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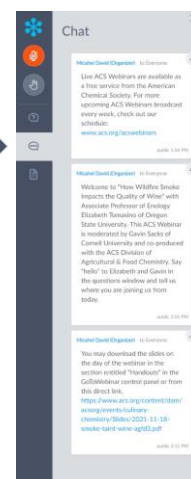


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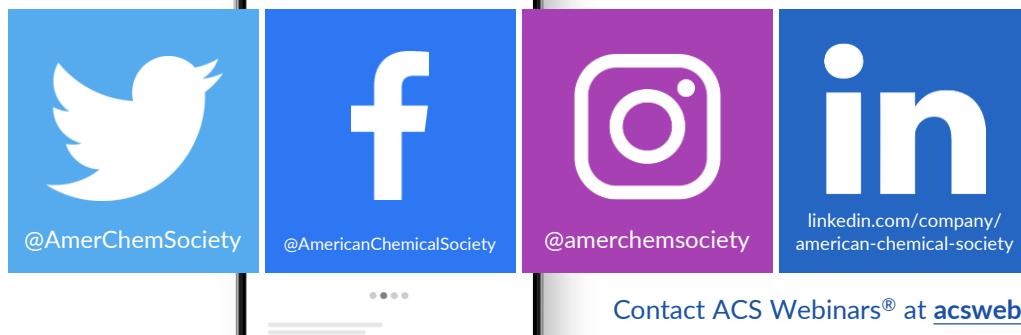


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A Career Planning Tool For Chemical Scientists



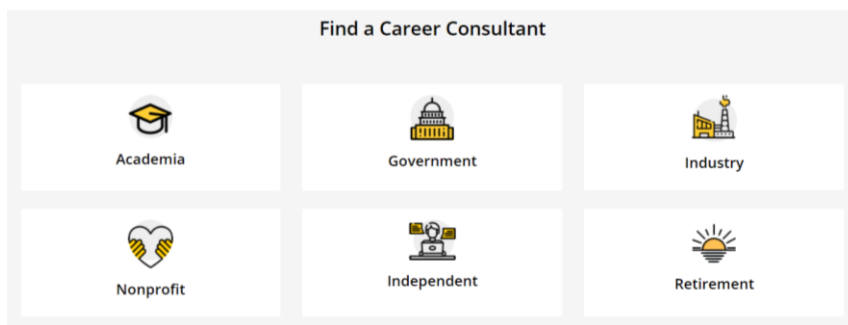
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Career Consultant Directory

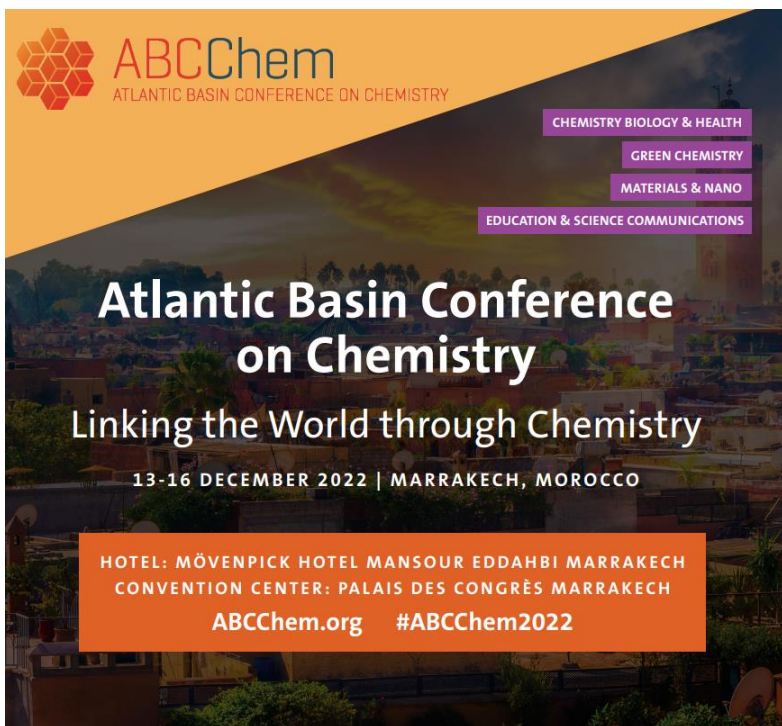


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ACS Scholar Adunoluwa Obisesan

