2020 TRENDS AND SCENARIOS

Exploring the business environment for the DNV GL Group Strategy 2016-2020

SAFER, SMARTER, GREENER
We pride - and brand - ourselves on taking a broader view in relation to the risks our customers face in their businesses.

DNV GL’s market space comprises companies providing classification, certification, verification, inspection and testing services (known as the TIC industry), as well as expert advisory services and technical software products.

From our vantage point across industries, we are strong proponents of taking a holistic approach to understanding the complex interplay of forces - technological, social, political, economic and environmental - that have a bearing on the performance of our customers’ physical assets and operations.

It follows that we should apply the same ‘broader view’ to the way we conduct and plan our own business. That is why we produced this booklet - with the intention of helping us stress-test our strategy for the period 2016-2020. However, to facilitate dialogue and enhance interaction with our customers and other stakeholders, we have decided to make our internal scenario work available externally too.

In the 15th year of this new millennium, we already have a fairly good idea of the major trends shaping this century. These are the rules of the game, if you like, and the first part of this booklet is devoted to describing them in some detail. Companies will need to ask and debate whether the strategies they have in place or are planning for the next few years adhere to these rules.

Knowledge of the major trends might help companies set their overall direction, but the details of their journeys over the next half decade or so are still full of unknowns.

Who would have believed, at the start of this year, that before the first month had run its course, some 3 million people would take to the streets of Paris, led by 40 world leaders, protesting the right to freedom of expression? And who could have predicted that the price of oil would halve in less than 6 months in 2014?

The second part of this booklet is devoted to key uncertainties about the future and how these uncertainties will play out. The cone of uncertainty yawns ever-wider in this fast-paced world and because of this we need to prepare our minds for a variety of challenges and opportunities that will arise in the coming half decade. To help us do so, we have prepared three very different scenarios: ‘Tera-size’; ‘Distributed’ and ‘Rebooting’.

As with the trends section, the scenarios section draws on publicly available data and knowledge, dialogues and interviews with external stakeholders, and a wide cross-section of expertise here in DNV GL.

A company’s strategy should make sense under each of these scenarios. The point is not necessarily to ‘agree’ with any of the story lines, but to get a feeling for how the world could unfold if the most impactful uncertainties come into play.

I hope this document sparks lively debate and discussion - for it is by actively rehearsing the steps we may take that we shape our future. We can’t predict that future, but we can train ourselves to recognise the change that does come along, and respond with a prepared mind and a set of actions.
Standing at the start of 2015 and looking towards 2020, we face a very complex and fast-changing world. We consider it essential to separate the developments that can be predicted from those that are fundamentally uncertain.

The first chapter of this document describes current trends that will continue or amplify towards 2020. They are included in all scenarios, but their rates of development vary somewhat.

The second chapter introduces uncertain developments in the form of three scenarios, with the intention of presenting three quite distinct possible futures for the world in the next half decade.
The trends described in this section apply to all scenarios for the world through to 2020. In other words, they represent the playing field on which less certain developments and our strategic choices will interact.

“Follow the trend lines, not the headlines”
Bill Clinton
Access to natural resources
Rivalry over access to energy and ever-scarcer natural resources will be a major determinant of geo-political shifts in the world through to 2020. Many nations, not least the USA, will pursue an ambition of self-sufficiency, while other nations, notably China, will seek to consolidate or secure strategic alliances with resource rich nations.

Europe will look enviously at the US, where cheaper oil and gas will continue to fuel modest economic and job market recovery – and, if not a full scale ‘re-shoring’ of jobs, then more nuanced growth in energy intensive industries and knowledge driven sectors like healthcare and professional services.

China’s growing influence is significant in any scenario.
The question then arises: what will China seek to influence?

Dormant Europe
Europe is unlikely to follow the US on the road to even modest recovery. All indications are that continued political pressure for fiscal austerity in Europe will fail to deliver the hoped-for reductions in real wages and prices to boost export-led recovery. While slow or negative growth will prove challenging for many firms in the euro-zone, major efforts to boost recovery, such as the European Commission President’s plan to entice private sector investment in massive infrastructure projects across the EU, will open up significant opportunities for well-placed companies.

The power shift is likely to be mainly contained within regional domains – USA in the West, China in the East – with an economically ailing Europe exerting less influence in both hemispheres.

Economic challenges are likely to render the EU politically fragile and focused on inward-looking policy and divisive issues such as immigration, exacerbating a protectionist trend. Indeed, with protectionism on the rise across the globe, the coming half decade will see a strengthening of trading blocs and increased resource nationalism. Locally produced goods, including food, will be favoured over imports.

