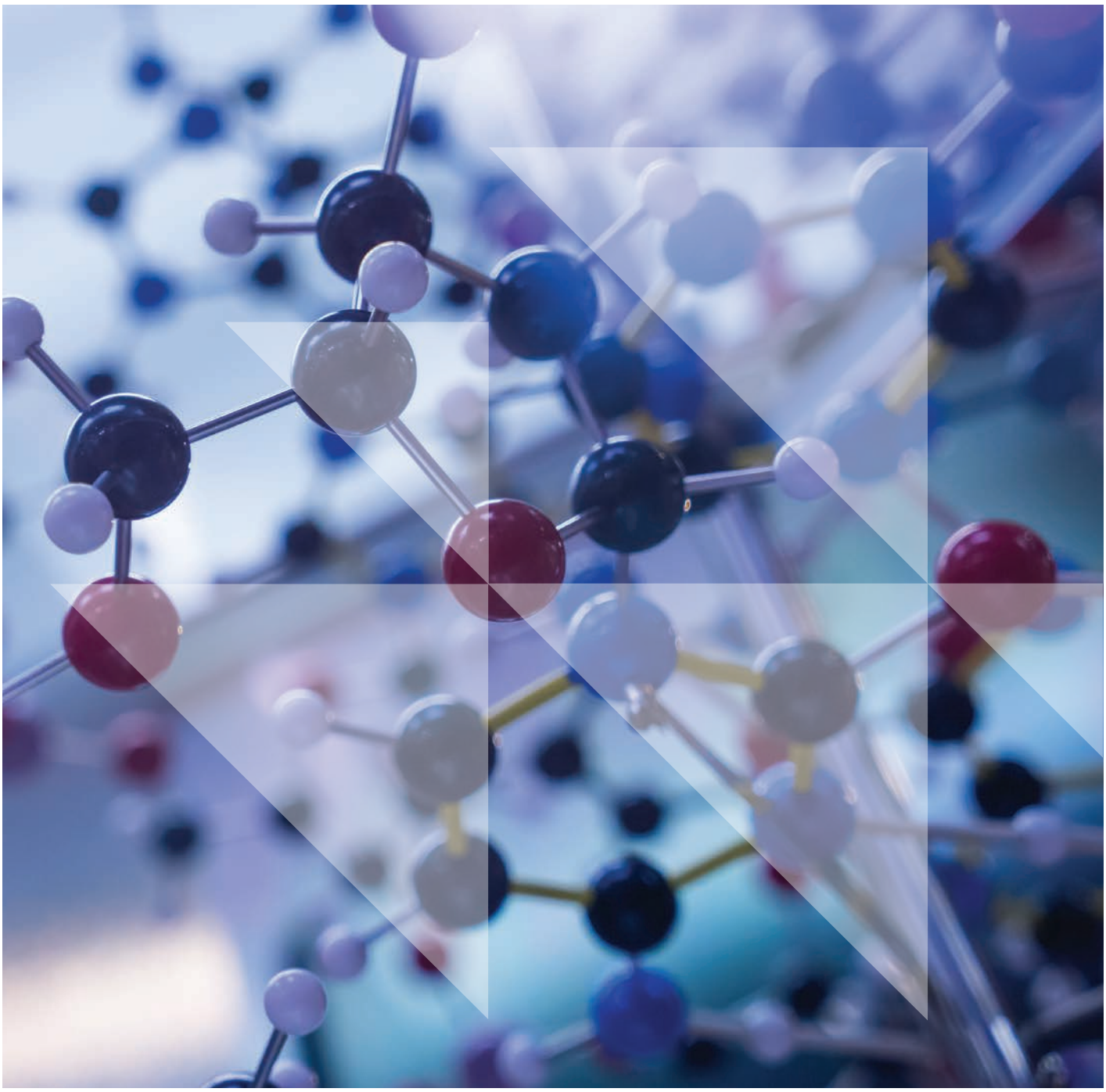
Catalyst for change

Which chemical companies are prepared for the low carbon transition?
Executive Summary

October 2017



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Linking climate-related metrics to earnings for chemical companies

This report updates and expands CDP's research and League Table for chemical companies, first published in August 2015. It ranks 22 of the largest publicly listed chemical companies on business readiness for a low carbon transition which in aggregate emit 276 Mt CO_2 emissions per annum, accounting for approximately 25% of emissions of the global chemical industry. Notable omissions are the Chinese chemical industry and the petrochemical businesses of oil & gas companies.

The chemicals industry is a large energy user, with petrochemicals accounting for 11% of total annual energy use (28% of industrial use) and accounting for 13% of global industrial CO_2 emissions (IEA 2017). At the same time, chemical products and processes are intertwined with a number of industries and products, including energy efficient and low carbon products and processes in other sectors – around 95% of manufactured products rely on chemistry (ICCA).

