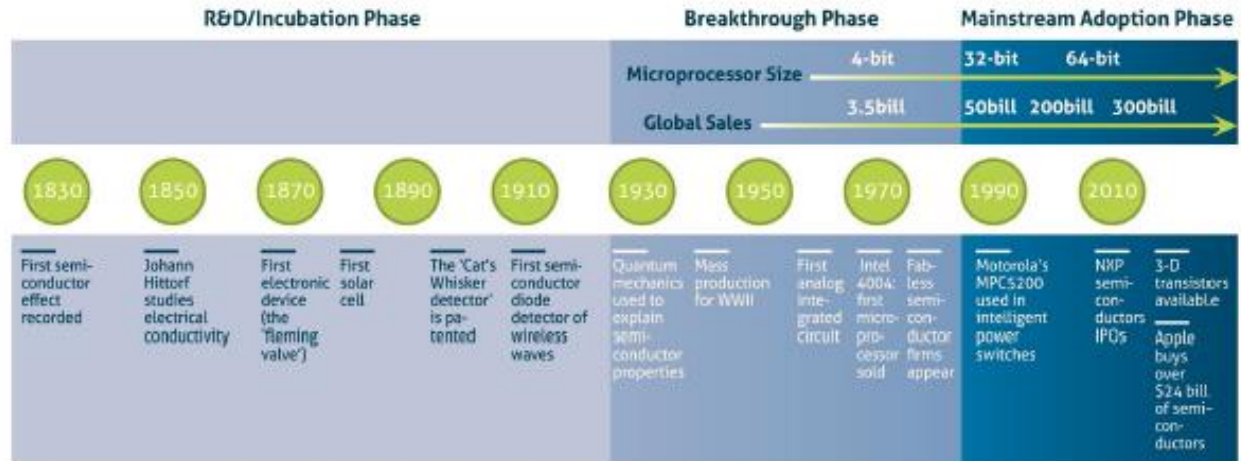
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### SEMICONDUCTORS: A STORY IN TIME



MAY 2014



..the short run...and underestimate it in the long run

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Looking Back,  
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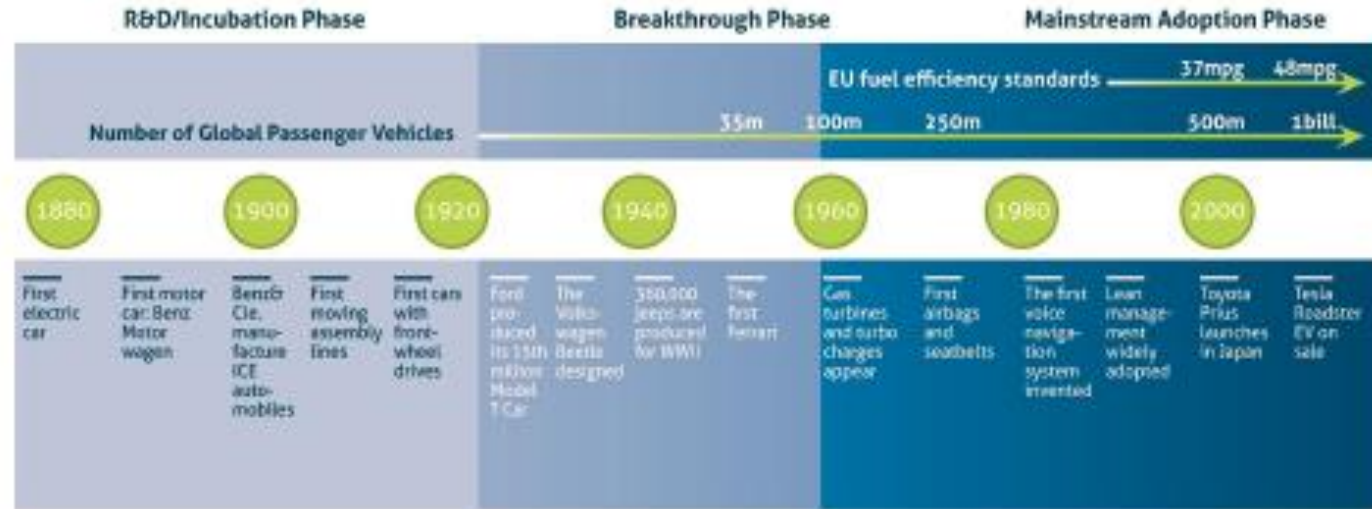
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## AUTOMOBILES, OVER A CENTURY OF INNOVATION



MAY 2014





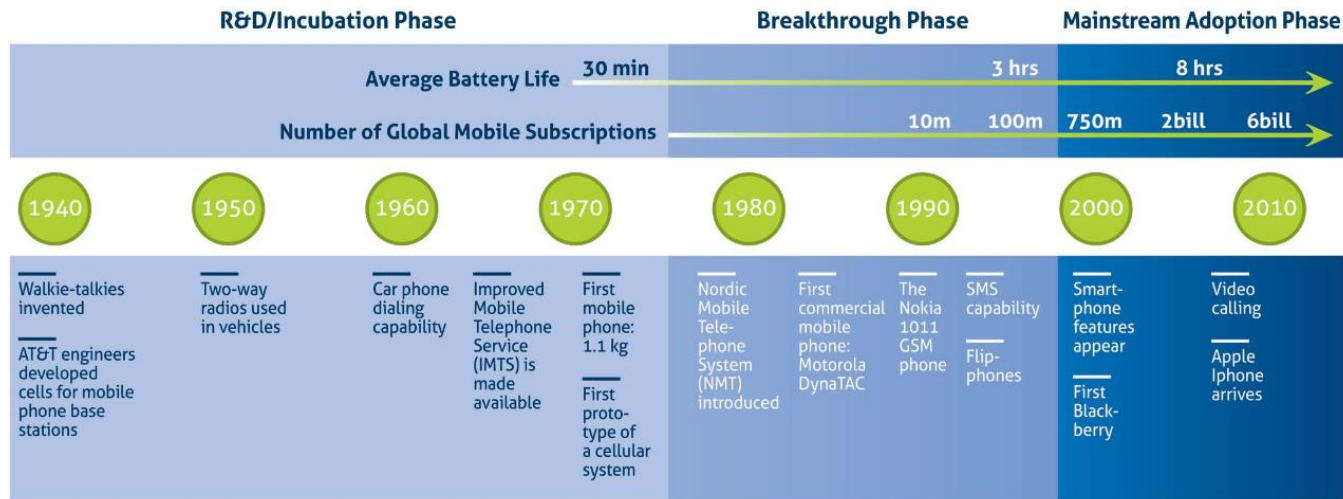
## Adoption phases can be short, where conditions allow

A Commemoration of 10 Years of  
Cleantech Forum Europe: 2005-14



Looking Back,  
Looking Forward:  
the Best is Yet  
to Come

### MOBILE PHONES: A HISTORY



MAY 2014

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## The impact of innovations accelerate and multiply over time

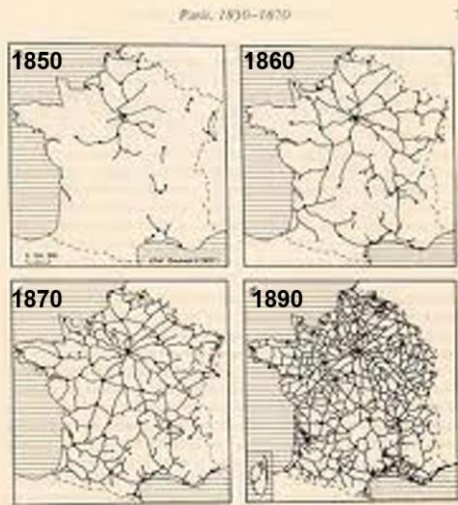


Fig. 1. The changing rail network of France, (a) 1850, (b) 1860, (c) 1870, (d) 1890.  
(Reproduced, with permission, from M. D. Cole, Themes in the Historical  
Geography of France, Academic Press, 1977.)