Protectionism
Protectionism is one strand of a broader theme of emerging regionalism. The world is moving away from having one global superpower; the absence of a ‘super cop’, combined with rivalry for access to energy and natural resources, will see an increasing number of geopolitical tensions towards 2020. The most challenging areas include: Russia, Middle East, South China Sea, and North Korea.

A shift to the east
Asia will continue to maintain higher growth rates than the OECD, accompanied by a gradual shift of economic power eastwards. Emphasis lies on the word gradual in the coming half decade the power shift is likely to be mainly contained within regional domains – USA in the West, China in the East, with an economically ailing Europe exerting less influence in both hemispheres.

In terms of purchasing power parity, China’s economy surpassed that of the US in late 2014. However, size of GDP does not necessarily correlate with national power, especially when development factors are taken into account. Most Asian countries, China in particular, have a long way to go to match the accumulated wealth, and the social and economic infrastructure that continues to give developed countries an advantage. Nevertheless, China’s growing influence is significant in any scenario.

The question then arises: what will China seek to influence?

The US will continue to dominate the decisions of the World Bank and Japan will continue to control the Asian Development Bank (ADB) – two of the major sources of funding available to close at least part of Asia’s massive infrastructure funding gap, estimated by ADB at some $8 trillion between 2010 and 2020. China will seek to sidestep these institutions through the Asian Infrastructure Investment Bank, established by 21 Asian nations, but which China clearly dominates.

There will still be vast differences among the Asian countries, and each one will have their special challenges in the coming period. Generally, however, they will continue to bring their people out of poverty, the standard of living of the middle class will keep increasing, and consumption based economic growth will take a stronger foothold in most Asian countries.
ECONOMICS – SLOWER GROWTH IN A WORLD AWASH WITH MONEY

We are entering a period of slower global growth in the next half decade. However, some population rich areas such as sub-Saharan Africa, Malaysia, Philippines, Poland, Peru, Chile, India and Indonesia may see continued high growth. Western nations face the prospect of a flat economic universe driven by their static populations, while the relatively younger US population provides some headroom for growth which may prove challenging to sustain over a longer period.

Slower growth, even in China

Even China will probably experience slower growth than in our previous two strategy periods (2006–2015) as it performs a very tricky balancing act. China cannot continue to rely on export-led growth (buoyed by a currency held artificially low) and debt-fuelled investment, which has shown recent signs of diminishing returns. Social stability, in particular the growing division between eastern and western China, is dependent on a rise in consumption expenditure, which, in turn, is linked to higher wages. A rising wage bill will dampen growth, and so it is very likely that China will be heavily focused on other productivity factors in the coming years, not least innovation. As part of its quest to evolve from an economy based on construction and manufacturing to one based on innovating, China will start to play an increasingly influential role in a smarter energy mix and energy efficiency.

Aging infrastructure

Much of the infrastructure in developed countries was installed more than 50 years ago and needs to be modernized. Owing to budgetary constraints in OECD countries, public-private partnerships will be increasingly favoured as mechanisms for infrastructure renewal, including investment in electrical power infrastructure.

Efficiency and substitution

Globally, the ever-increasing costs of extracting remoter resource deposits will intensify a technological wave towards efficient resource utilization and/or substitution. Enhanced Oil Recovery (EOR) and fuel efficiency will attract massive R&D funding. Solar and wind will start to be seen as real mass-market alternatives without the need for subsidies.

The coming decade will see some shifts from oil-price driven economics to renewable energy driven.

Abundant capital, few ideas

Paradoxically, the era of resource scarcity coincides with unprecedented levels of investment capital superabundance. By 2020 the value of global financial assets could reach US$ 900 trillion – more than 10 times the value of total annual global output of goods and services.

The consequences of so much capital chasing limited investment opportunities in an era of all-time low interest rates and poor returns from most asset classes - not least ships - are profound. To avoid investment overreach (taking on unjustifiable risk in pursuit of illusive gains), the hallmark of investment success will be the ability to invest in the owners of good ideas and help them reach their potential, working with expert partners to manage risks.

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developed economies, the emphasis will not be on cheap but on ‘smart’. These, mainly western, cities will witness the addition of smart convenience or efficiency enhancements to many aspects of urban life, e.g. buildings, mobility, energy, communication and governance.

All cities, rich and poor, will be more connected, both virtually (by 2020 around 90% of the world’s population aged six years and above will have a mobile phone, according to a leading source) and physically, through enhanced infrastructure or conurbation - the Hong Kong-Shenzhen-Guangzhou corridor in China is home to about 120 million people. Viruses, of both the IT and biological varieties, are likely to be far more disruptive in coming years.