BS, Massachusetts Institute of Technology, June 2021
(Chemical-biological Engineering, Computer Science & Molecular Biology)

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**Adapted from definitions from the Ford Foundation Center for Social Justice:

Equity**

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Inclusion**

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Respect

Ensures that each person is treated with professionalism, integrity, and ethics underpinning all interpersonal interactions.

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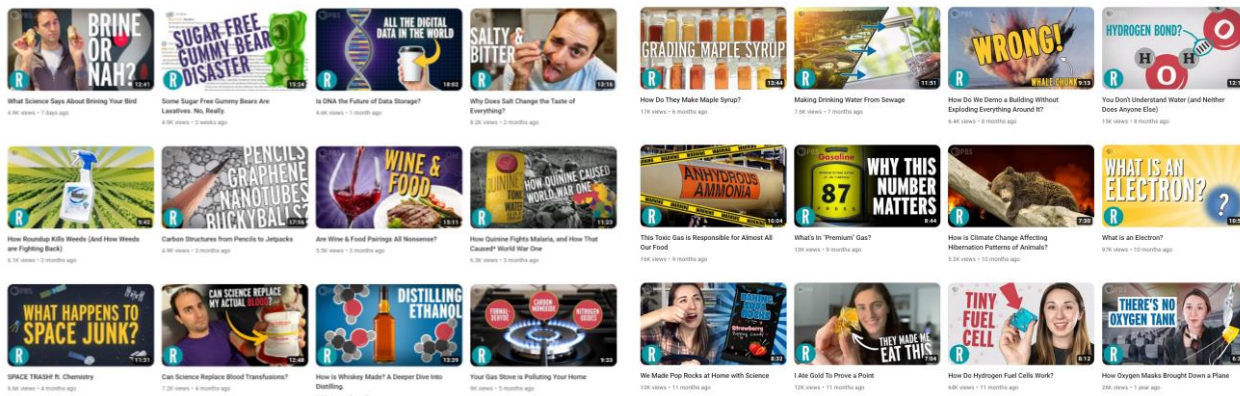
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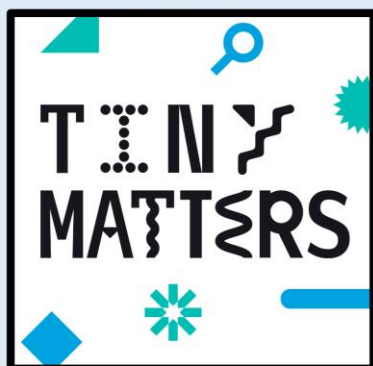
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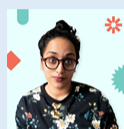
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Bonus Episode
Carolyn Bertozzi and K. Barry Sharpless chat about sharing the 2022 Nobel Prize in Chemistry
December 6, 2022



Bonus Episode
Bioorthogonal, click chemistry clinch the Nobel Prize
October 9, 2022



Episode #40
Lithium mining's water use sparks bitter conflicts and novel chemistry
September 13, 2022



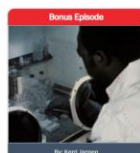
Bonus Episode
For John Goodenough's 100th birthday, Stereo Chemistry revisits a fan-favorite interview with the renowned scientist
July 25, 2022



Bonus Episode
Jess Wade on Wikipedia and work-life balance
June 21, 2022



Bonus Episode
The sticky science of why we eat so much sugar
May 31, 2022



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There's more to James Harris's story
April 27, 2022



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The helium shortage that wasn't supposed to be
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👋 Say hello in the
questions window!