"Among the social forces of the modern world the railroad holds unquestionably the first place. There is not a single occupation or interest which it has not radically affected. Agriculture, manufacturers, commerce, city and country life, banking, finance, law, and even government itself, have all felt its influence."

Edward Howard  
"A Railroad Study"  
Harper's New Monthly Magazine 1877

"Taking on the incumbent industries is a multi-decade effort, and we're only in the second or third innings of an extra-innings game with cleantech."

khosla ventures

Andrew Chung,  
Partner, Khosla Ventures.  
March 2014 interview  
with CTG

Source: Looking back, Looking Forward: the best is yet to come, Cleantech Group, May 2014





2019 isn't 2014: the "railroads"  
are more progressed

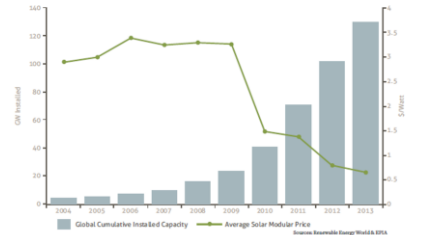


## It is no longer a question of when/whether they will be cheap

### Slides from 2014: solar & LEDs were proving out Amara's Law

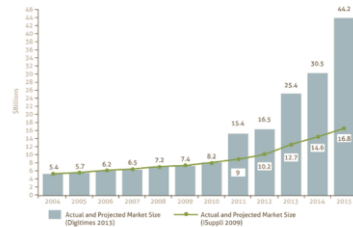
Not only is 2014 not 2004 – in some areas the 'railroads' are more advanced than we were expecting

AVERAGE PV MODULE PRICE VERSUS GLOBAL CUMULATIVE INSTALLED CAPACITY



Not only is 2014 not 2004 – in some areas the 'railroads' are more advanced than we were expecting

LED LIGHTING MARKET SIZE (2009 VERSUS 2013 FORECAST)



**Source:** Looking back, Looking Forward: the best is yet to come, Cleantech Group, May 2014

### A 2019 update

## Global cumulative PV capacity tops 480 GW, IRENA says

New global PV additions reached 94.2 GW in 2018, according to the International Renewable Energy Agency (IRENA). Asia is the region with the largest share of cumulative PV capacity, with around 274.6 GW, followed by Europe and North America with 119.3 GW and 55.3 GW, respectively.

**pv magazine**

APRIL 2, 2019 **EMILIANO BELLINI**

## Cree to Sell Lighting Business to IDEAL INDUSTRIES, INC.

MARCH 15, 2019

**OSRAM**

**DIGITAL LUMENS**

**FLUENCE**  
BIOENGINEERING



## Battery pricing is on a downward path, performance up

### A slide from 2014

Other sustainable 'railroads' will make big leaps in the next 10 years



### A 2019 view

1:45 PM - 2:45 PM

Riddarsalen

Wednesday

**Energy Storage: A Game Changer for Power, Transport and Industry**

As one of major facets in the decarbonization story across Europe, batteries are increasingly taking a central role in the transformation of the power, transport and industrial sectors. InnoEnergy will lead a discussion on a cross-section of the energy storage market, exploring how innovative technologies are transforming the region's major sectors. Key representatives from these sectors, alongside market innovators, will discuss key market developments, challenges and opportunities, as well how innovation can drive cross-sector collaboration.

*Co-hosted by: InnoEnergy*



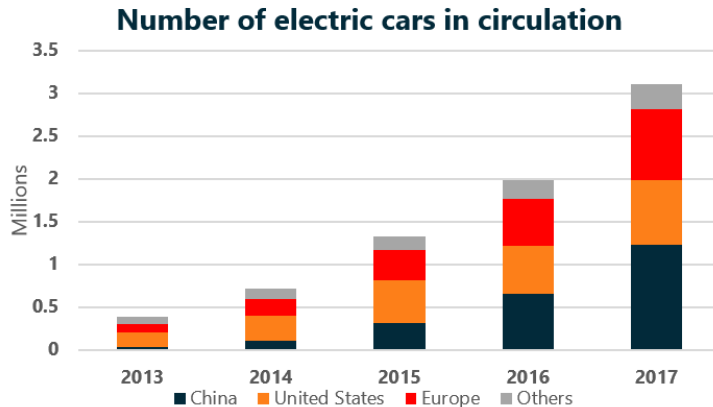
**Battery Technology Innovation Beyond 2019 – What's Next for Lithium-ion?**

By the close of the next decade, lithium-ion battery factories around the world will have a combined production capacity equivalent to 22 Tesla Gigafactories. Despite a ten-fold drop in costs over the past decade, lithium-ion battery costs are the biggest reason why electric vehicles (EVs) remain uneconomical compared to gas alternatives, with 30 to 50% of the cost of an electric car currently dedicated to the battery. ...



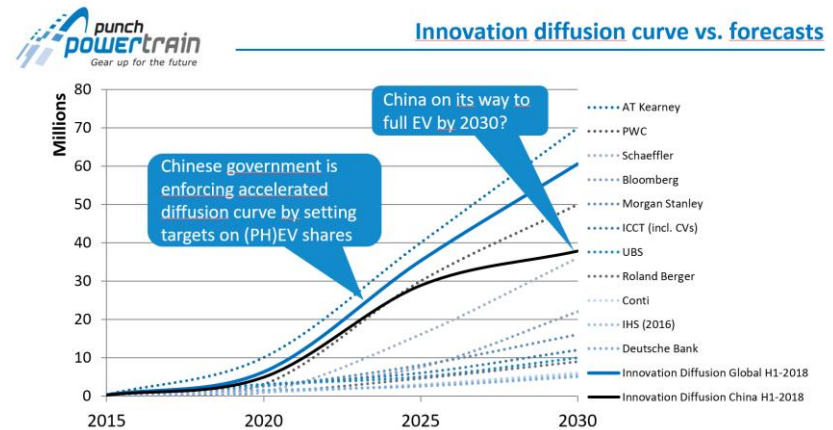
## China will turbo-charge the EV as the next “railroad”

EV numbers were negligible in 2014. They had increased by 500% by the end of 2017.



Source: Global EV Outlook 2018, IEA

Punch Powertrain: China's acceleration is consistent with the potential to achieve 85% EV's in the 2020s



Source: Next-Gen Energy Summit, Nanjing China,, Nov 2018



## “Big data” talk has largely disappeared

### A slide from 2014

The impact of Data and Connectivity is only going to accelerate and become yet more pervasive

#### SIGNALS FROM

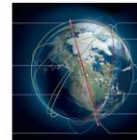


"With a trillion sensors embedded in the environment—all connected by computing systems, software, and services—it will be possible to hear the heartbeat of the Earth, impacting human interaction with the globe as profoundly as the Internet has revolutionized communication."