The power of social media
A further consequence of connectedness is that social media and the Internet will continue to shift the balance of power in favour of the people. While this is likely to see the fall of more dictatorial regimes, what replaces them may not be democracy in the western sense of the word as has become apparent in the wake of the Arab Spring, which, if anything, has seen a hardening of Islamic fundamentalism and sectarianism.

The old - getting older
Across much of the world, but in the OECD in particular, populations are also ageing. Japan and parts of Europe face a declining population as well - flattening economic growth and swelling budget deficits through rising costs of state-funded medical care, pension schemes, social security and the state sector in general. This will leave insufficient funding for other social needs, including unemployment benefits. Developed countries will also struggle to recruit and educate enough skilled employees, leading to a massive migration of skilled workers from emerging countries, which in turn will require flexibility in work forces and new ways of working.

Healthcare is now the world’s largest industry - three times the size of the banking sector and even larger when the growing demand for adjacent services and industries like healthfood and biotech are taken into account. Healthcare analytics - a set of services aimed at reducing costs and improving the quality of care - is projected to grow by 25% annually in the next five years, resulting in an industry within an industry worth over US$23 billion in 2020.
We are entering a period of ‘the Internet for everyone’. The next five years will add 2 billion Internet users, resulting in an online population of 5 billion in 2020. Public versus private boundaries will blur, with the ‘cloud’ gradually replacing the PC as the storage location for personal and business information.

More surfers, many more hackers
Analytics associated with online behaviours and personal data is already an established industry - the main assets of global players like Facebook, Google, Twitter, etc., and for whom privacy issues and data protection represents a growing risk.

Population growth and the explosion of Internet users will see the number of hackers rise by a factor of 20 by 2020. Cyberwar will come to be accepted as a fifth battle front, alongside sea, air, land and space.

Big data
The next half decade will see the emergence of the Internet of Things (IoT) as a major trend for global industries, involving a network of physical objects that contain embedded technology, like sensors, to communicate and sense or interact with their internal states or the external environment. Wedded to the concept of ‘big data’ (the processing of high volume, high velocity and highly varied information to support insight and decision making) the IoT will start to impact many industries. This will include maintenance, energy efficiency and safety performance in almost all industrial sectors including maritime and offshore; real-time monitoring and maintenance of pipelines and other infrastructure; grid and consumer analytics in energy; and a host of applications in healthcare.

Big challenges, big alliances
None of this will happen without overcoming formidable challenges like gaining access to data and related connectivity components, training and sourcing talent with new, cross-disciplinary skills, establishing secure and smart IT architecture, and forging relevant technology partnerships.

The scale of the challenges involved will push very large companies to establish alliances and joint innovation programmes that would otherwise seem unlikely, with SAP/Samsung, Apple/IBM and GE/Cisco as some of the latest such examples.

There will also be extensive adoption of technology related to automation, remote monitoring and controlling.

Growth for hi-tech and clean-tech
A key business driver for automation, 3D printing and ‘smart’ supply chain analytics is the recovery of the manufacturing sector in the developed countries, and the USA in particular, where labour costs are at a premium. Efficiency, and to some extent safety concerns, will drive nanotech developments to create new structural as well as functional materials, offering new possibilities in many sectors; e.g. lighter and stronger materials, less hull resistance for ships, and so on.

Clean energy technology will continue to gain market share, both in generation and energy usage.

Energy-efficient technologies will often prove to be a ‘no regret’ option, growing particularly fast when consumers expect high energy prices. Low carbon generation technology will continue to grow as levelized costs reduce. Policymakers will show a preference for incentivizing technologies which bring benefits beyond just decarbonisation.

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Implications of meeting high safety thresholds, combined with high risk and limited public acceptability, will significantly constrain deployment.

Changing energy mix
The deployment of these clean power technologies will have a transformative effect on the wider energy system. As the power sector decarbonizes, light transport will be increasingly electrified, with the rate of uptake of electric vehicles being determined by cost reduction in batteries, infrastructural roll-out and the attractiveness of policy incentives.

Electricity will increasingly become the carrier of choice, with some important exceptions; heavy transport, for instance, will switch to natural gas. Most significantly, the integration of large amounts of variable, modular renewables with power electronic interfaces will require new investments in transmission and distribution. In regions of low population density, storage technology will play an increasing role, if costs come down. New market structures will be required for this energy revolution, as the growth of non-dispatchable renewables means that available capacity rather than just consumed energy matters more and will start to be reflected in pricing models.