Large scale chemical plants and integrated facilities have been targeting energy efficiency improvements of 2% annually over a number of years, leaving only incremental gains (0.5% - 1.5%) to be made on existing plants.

This industry covers a diverse group of companies from pure play petrochemical companies, diversified companies with business models based on horizontal and vertical integration and speciality companies servicing a range of end markets from nutrition, healthcare, electronics and autos.

A number of chemical products also enter the value chain of different industries at different points. This creates complexity and a lack of transparency, presenting challenges for policy makers and estimates of Scope 3 emissions.

There are four key areas assessed in the League Table, which have been aligned with recommendations for company reporting from the G20 Financial Stability Board's Task Force on Climate-related Financial Disclosures (TCFD):

Transition risks: We assess companies' exposure based on emissions intensity, energy intensity and Scope 3 emissions in the value chain.

Physical risks: We assess companies on use and withdrawal of water as well as water quality and governance metrics.

Transition opportunities: We assess companies' progress and strategy in shifting towards a low carbon economy by looking at product and process innovation, low carbon revenues, R&D spend and use of renewable energy.

Climate governance and strategy: We analyze companies' governance frameworks including emissions reduction targets and alignment of governance and remuneration structures with low carbon objectives.

Key findings

- **The chemicals sector performs well in terms of emissions and energy intensities** with most companies in the universe covered showing annualized improvements in emissions and energy efficiency of between 2-5% which flow directly to the bottom line.

- **Efficiency improvements are likely to continue, although the pace will be incremental in the short term,** evidenced by much less ambitious targets for emissions intensity - even small changes in efficiency could be meaningful given the scale of operations.

- **High carbon risks remain for the sector in the medium to long term which require game changing technologies in feedstock and processes** which are a good 5 -10 years away with current process innovation based on incremental improvements.

- **While transition and physical risks remain, the sector is found to be innovative** with potential to generate revenues from products and processes for customers transitioning to a low carbon economy, mitigating risks.

- **R&D % of sales for the sector is around five times higher than other industrial sectors,** supporting scope across the sector to capitalize on revenue streams from low carbon technologies.

- **The sector suffers from a lack of transparency evidenced by the lack of reporting on disaggregated data,** with a prolonged period of cross border M&A and vertical integration creating groups which are hard to analyze and regulate.

- **Regulation is likely to be uneven for this global sector** with European chemical companies facing tougher regulation from committed carbon emission cuts and potentially higher capex in the medium to long term.

- **Pressure from carbon regulation on consumer demand is limited** with packaging pollution the only likely source of a "diesel" moment for the sector as regulatory pressures increase for a circular economy.

- **The importance of water to operations differs significantly** across the sector, reflecting the heterogeneity of the industry.

- **China is a large part of the chemical sector** – while Chinese chemical companies have been omitted from this analysis, they are big drivers to the supply and demand for chemicals for our universe with the upcoming Chinese ETS creating potential disruption for the sector.

- **AkzoNobel** is a clear leader, outperforming all other companies by a clear margin across most metrics.

- Lowest ranked are **Formosa and LyondellBasell**

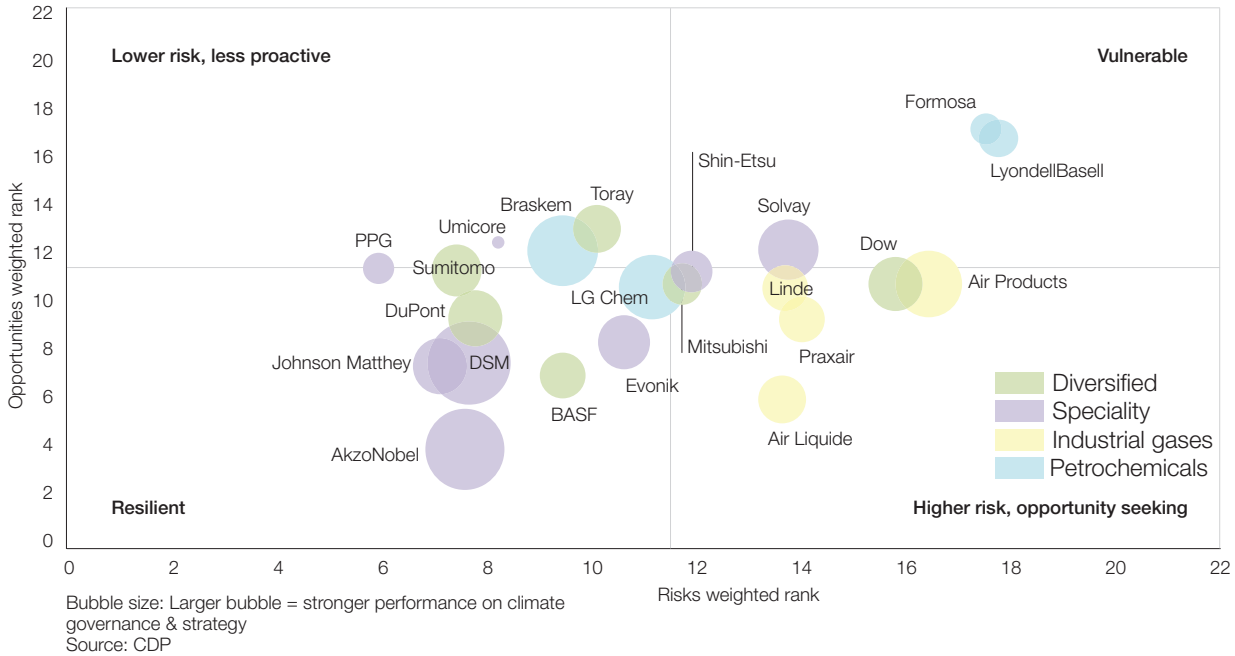
The summary League Table below presents headline company findings. It is based on detailed analysis across a range of carbon and water-related indicators which could have a material impact on company performance. The League Table is designed to serve as a proxy for business readiness in an industry which will undergo significant change as governments increase efforts to implement the Paris Agreement. Companies placed towards the bottom are deemed less prepared for a low carbon transition.