Peter Hartwell  
Senior Researcher, HP Labs



### A 2019 view (from our analysts)



#### Data Abundance – Opportunities in Planet Management

Modern satellites and sensors are capturing huge amounts of data – around 2.5 billion gigabytes per day. Converting this data into actionable insight will create value by helping us to understand how to mitigate climate change caused by industrial activity. Two areas of interest are making use of existing capacity through “Space as a service” and advances in data analytics...

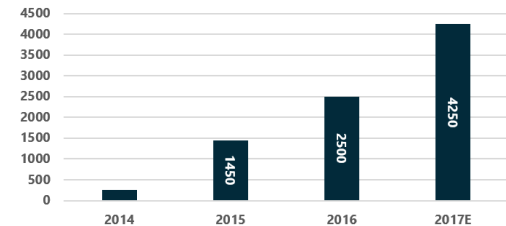
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#### Industrial Analytics – Optimizing Operational Efficiency

Searching for AI in Google returns over four billion results (climate change returns only 200 million) and buzz words like analytics, condition monitoring, predictive maintenance and industry 4.0 are commonplace at conferences. How much is hype and how much is delivering measurable results?...

#### Inquiries to Gartner about AI



Source: Gartner,  
Generation IM's  
Sustainability Trends  
Report 2018



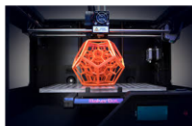
## The enabling technology portfolio has improved and grown

### A slide from 2014

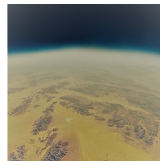
Some technology areas to watch out for...that we weren't talking about in Paris, May 2005



SIGNALS FROM **i3**



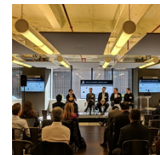
### A 2019 view (from our analysts)



#### Geospatial Analytics in 2019: Key Industry Trends

Geospatial companies have gone through a rapid evolution over the past 24 months. In 2017, large rounds of funding went to a handful of start-ups spun out from US-based research institutions, providing new technology to a broad range of markets. In 2018, we saw an increase in funding for smaller and leaner solution providers, with market consolidation via restructuring and acquisition by large corporate players further up the satellite value chain....

[READ MORE](#)



#### Blockchain in Energy & Mobility: A report from the scale-up frontlines

Last month, we held our second executive summit on blockchain in New York. Like last year, leading corporate executives gathered to meet some of the most promising innovators in the space. But the state of play has changed radically over the year, and so has the mood...

[Read more](#)



#### Virtual Reality Meets Industrial Innovation: How Technology Can Aid Creativity

Entertainment has been one of the drivers of Virtual Reality (VR) systems with popular offerings from Oculus, HTC Vive and Sony's PlayStation VR system. Commercial applications are taking the next step. Mixed Reality (XR), overlaying graphics on top of the real world, is led by companies like Magic Leap and Microsoft's HoloLens. As an enabling technology, VR/XR has the potential to touch many facets of the industries we cover...

[READ MORE](#)





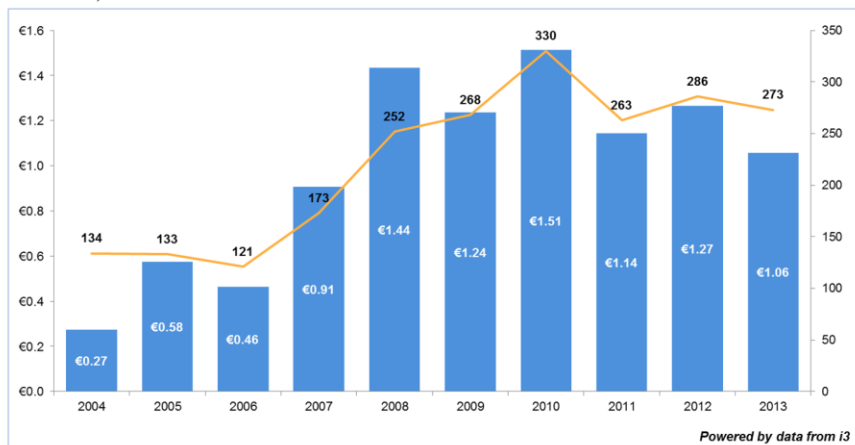
2019 isn't 2014: the ecosystem is  
more robust, more mature



## 2008-13: ours was a €1-1.5bn theme in Europe & Israel

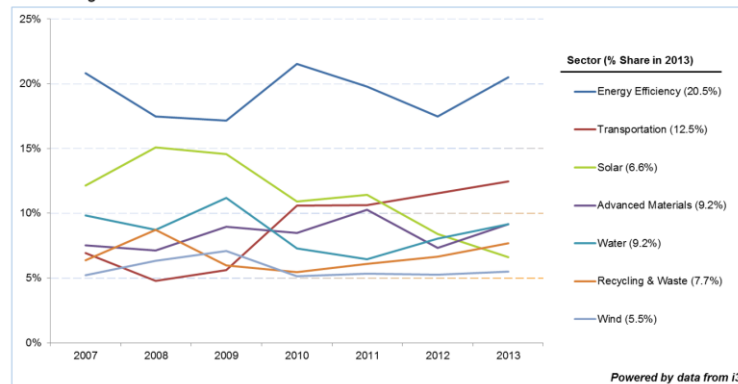
**The broad cleantech investment theme plateau'd during the early 2010's – in Europe, particularly**

**Cleantech Venture & Growth Capital Investment in Europe & Israel**  
€ Billions, # of Deals



**Energy Efficiency was the topic of the time. Transportation's meteoric rise was still to come**

**Europe & Israel Cleantech Venture Equity Investment, by Sector**  
Percentage of Deal Volume



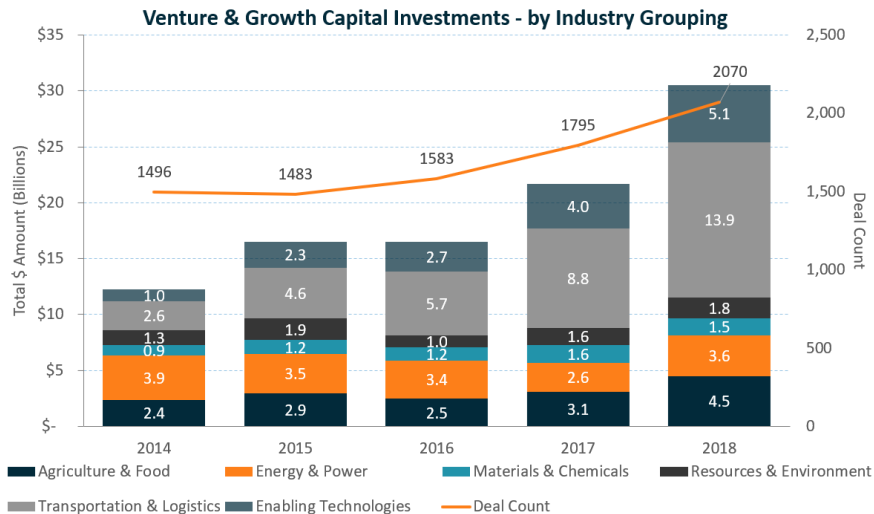
Source: Quarterly Investment Monitor, Q1 2014, Cleantech Group