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Chemistry and the Economy: Break In Case of Emergency!



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New Normal Consulting



Bill Carroll, PhD

Principal,
Carroll Applied Science

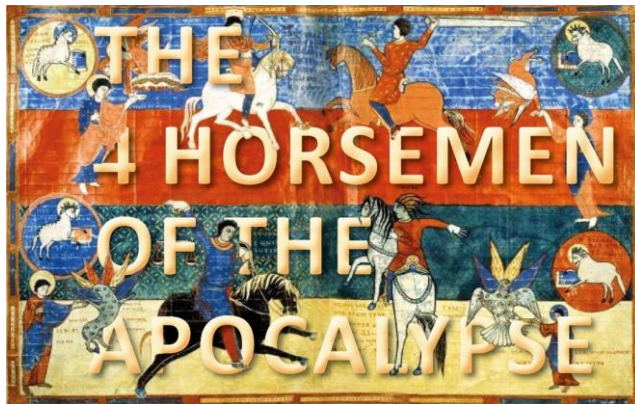
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Helping you navigate the New Normal

The 4 Horsemen of the Apocalypse



15 December 2022

 | The 4 Horsemen of the Apocalypse

Paul Hodges, phodges@new-normal.com, +44 7785 354809

22

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EXECUTIVE SUMMARY

First there was the pandemic and associated supply chain chaos. Now we are seeing the rise of ‘Putinflation’ as Russia’s invasion of Ukraine creates a growing risk of energy, food and financial crises.

“We are facing the biggest *crisis* the post-war Federal Republic has ever had. We have to be honest and say: First of all, we will lose the prosperity that we have had for years.” German Employers Association President, Rainer Dulger, 13 July



“There are things that the models don’t capture. Sometimes the unexpected happens. So, we have to pay attention to traditional indicators while also monitoring empirical data and what we expect to happen in terms of *geopolitics, energy price developments and demographics.*” ECB President, Christine Lagarde, 25 August

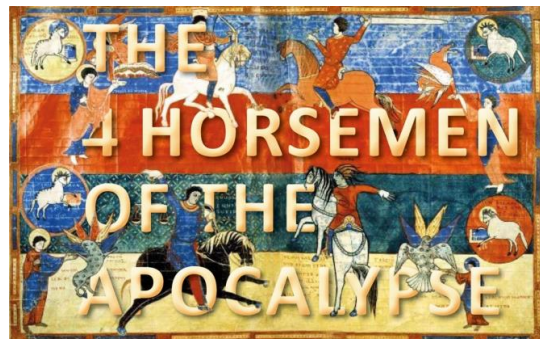


New Normal is a Swiss-based strategy consultancy advising Fortune 500 and FTSE 100 companies, investment banks and fund managers. **Paul Hodges** is a trusted adviser to major companies and investors. He publishes The pH Report, and serves as chairman of NiTech Solutions and the Advisory Board of Infinity Recycling. He is a Global Expert with the [World Economic Forum](#) and a regular speaker at international conferences, and appears regularly on Real Vision, Forward Guidance and other leading financial media. He formerly a senior executive with ICI. Members of the team include: David Hughes, ex-SABIC; Jens Utecht/Richard Carter, ex-BASF; Hans Rovers, ex-LyondellBasell; Jennifer Lovell/Bob Townsend, ex-Shell; George Smith, ex-BP.