Figure 1: League Table summary

League Table rank	Company	Ticker	Classification	Country	Average market cap Q2 2017 (US$bn)(i)	2016 Emissions (S1+2 CO_2 million tonnes)	League Table score	Managing transition risks	Managing physical risks	Transition opportunities	Climate governance & strategy	Company classification by revenue (%)
1	AkzoNobel	AKZA NA	Speciality	Netherlands	20.7	3.7	5.7	B	A	A	A	
2	DSM	DSM NA	Speciality	Netherlands	12.8	1.5	6.8	B	B	B	A	
3	Johnson Matthey	JMAT LN	Speciality	UK	7.4	0.5	7.8	B	A	B	C	
4	DuPont	DD US	Diversified	USA	64.4	6.3	8.8	B	C	B	C	
5	BASF	BAS GR	Diversified	Germany	88.3	20.8	9.1	C	B	B	C	
6	Sumitomo Chemical	4005 JP	Diversified	Japan	9.2	6.5	9.5	B	C	C	C	
7	PPG	PPG US	Speciality	USA	27.1	1.8	9.7	A	C	C	D	
8	Evonik	EVK GR	Speciality	Germany	15.2	6.4	9.8	C	C	B	C	
9	Braskem	BRKM5 BZ	Petrochemicals	Brazil	8.3	10.2	9.8	C	A	D	B	
10	LG Chem	051910 KS	Petrochemicals	South Korea	18.6	9.1	10.2	C	B	C	B	
11	Air Liquide	AI FP	Industrial gases	France	46.0	25.2	10.6	C	D	B	C	
	DowDuPont (ii)	*DWDP US*	*Diversified*	*USA*	*159.7 (ii)*	*41.8*	*10.8*					
12	Toray	3402 JP	Diversified	Japan	14.3	5.6	11.4	B	D	D	C	
13	Mitsubishi Chemical	4188 JP	Diversified	Japan	12.0	14.5	11.7	C	B	C	D	
14	Shin-Etsu	4063 JP	Speciality	Japan	37.7	6.2	11.8	C	C	C	D	
15	Umicore	UMI BB	Speciality	Belgium	7.2	0.7	11.9	B	D	D	E	
16	Praxair	PX US	Industrial gases	USA	36.0	21.2	11.9	D	C	B	C	
17	Solvay	SOLB BB	Speciality	Belgium	13.8	13.2	12.1	C	D	D	B	
18	Linde	LIN GR	Industrial gases	Germany	33.4	25.8	12.2	D	B	C	C	
19	Air Products	APD US	Industrial gases	USA	31.2	30.2	12.7	E	C	C	B	
20	Dow	DOW US	Diversified	USA	68.0	35.4	12.9	D	D	C	C	
21	LyondellBasell	LYB US	Petrochemicals	USA	35.3	21.7	16.5	E	E	E	D	
22	Formosa Plastics	1301 TT	Petrochemicals	Taiwan	19.0	9.0	16.9	E	D	E	D	
Weighting								**35%**	**10%**	**35%**	**20%**	

(i) Average market cap for last 12 months up to Q2 2017
(ii) Dow and DuPont completed merger to form DowDuPont on 1st Sep 2017. Average market cap is calculated for Sep 2017.
Source: CDP

Figure 2: Opportunity vs. risk for low carbon transition



Bubble size: Larger bubble = stronger performance on climate governance & strategy
Source: CDP

Accessing the full report

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