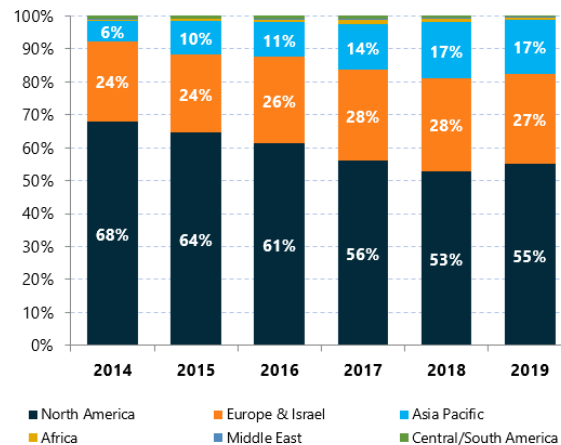
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## 2014-18: this theme has grown globally by 250%

**Global innovation investments into this theme have increased from \$8bn to \$30bn over the last 5 years**



**And the innovation activity continues to “internationalize”, year on year**



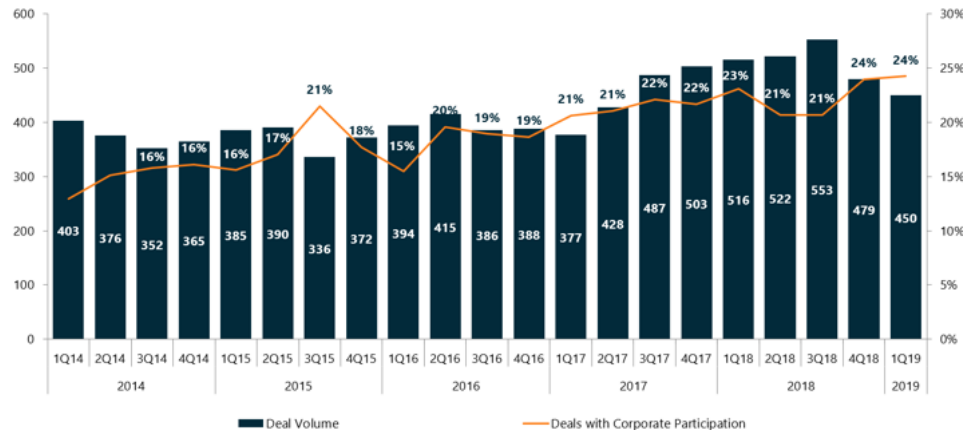
**Source:** Quarterly Investment Insights, Q1 2019, Cleantech Group



## Corporate activity in open innovation continues to rise

A trend we have been following since calling it out in 2010....

Corporate venture capital participates in approx. 25% of all deals



Source: Quarterly Investment Insights, Q1 2019, Cleantech Group



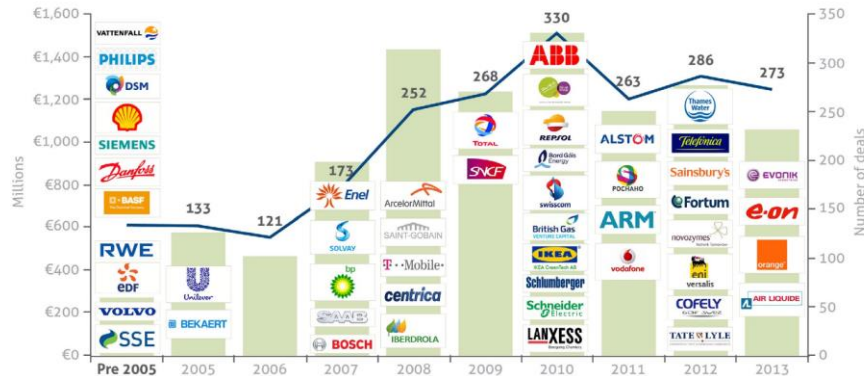
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## A few come and go but the trend is upwards

### A slide from 2014

THE EUROPEAN CORPORATE INVESTORS: A STORY IN TIME

Powered by data from i3



<sup>a</sup>The graphs in the background show venture and growth investments into European cleantech companies. The bar chart represents the investment activity by €'s and the line graph by number of deals. Placement of Corporate is based on Year of First Minority Investment, according to CleanTech Group's i3 (the list is not comprehensive, but illustrative).

### A 2019 view

New Players since 2014

Eneco Group

ENGIE

Statkraft

EnBW

equinor

nationalgrid

Increased Commitment from Existing Players  
&/or Revived/Refreshed Programs








The strongest current wave of newcomers is  
coming from the Asia Pacific region



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## BP has re-committed and upped/expanded its activity set










Investor	Company	Primary Use-Case	Round	Date	Notes
		Mobility: Fleet Management	<u>Undiscl.</u> , Growth Equity	Feb 2019	GPS tracking and fleet monitoring data analytics (operational and driver data) for improved efficiency.
	 电享 ( <i>PowerShare</i> )	Mobility: EV Charging & Infrastructure	<u>Undiscl.</u> , Series A	Jan 2019	EV Charging hardware and software developer. First direct investment in China for BP.
		Mobility: EV Charging & Infrastructure	Acquisition	June 2018	UK-based charging infrastructure developer. Acquisition aligns with BP's UK retail strategy.
		Electricity/Mobility: Energy Storage	\$20M Series A	June (\$5M) & Dec 2018 (\$15M)	Second life EV battery storage solutions and portable EV charging infrastructure.
		Electricity: Energy Efficiency	\$3.2M Series A	July 2018	Electricity usage monitoring software for residential & commercial customers.
		Electricity/Mobility: Energy Storage	\$20M growth equity	May 2018	Developing organic compounds for fast-charging energy storage and LCD displays.
	<b>DROVER</b> <b>VICTOR</b>	Mobility: Mobility-as-a-Service Mobility: Aviation	\$7.7M Seed \$18M Series B	March 2018 Jan 2018	Provider of subscription-based car ownership services. Private jet chartering platform.

Source: Cleantech Group





## ENGIE and Centrica have become active since 2014


















Investor	Company	Primary Use-Case	Round	Date	Notes
		Electricity: Smart Grid	Acquisition	March 2019	Developing virtual power plant (VPP) technology focused on European markets.
		Electricity: Smart Grid	Series B <u>undiscl.</u>	Dec 2018	Software platform for utilities and distributed energy resource owners to conduct energy transactions.
		Electricity: Energy Efficiency	Series A, \$20M	March 2018	Developer of 'energy-as-a-service' platform allowing customers to outsource energy efficiency upgrades.
		Electricity: Energy Storage	Series B \$20M	Jan 2018	Developer of rural distributed mini-grids (co-investment from Shell).
		Electricity: Smart Grid	Series B \$4.1M, Series A <u>undiscl.</u>	Jan 2018 (Series B) Dec 2017 (Series A)	Energy storage to help industrial and commercial energy companies capitalize on load flexibility.
		Electricity: Energy Efficiency	\$8.5M Series A	April 2019	Blockchain-based home monitoring and energy data analytics and a P2P energy marketplace.
		Electricity: Demand Response	Series B <u>undiscl.</u>	Feb 2019	Developing a platform for utilities, energy services and OEMs to manage IoT devices efficiently in distributed energy systems.