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The 4 Horsemen of the Apocalypse

- ❖ **The 4 Horsemen of the Apocalypse**
- ❖ EVs/AVs are moving up the S-Curve, and will pressure naphtha supplies as refineries close
- ❖ “We’re trying to drive the development of an entire recycling ecosystem to make this happen”
Jim Fitterling, Dow CEO, November 2022

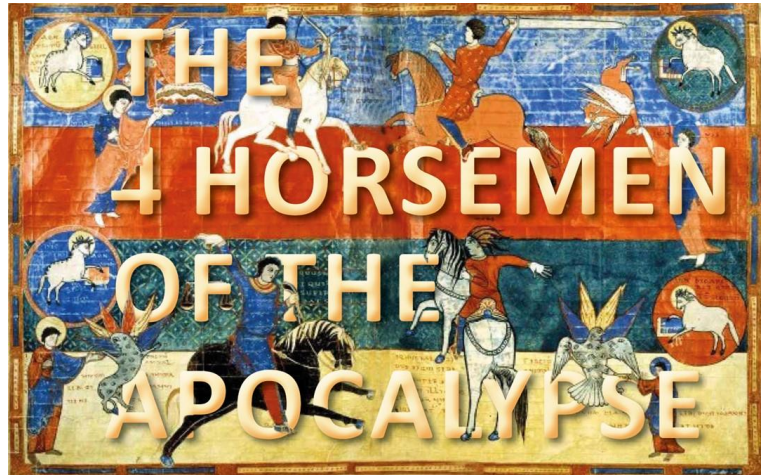


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We face the 4 Horsemen of the Apocalypse in terms of immediate crises

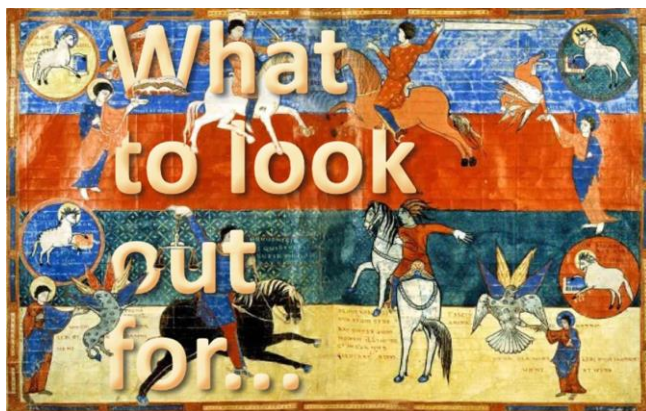
Apocalypse Now?

- **War**
Invasion and energy crisis
- **Plague**
Covid-19 & supply chain crisis
- **Famine**
Fertilizer and food shortages
- **Inflation**
Stock market and housing downturn



25

Risks are multiplying, and becoming more complex to anticipate



- ❖ High and volatile pricing environment for energy, food and other products
- ❖ Interest rates continue rising in response to rising inflation and US\$ strength
- ❖ Stock and housing market downturn reduces consumer spending power
- ❖ Corporate earnings start to reduce along the value chain and debt risks rise
- ❖ Plastics industry hit by over-capacity and growing environmental pressure

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Scenario analysis has become essential



The 4 Horsemen

Global Growth

Recession	Temporary Risks INFLATION PEAKS Today's rise in inflation leads to recession, and then a return to 'Business as Usual'	Permanent Risks NEW NORMAL The 4 Horsemen risks combine with recession & Net Zero to change the future landscape
	No Recession	BUSINESS AS USUAL Companies continue to face traditional risks

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Audience Survey Question

ANSWER THE QUESTION ON THE INTERACTIVE SCREEN IN ONE MOMENT

Which of the four horseman do you feel is the largest threat?