Source: Cleantech Group



## The number of strategic M&A events has been increasing

### The future of energy & power is where the trend is strongest

Acquiror	Target	Date	Acquiror	Target	Date
		Jan 2018			Feb 2019
		March 2017			Feb 2019
		May 2016			Feb 2019
		July 2015			Oct 2017
		Nov 2017	 <div><b>Does Shell's Acquisition of Sonnen Represent our Netscape Moment?</b> There were milestones on the Internet's journey to becoming what it is today, namely an all-pervasive, essential and normal part of consumer, business and now, with the rise of IIoT (Industrial Internet of Things), industrial life.... <a href="#">READ MORE</a></div>		
		Nov 2015			
		Oct 2017			
		June 2017			

### Enabling technologies have also been attracting attention

Acquiror	Target	Date
		Oct 2018
		Sept 2018
		June 2018
		Nov 2017

Source: Cleantech Group



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## The “\$1bn club” are now all actively investing

Investor	Size	Investment Orientation/Language	Example Portfolio Companies
SoftBank	\$93 Billion	“Enabling the new age of innovation”	view, KATERRA, PETUUM, INNOVIZ TECHNOLOGIES, Plenty, NAUTO, LanzaTech, UBER, Grab
RISE	\$2 Billion	“achieving social and environmental impact alongside competitive financial returns”	BRAVA, EBES, Dharma
OGGI OIL AND GAS CLIMATE NUTRI-VE	\$1 Billion	“technologies that have the potential to significantly reduce greenhouse gas emissions”	Kelvin, KAIVOS AEROSPACE, GHGSat, ClarkeValve, inventrys, Solidia Technologies, EONIC, achatesPOWER
RENAULT NISSAN MITSUBISHI	\$1 Billion	“Building clean, affordable and safe cars for everyone”	ENEVATE, ionic MATERIALS, WeRide, SHIFT, KALRAY
Breakthrough Energy	\$1 Billion	“Ensure...standard of living, including basic electricity, healthy food, comfortable buildings, and convenient transportation, without contributing to climate change.”	DMC, MALTA, ZERO MASS WATER, CARBON CURE, CFS, QUINNET ENERGY, FERVO ENERGY, Form Energy
next 47	€1 Billion	“innovation that can disrupt industries and create new markets”	BRINGG, TURVO, SILA, CLAROTY, fair, rideOS, Seurat, ubitricity
TEMASEK HOLDINGS	Many \$Bs of AUM	“Committed to transforming economies, growing middle class income populations, deepening comparative advantages, and invest in emerging champions”	PIVOT BIO, GOJEK, BOWERY, stem, thinci, RokiD, Bolt Threads, IMPOSSIBLE, gogoro, FARMERS BUSINESS NETWORK, DiDi

Source: Cleantech Group



## May 21: The “\$1bn club” just got added to

London and SF-based Generation closes \$1 billion fund to invest in startups innovating for a sustainable future

By Mary Loritz - May 21, 2019

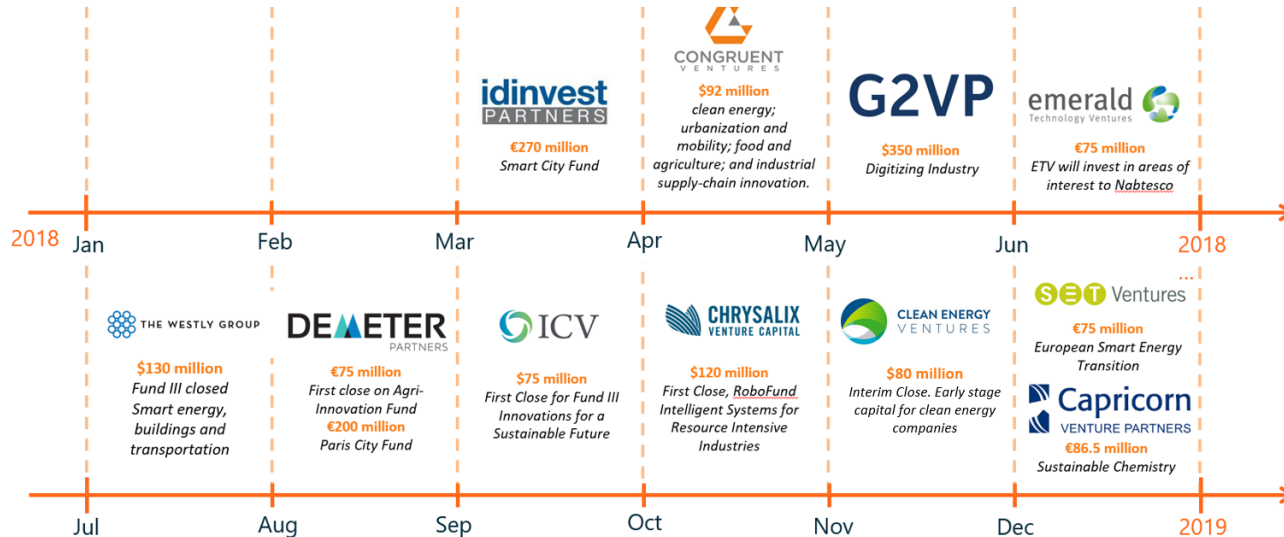


*“We believe that we are at the early stages of a technology-led sustainability revolution, which has the scale of the industrial revolution, and the pace of the digital revolution,” said Al Gore, Chairman and Co-Founder of Generation.*

*“Globally, we see the rapid adoption of sustainable solutions at an important inflection point,” said Lilly Wollman, Partner of the Growth Equity platform. “By taking advantage of technology cost-down curves, companies can drive sustainable transition through profitable growth and innovative business models.”*



## 2018 fund announcements have belonged to the pioneers



This chart was put together to illustrate the re-bond of some of the pioneers of the 2010's in the US and Europe/Israel.

(Pioneers here included individuals who have raised a new fund under a new name/outfit – e.g. Congruent and G2VP)

Source: Cleantech Group



2019 isn't 2014: the signals of mainstreaming are getting clearer and stronger





## Mainstreaming signals: the rise of ESG and Impact Investing

**Demand for sustainable investments in mainstream investing has risen by 150%+ since 2014**

### What is happening in the market

There is growing evidence that sustainability generates better risk-adjusted performance

The average performance of sustainable funds in 2018 was above-average according to Morningstar research

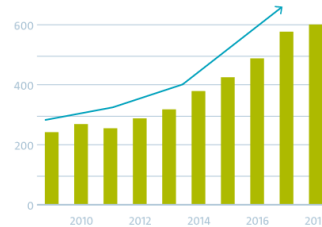


Source: Morningstar Direct (Data as of December 31, 2018)

There is increasing demand for sustainable investments

Assets under management in Responsible Investing

AuM in EUR (billion)



Source: Broadridge GMI (Global Mutual fund & ETF AuM)

Source: [www.robecom.com](http://www.robecom.com)

**Robeco attributes 22% of the outperformance of its Global Stars Equities fund to ESG**

### How ESG aids outperformance in Global Stars Equities

10-05-2019 | Insight

Robeco has long believed that embracing sustainability investing can lead to a better risk/return profile. But we had not publicly quantified it until analysis of our flagship Global Stars Equities fund showed the contribution ESG had made over the past two years.

#### Speed read

- Analysis quantifies the performance attribution from sustainability
- ESG explains about 22% of outperformance from 2017-2018
- Negative effect of certain exclusions more than offset by others



## Mainstreaming signals: appetite for new asset types

### £2bn DC scheme selects ESG strategies for default option

31 OCTOBER 2018 | BY [NICK REEVE](#)

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One of the UK's biggest defined contribution (DC) master trusts is to migrate part of its default investment option to environmental, social and corporate governance (ESG) focused strategies by the end of the year.

The £2bn (€2.3bn) LifeSight scheme, run by Willis Towers Watson, will reallocate roughly half of its equity holdings in its default fund to track the MSCI Adaptive Capped ESG Universal index and the Robeco Global Sustainable Multi-Factor Equities index.

Source: [www.ipe.com](http://www.ipe.com)

#### RELATED CATEGORIES

[United Kingdom](#)

[Equities](#)

'First of a kind': SEEIT energy efficiency fund completes £100m IPO



BusinessGreen staff

11 December 2018

### Gresham House battery trust seeks £75m in second fund raising

By Loukia Gyftopoulou / 26 Apr, 2019



WEALTH  
MANAGER





## Mainstreaming signals: appetite for plant-based food

### FINANCIAL TIMES

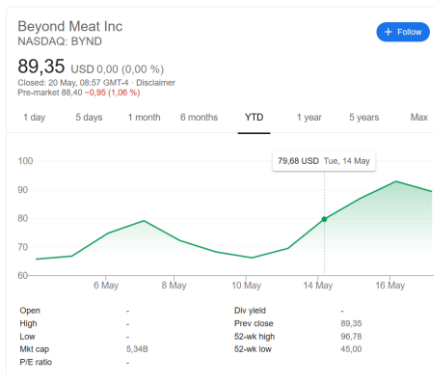
Cashew foie gras? Big Food jumps on 'plant-based' bandwagon  
MAY 18, 2019

Boom in meat and dairy substitutes sets up 'battle for the centre of the plate'



### Appetite for Beyond Meat drives IPO price range higher

Vegan start-up valued at \$1.5bn after issuing new shares at \$25 each



2019 GLOBAL  
CLEANTECH<sup>100</sup>  
COMPANY

Produced by  Cleantech.  
Group



## Mainstreaming signals: hard to argue with 10 years of data

Our exchange-traded fund (ETF), Cleantech Index (CTIUS) has matched “all market” mainstream benchmarks over 10 years, outperforming over the last 3. This speaks forcibly to “cleantech” being so much more than “just” Clean Energy

Index	Index <u>Total</u> Returns <i>(in U.S. Dollars)</i>					2019 to April 15	3 Years to 2019	10 Years to 2019
	2015	2016	2017	2018	2019 Q1			
<b>The Cleantech Index</b> <i>Yahoo: DE000SLA48M8.SG; Bloomberg: CTIUSTR Index</i>	3.0%	13.7%	31.1%	-11.7%	13.3%	20.4%	31.5%	152.7%
<b>MSCI All-Country World Index</b> <i>MSCI ACWI (USD)</i>	-1.8%	8.5%	24.6%	-8.9%	12.3%	15.3%	23.1%	160.6%
<b>WilderHill New Energy Global Innovation</b> <i>ISIN: DE000SLA4684; Bloomberg: NEXUST</i>	-14.4%	-6.5%	28.1%	-20.8%	14.7%	19.3%	-3.1%	-4.3%
<b>WilderHill Clean Energy Index</b> <i>Yahoo: ^ECOTR</i>	-11.2%	-24.0%	35.6%	-14.5%	24.3%	29.9%	-7.8%	-40.0%
<b>Ardour Global Alternative Energy</b> <i>S-Network: AGIGL</i>	1.2%	-1.5%	23.5%	-2.9%	14.0%	20.1%	9.7%	-0.8%



2019+: some topics to look out for (at this Forum and beyond)



## Circularity & Waste to Value topics are trending upwards

### Sessions in this Forum's Agenda

11:15 AM - 12:15 PM

Riddarsalen

Wednesday

#### The Future of Carbon: Utilization or Sequestration or Both?

Our 2019 Global Cleantech 100 featured a record number (5) of carbon-to-value companies, a signal that the utilization of carbon as a future growth market is gaining traction and momentum as we head toward the 2020s. However, given the scale of the carbon issue, there are plenty of the persuasion that converting it to fuels, chemicals or concrete isn't going to deal with the global CO2 challenge, and that we will still need to sequester and store as well. This session will give voice to this debate.

Co-hosted by: BP Ventures

1:45 PM - 2:45 PM

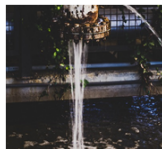
Riddarsalen

Thursday

#### The Circular Water Economy: Opportunity & Innovation

More efficient treatment, use and reuse of water can play an important part in both driving profit margins and addressing climate damage. Innovative circular water innovation and new business models are enabling a shift towards more efficient and affordable treatment of residential, commercial and industrial water. In this session, we will dive into some of the market dynamics, with startups and corporates who are leading the charge in driving a more circular water economy.

### Other Topics our analysts are following closely



#### Building The Pipeline: Corporate Engagement with Industrial Water Innovation

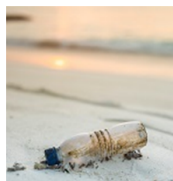
Earth may be the blue planet, but both growing population and climate change are creating freshwater scarcity in many geographies. Industrial activities come second only to agriculture in the use of water resources, responsible for [16% of global freshwater withdrawals](#)...



#### Strength in Numbers: Long Term Solutions for CO2 Reuse

Industrial clusters are geographic concentrations of interconnected companies, benefiting from shared infrastructure. For CO2 reuse, this creates a wider set of opportunities to connect elements along the carbon, capture, utilization, and storage (CCUS) value chain...

[Read more](#)



#### If Robots Could Recycle: How Technology Innovation Can Help Solve Plastic Pollution

Global plastics production has increased from 225 million metric tons in 2014 to 335 metric tons in 2016: only about 16% of this is recycled. The other 84% is either dumped into landfill or makes its way into the ecosystem, causing a tremendous amount of pollution....