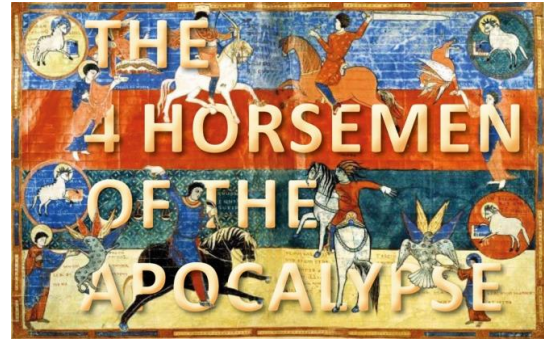
- **War** (Invasion and energy crisis)
- **Plague** (Covid-19 & supply chain crisis)
- **Famine** (Fertilizer and food shortages)
- **Inflation** (Stock market and housing downturn)
- **Other** (Let us know in the questions window)

* If your answer differs greatly from the choices above **tell us in the questions window!**

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The 4 Horsemen of the Apocalypse

- ❖ *The 4 Horsemen of the Apocalypse*
- ❖ *EVs/AVs are moving up the S-Curve, and will pressure naphtha supplies as refineries close*
- ❖ *“We’re trying to drive the development of an entire recycling ecosystem to make this happen”
Jim Fitterling, Dow CEO, November 2022*



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Transitions can happen very quickly - Easter Parade, New York

1900 Spot the car?



1913 Spot the horse?

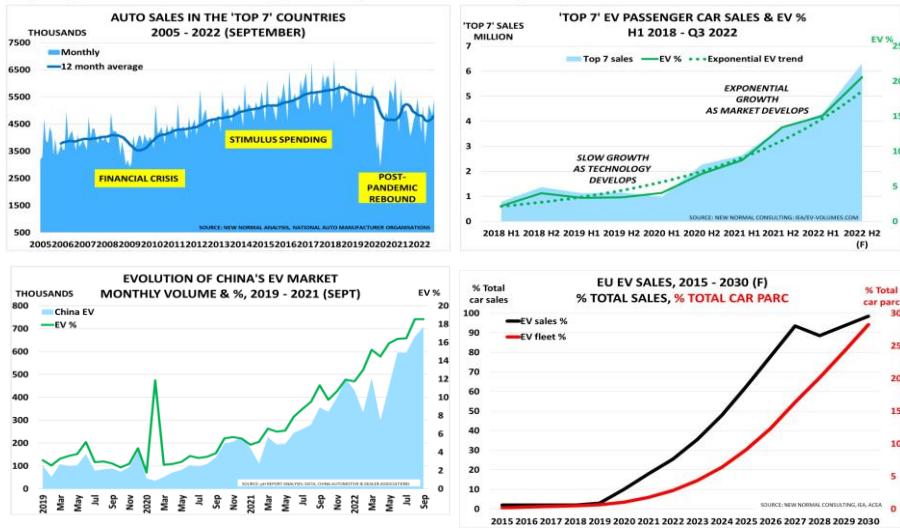


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EV sales are accelerating up the S-curve in the major markets as ICE sales decline

The EV30@30 Campaign aims for 30% EV market share by 2030, and 300m EVs on the road

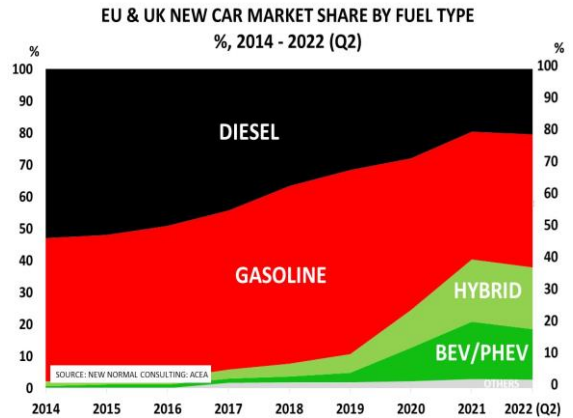


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The EU car market is seeing major change, as diesel disappears and EVs arrive

- ❖ Diesel's market share has fallen from 53% in 2014 to 20% today
- ❖ Gasoline's share initially rose to 58% in 2019, but is now only 41%
- ❖ Battery/Plug-in EVs have risen from 2.1% to 16% since 2014
- ❖ Hybrids have risen from 1% to 19%
- ❖ The EU is banning gasoline/diesel (ICE) sales by 2035
- ❖ Few people will buy ICEs after 2030 as resale values by 2035 will be low