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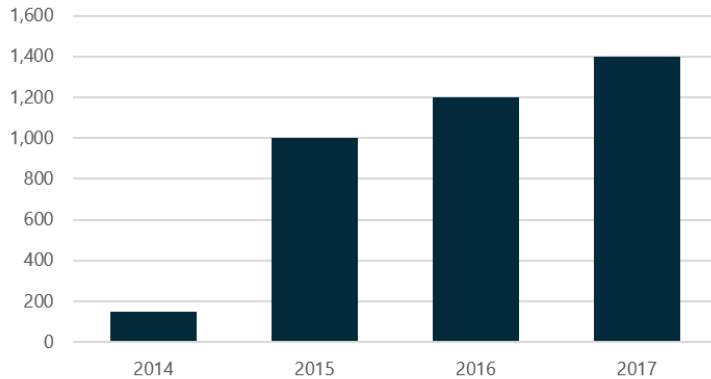




## Carbon is rising up the corporate agenda (for some)

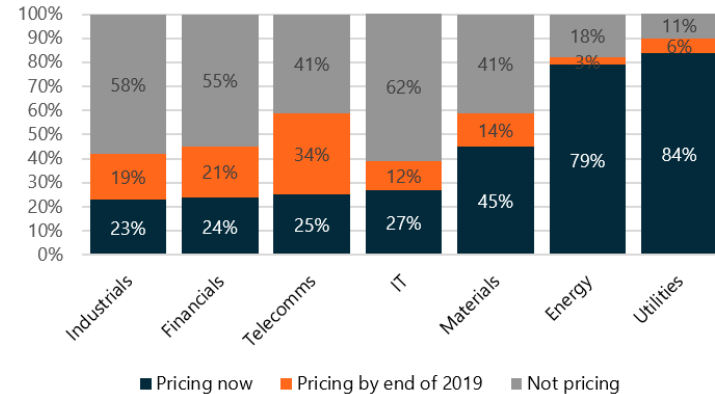
### The Paris agreement created a change...

Number of global companies factoring an internal carbon price into their business plans (by year)



### ...especially (but not only) in the Energy & Power world

Number of global companies factoring internal carbon pricing into their business plans (by sector)



Source: Carbon Pricing, Carbon Disclosure Project



## Circularity & Waste to Value topics are trending upwards

### Sessions in this Forum's Agenda

11:15 AM - 12:15 PM

Riddarsalen

Wednesday

#### The Future of Carbon: Utilization or Sequestration or Both?

Our 2019 Global Cleantech 100 featured a record number (5) of carbon-to-value companies, a signal that the utilization of carbon as a future growth market is gaining traction and momentum as we head toward the 2020s. However, given the scale of the carbon issue, there are plenty of the persuasion that converting it to fuels, chemicals or concrete isn't going to deal with the global CO2 challenge, and that we will still need to sequester and store as well. This session will give voice to this debate.

Co-hosted by: BP Ventures

1:45 PM - 2:45 PM

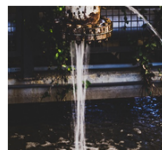
Riddarsalen

Thursday

#### The Circular Water Economy: Opportunity & Innovation

More efficient treatment, use and reuse of water can play an important part in both driving profit margins and addressing climate damage. Innovative circular water innovation and new business models are enabling a shift towards more efficient and affordable treatment of residential, commercial and industrial water. In this session, we will dive into some of the market dynamics, with startups and corporates who are leading the charge in driving a more circular water economy.

### Other Topics our analysts are following closely



#### Building The Pipeline: Corporate Engagement with Industrial Water Innovation

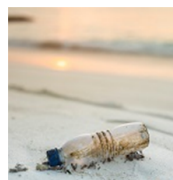
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Read more



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## Circularity & Waste to Value topics are trending upwards

### Sessions in this Forum's Agenda

9:50 AM - 10:50 AM

Riddarsalen

Thursday

#### Reforming an Age-Old Industry: How Sustainable Chemistry is Enabling a Circular Economy

The 20th century chemicals industry developed dozens of fossil-based materials that formed the foundation of our current linear economy, a system that consumes the resource equivalent of 1.6 earths annually and threatens to pollute the environment beyond

11:30 AM - 12:30 PM

Riddarsalen

Thursday

#### Changing Clothes: The Circular Fashion Economy

Fast fashion – mass-produced, inexpensive, throwaway clothing – is damaging the environment and the workers who make it. Textile dyeing is the second largest polluter of clean water globally (after agriculture), and reams of un-recyclable materials are being discarded in landfill. However, innovation in textiles, factories, and supply chain practices are emerging to offer viable alternatives to the make-use-dispose model of fashion. In this session, we will highlight some of the innovators and enablers addressing these issues.

### Other Topics our analysts are following closely



#### Are Plants the Solution to our Plastics Problem?

Plastic made with inexpensive feedstock, supported by large investment in infrastructure dominated by oil and gas companies, appears not only to be here to stay, but poised for production growth. At the same time, media and social pressure to do something about plastic waste is increasing. [Recycling is one solution](#), but the underlying question persists: is there a more environmentally attractive replacement?...

READ MORE



#### Where Synthetic Biology Meets Textiles

Synthetic biology is an interdisciplinary field combining biology and engineering that is being applied to textiles, where living organisms have the potential to become both the machine and operating system of bio-fibers and bio-fabrics. Two notable areas of innovation are: bio-leather (lab-grown, but biologically identical to traditional leather) and spider silk....

Read more



## Circularity & Waste to Value topics are trending upwards

### Sessions in this Forum's Agenda

9:50 AM - 10:50 AM

Riddarsalen

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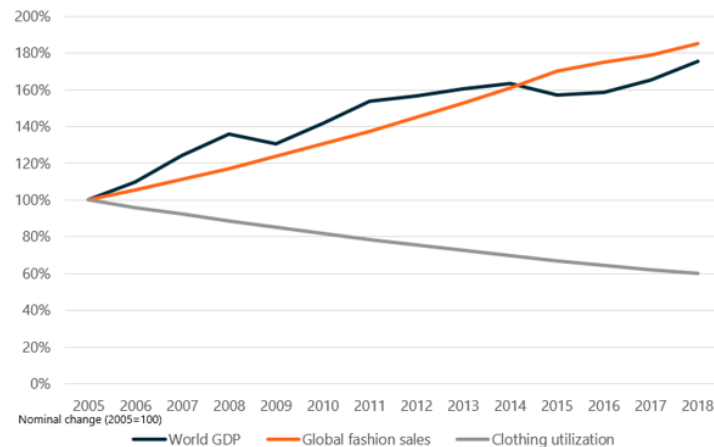
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### Clothing/Fashion is wasteful. Sales are outpacing the economy while actual utilization rates are falling



**Source:** Generation IM's *Sustainability Trends Report 2018* (based on McKinsey Fashion reports, World Bank data, Ellen Macarthur Foundation)



## Alternatives & Efficiency are key themes in Ag & Food

### Sessions in this Forum's Agenda

3:15 PM - 4:15 PM

Galleriet

Wednesday

#### Linking the Food Chain: How to Waste Less Food with On-Demand Logistics

How do you get food from field-to-fork fast, and how is this going to help us reduce waste? Food delivery is more convenient than ever for consumers, with direct-from-farm business models and a network of grocery and cooked food delivery options available on your phone. The new food system relies heavily on efficient logistics systems and less on a supermarket's ability to predict and drive demand. This session aims to understand how this system provides fresh opportunities to reduce food waste.

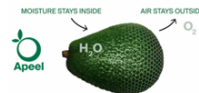
### Other Topics our analysts are following closely



#### Meat Alternatives on the Move

An [FAO](#) estimation says we are on track for a 9 billion-person planet by 2050, and along with the people comes a 50% increased appetite for protein. Traditional protein for human consumption comes from animals and fish, with soy increasingly part of the landscape. The non-traditional or alternative proteins market (\$4.2 billion in 2016) is around 1% of the traditional protein market, but is expected to [grow](#) more than 25% by 2022...