Some refineries may switch to become biorefineries, but many may well close – making naphtha harder to obtain and expensive

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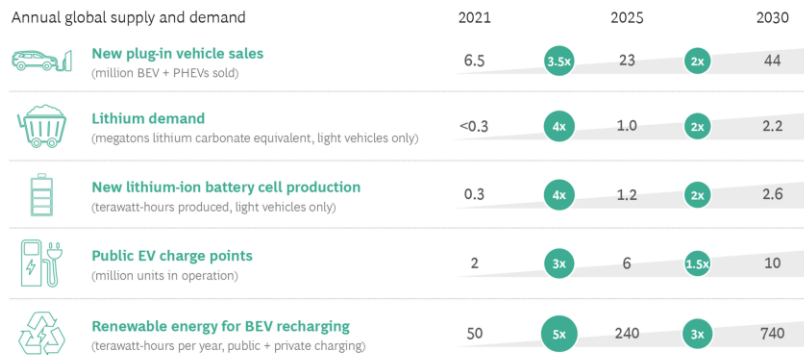
Battery-swapping and AV launches will be further game-changers



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As always with a new business model, key challenges still need to be solved

Exhibit 3 - Supply Chain Players Are Racing to Keep Up with Projected Electric Vehicle Demand



Source: BCG analysis.

Note: BEV = battery electric; PHEV = plug-in hybrid electric.

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Audience Survey Question

ANSWER THE QUESTION ON THE INTERACTIVE SCREEN IN ONE MOMENT

What is the top concern preventing you from purchasing a new EV for your home or business?

- Insufficient public charging network
- Cost of ownership
- Reliability of electrical grid
- Environmental concerns (Lithium mining, recycling, etc...)
- Prefer expanding public transportation over private vehicle ownership

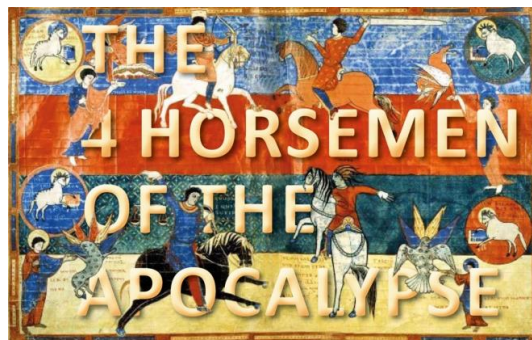
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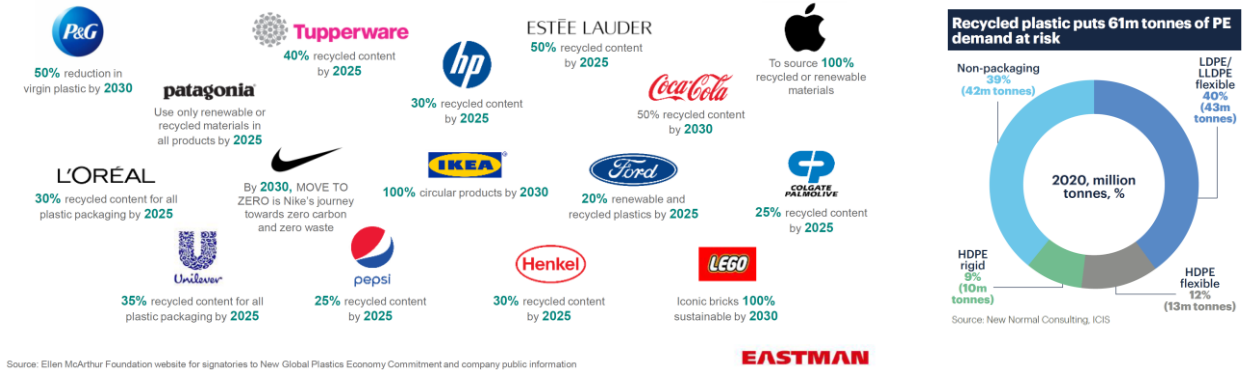
The 4 Horsemen of the Apocalypse