[READ MORE](#)



#### Fixing Food Waste with Packaging Innovation

Only two-thirds of food grown makes it to the consumer, at which point up to half of what's left goes to waste. Innovation in food packaging is an effective way to tackle food waste, as extending shelf life of a product reduces waste throughout the supply chain. We spoke to two innovative companies to understand more about the market: [Apeel Sciences](#) and [Food Freshness Technology](#)...

[READ MORE](#)



## Logistics: enabling a lot of unnecessary transportation

### Sessions in this Forum's Agenda

1:45 PM - 2:45 PM

Galleriet

Thursday

#### In Search of Efficiency Opportunities in Global Logistics

A massive industry rife with inefficiency, short on data and long on GHG emissions, global logistics represents opportunities for innovation to power it toward a more digitized, de-carbonized and resource-efficient future. Transportation, long-haul to last mile, is the single biggest contributor of the global logistics industry's estimated 28.5% contribution to global emissions. As an antidote to the hype around passenger mobility services of the services, we have invited a handful of entrepreneurs to share what they are seeing as the broad movements and trends in the transportation of goods. What opportunities are there, why and where for innovative solutions (for theirs and others) to solve market problems today and tomorrow?

### Other Topics our analysts are following closely



#### Innovation in Logistics: From a Supply Chain to a Demand Chain

A massive industry rife with inefficiency, short on data and long on GHG emissions, global logistics represents opportunities for innovation to power it toward a more digitized, de-carbonized and resource-efficient future...

[READ MORE](#)



#### How Digitization is Transforming Logistic Services

The increasing volume of global trades will put more pressure on the existing supply chain, with the logistic services sector estimated to reach a value of **\$16.445 billion by 2026** with a CAGR of 7.4%. A confluence of forces – Amazon & Alibaba, electrification & sustainability, autonomy & robotics, among others – are changing the logistics industry to become more resource efficient, faster, and responsive to customer needs...

[READ MORE](#)





# Cleantech Forum **Europe** | Stockholm



## Heat and Hydrogen have our attention right now

### Sessions in this Forum's Agenda

3:15 PM - 4:15 PM

Riddarsalen

Wednesday

#### Heat: An Opportunity As Big As Power and Transportation Combined

From industrial waste heat to residential air conditioning, heat is one of the major contributors to the global GHG emissions, and often not given the attention that it needs. This session will evaluate some of the innovative solutions to tackle the heating challenge, exploring alternative heat de-carbonization pathways, including digitization of heating systems, conversion of the gas grid to low-carbon hydrogen, and emerging waste heat recovery solutions.

4:30 PM - 5:30 PM

Riddarsalen

Wednesday

#### Hydrogen: Reimagining its Role in the European Economy

Government support, tightening emission regulations and decreasing equipment costs are just some of the factors influencing the new narrative around hydrogen in Europe. Once solely considered an industrial feedstock, hydrogen is now being seriously considered as a key component for the region's decarbonization efforts. This session will explore why hydrogen has come back in vogue, diving into what role it can play within different sectors such as heating, power, and industry across Europe.

### Other Topics our analysts are following closely



#### Could Methanol Become an Important Fuel for Energy and Mobility?

With a [global demand](#) of more than 80 million metric tons and a [growth rate](#) of 5.4% methanol is gaining acceptance. The market is [projected](#) to be worth \$54 billion by 2021. Its uses vary greatly – from adhesives and PET bottles to fleece jackets, packaging, paints and solvents. A key application is the energy market....

READ MORE



#### Energy & Power Shifts from IoT Cloud to Edge Computing

Distributed energy resources can easily generate over one Terabyte (TB) of data a day, which is pushed back to a centralized cloud platform service to be processed, analyzed and ultimately acted upon. Assets are now generating more useful data than infrastructure can efficiently move...

READ MORE





## How fast is next-gen mobility going to be with us?

### Sessions in this Forum's Agenda

5:40 PM - 6:15 PM

Masshallen

Wednesday

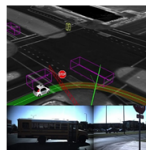
#### Mobility for the 2020s: A Progress Report from the Frontlines

As exciting as the promise of next-generation mobility is, significant hurdles toward making it a reality remain. For all the amounts invested, the unit numbers on the road today of what 2030 mobility might look like are small.

It is the interplay of autonomy, electrification, fleetification and TaaS (transport-as-a-service), underpinned by connectivity and systemic safety that would, as is well-argued in ReThinkX's *Rethinking Transportation 2020-2030*, bring forward truly disruptive economics and resource efficiencies to transportation. But, arguably, this vision of the future is only as strong as its weakest, or its slowest-moving, part since the power of the disruption is in the combination and convergence of all these factors.

This final plenary session of the day will feature two European Global Cleantech 100 companies to provide their perspectives on the current deployment frontlines, how fast the industry is evolving, and what challenges remain to be solved.

### Other Topics our analysts are following closely



#### Driving to the Future: How Autonomous Vehicles are Changing the Automotive Landscape

*Safety first.* According to the [National Highway Traffic Safety Administration](#), 94% of US traffic accidents are caused by human errors. Removing the human in human error will go a long way toward eliminating traffic accidents. The challenge: moving from driver assistance to full automation will take time, investment, and a lot of testing...

[Read more](#)



#### Intelligent Traffic Systems: Implementation and What's Down the Road?

According to INRIX's 2017 Traffic Scorecard study, the estimated total economic costs from traffic congestion for the US, UK, and Germany amounted to almost \$461 billion in 2017. The dollar value increases when the calculation includes data from the other 35 countries in this study...

[Read more](#)



#### We wanted flying cars, and they gave us... flying cars! Catching up with Lilium

Vertical take-off and landing (VTOL) cars have been in the public's imagination from the cartoon *The Jetsons* in the 60s to movies like *Blade Runner*, *Star Wars* and even the Weasley's Flying Ford Anglia in *Harry Potter*. Where imagination leads, innovators create – and now we have growing competition to commercialize electric VTOL (eVTOL) vehicles that will change the face of individual transportation...

[Read more](#)



The best has started to arrive  
More looks set to come.

But the future is always crazier  
than we think...



# Cleantech Forum **Europe** | Stockholm

## Thank you for your attention. Enjoy the Forum.

### Catch up with us, and our latest work, over the next 2 days

*Our research, consulting and events catalyze opportunities for sustainable growth powered by innovation.*



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Keep your finger on the pulse of who and what is happening. Our online subscription service gives you access to the leading companies, the trends to pay attention to, and analyst insight about emerging sector and investment themes.



#### Events

Engage with industry leaders and innovators from across the breadth of the global sustainable innovation ecosystem. Find capital, advisors, partners and co-investors at our international events.



#### Consulting

Set priorities and find the partners and investment opportunities that will help you challenge uncertainty and succeed.

### Note these dates for your H2-2019 calendar

#### June 21

Deadline to make 2020 Global Cleantech 100 Nominations online.

<https://i3connect.com/gct100/nominate>

#### October 8-9