- ❖ *The 4 Horsemen of the Apocalypse*
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- ❖ **“We’re trying to drive the development of an entire recycling ecosystem to make this happen” Jim Fitterling, Dow CEO, November 2022**



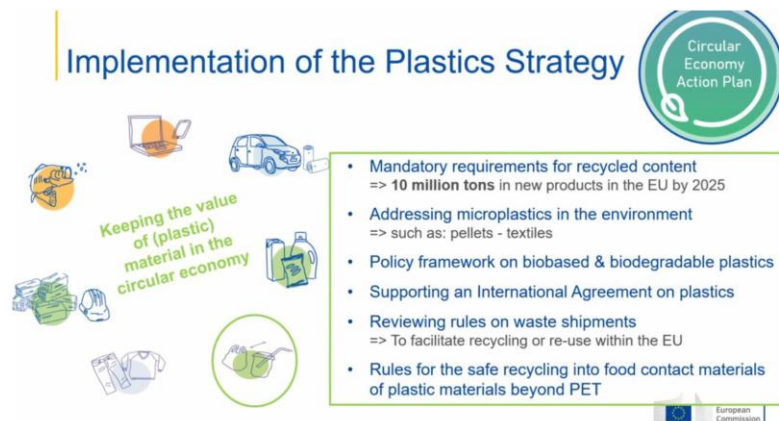
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Global brands are committed to cutting use of virgin plastic packaging



37

The Commission will likely propose a mandatory 55% recycling target under the Plastic Packaging Waste Directive (PPWD) by 2030



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Oil companies are already planning for Net Zero

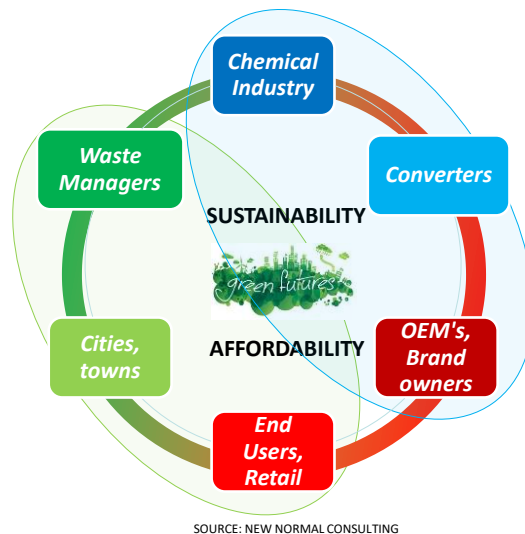
The IEA's 10-point plan calls for an acceleration of the transition to EVs and the use of recycled plastic



“Increase plastic waste collection, re-use and recycling: Many products made from plastic are ‘single use’ – some for good reason (e.g. certain medical supplies) and some more for convenience (e.g. plastic bottles, cutlery and food containers).” IEA

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Collaboration needs to intensify amongst the key partners



40

Sorting technologies are becoming available

The detection unit demonstrated high results across all tested categories of plastic/fibre-based packaging material of 99% detection, 96% ejection and 93% purity rates, on average.

Near-infrared spectroscopy (NIR); Visible light spectrometry (VIS), X-ray transmission (XRT), Electromagnetic Sensor (EM), Laser reflection/fluorescence (Laser)



MUNICIPAL SOLID WASTE



Hard plastics, plastic film, mixed paper, RDF, metals, organics/biomass

NIR, VIS, XRT, LASER

PACKAGING



Plastics, plastic film, cardboard, mixed paper, deinking paper, metal

NIR, VIS, EM

UPGRADING PLASTICS



PET, PE, PP, flakes

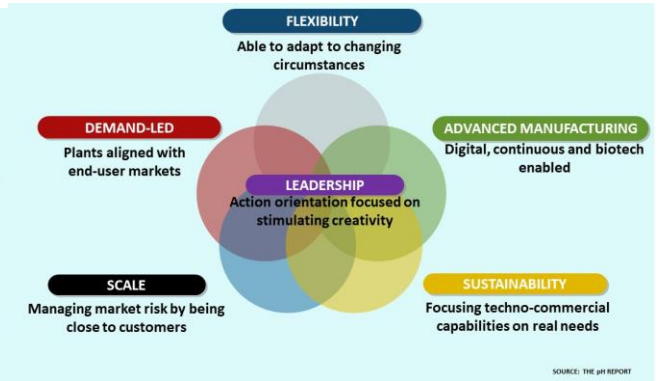
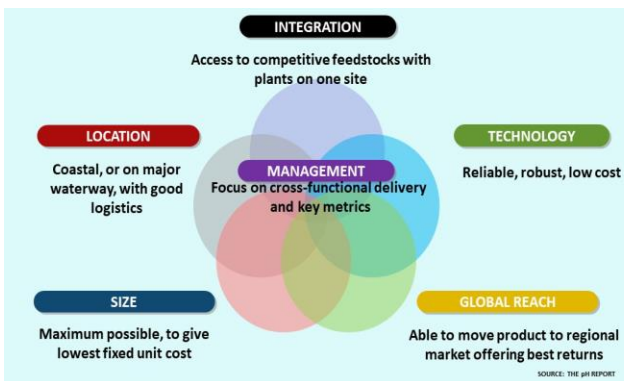
NIR, VIS, EM

Source: Tomra March 2022

Critical Success Factors are transforming

Supply-driven, product focused

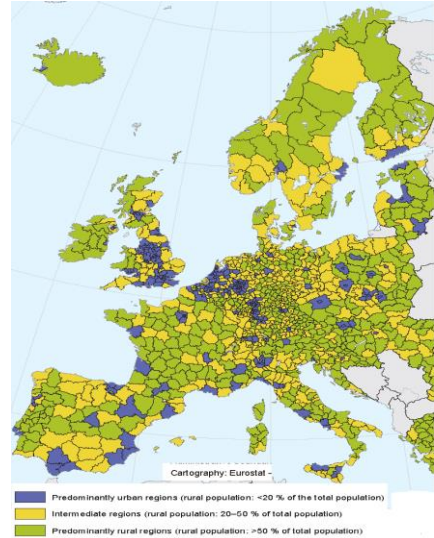
Demand-led, solution-oriented





“Producing plastics from renewable raw materials should be the starting point.” Hans Bruyninckx, Executive Director, European Environment Agency

- ❖ New business models now need to be developed through innovation by companies.
- ❖ Maximising sustainability, and minimising CO2, is likely to lead to a return to locally-based activity.
- ❖ Piloting the first Resource Centres in the main urban areas is an essential first step.
- ❖ Advanced manufacturing technologies will enable these to be safer, **greener**, faster and cheaper.
- ❖ Funding is now available from multiple sources to pilot the first of these today.



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CONCLUSIONS

Risk management will be key to survival, and future success

- ❖ **Scenario planning**, based on a wide range of potential outcomes, will be key to success given today's levels of volatility.
- ❖ **Recession till 2025**. We need to be realistic as today's deep-seated problems are unlikely to be over by Christmas.
- ❖ **China is changing**. Its real estate bubble has been 'subprime on steroids' and its bursting will have far-reaching impacts.
- ❖ **Food shortages**. Social unrest will continue to rise around the world as food shortages increase along with prices for essential goods.
- ❖ **Invest for the future**. The invasion is accelerating the transition to a Net Zero economy as fossil fuel demand reduces.

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The famous “Irish” comment seems very appropriate today



"Well, sir, if I were you, I wouldn't start from here."

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