Renewables and the Internet of Things
The ‘Internet of Things’ will be crucial to ensuring that the components of this integrated energy system work together as a whole. Meeting demand at all times through variable renewables will remain a fundamental challenge. Real-time communication between devices and the development of the smart grid will be key parts of the solution, allowing network operators to move from passive to active network management. In addition, big data analytics will play a crucial role in optimising the utilisation of operational assets that were originally designed to deal with very different power generation patterns.
Polarizing views
The USA’s side of the deal, dubbed ‘Obama’s war on coal’, involves an ambitious plan to curb greenhouse gas emission from power stations across the country. The plan exposed a growing rift between consumer businesses that support the proposal and some industrial groups that are vehemently opposed to it.

Gas
The positioning of natural gas as a transition fuel for transportation, replacing oil, will gain credibility but cannot be considered a certainty in the next five years. Nor are there clear signs, in the next five years, of a big switch from coal to natural gas for power generation.

Water stress
The next strategy period will reveal how many basic commodities are under pressure not only from their own higher demand but also from increasing alternate uses. For example, water will be required for consumption, manufacturing, agricultural purposes and energy production. Global water demand is forecast to increase by 55% between 2000 and 2050, and with the growing need for agricultural intensification, water stress will be severely exacerbated in many regions: it is estimated that two out of every three people will live in water-stressed areas by the year 2025.

A changing climate
There will be growing acceptance - and alarm - that climate change is real, and with no convincing frame conditions to keep the world within the 2°C limit, climate adaptation will become increasingly important. Tougher regulations will be implemented, for example, on development restrictions and improved infrastructure resilience. Insurance requirements and investor concerns on companies’ exposure to the effects of climate change will also spur adaptation activities.

Energy efficiency in many sectors, including transportation, will be subject to both direct requirements and incentive programmes. The momentum for renewable energy sources will keep increasing, driven by low carbon policies and favourable economics, most prevalent being solar PV.

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A tarred reputation
Coal and oil will increasingly become an unacceptable energy source to both public and political eyes. The divestment campaign targeting coal pure plays will gain momentum. Smaller operators and project-level investment will encounter difficulties with campaigns targeting so-called carbon stranded assets.

The USA and China’s 2014 agreement on greenhouse gas emission restriction puts into sharp relief the willingness of Asia’s leaders to take concerted action in moving to cleaner energy sources, fuelled in part by growing concern over air quality in Asia’s mega cities. China’s commitment to peak CO₂ emissions by 2030 automatically signals a significant cut in coal consumption, given that oil demand will continue to grow in the country’s transport sector.

Basic commodities are under pressure not only because of higher basic demand but also from increasing alternate uses.
A total of seven items have been assessed as being important enough, and uncertain enough, to be classified as scenario drivers. This means various extremes of these drivers have been adopted in the different scenarios. This table summarises the key theme of each scenario driver across our three possible worlds through to 2020.

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Growth returns to pre-2008 levels, helped by expansionary monetary and fiscal policies. International trade flourishes, as do new global supply chains chasing low cost production beyond India and China. Increased trade, new routes and a switch to alternative fuels and more energy efficient vessels, sees an upswing in ship new-building.

The US is resurgent and the clear global heavyweight – think shale boom, manufacturing comeback and almost full employment. Europe recovers, but not as fully as the US, owing to weaker domestic demand and higher costs.

China is on track to becoming the world’s largest economy, but deliberately slows its growth to rehabilitate corporate debt. India grows at a faster rate, driven by reforms and a growing consumer base. Several emerging economies surprise on the upside.

This is a world where size matters. Big alliances form: trans-Pacific US and Asia; China and Russia. Governments and central institutions, like the UN and WTO, set the main directions for policies. Tight regulation of key industries creates high barriers to entry – except for distributed power generation, which gains market share, helped by big public investment programmes.

Extreme weather is a wake-up call for policy makers. Most regulations target energy efficiency; carbon caps and taxes gain regional ground.

An unconventional oil & gas boom puts competitive pressure on high cost/complex conventional production. Oil and gas prices are more volatile than ever, swinging between insatiable demand and production glut, but the long term trend remains on an upward trajectory. However, the oil price volatility spurs a transition to renewables, which are also helped by cost-reducing technology developments, public investment in supportive infrastructure and a renewables-friendly policy environment.

SCENARIO 1:
TERA-SIZE
Global growth sees a comeback to pre-2008 levels. Through fiscal policies and reforms, growth returns to both the US and, to a lesser extent the EU, supported also by productivity gains that come as a result of digitalization and automation of most industries. Emerging economies maintain their above-average growth levels, and increase their share of global GDP from 50% in 2013 to 55% in 2020. Growth provides the recovery force that the world needs, and combined with policymakers’ actions to improve sovereign balance sheets, keeps the risk of stagnation at bay.

In the period, the US economy has fully recovered from the recession, primarily fuelled by private sector growth and rising domestic demand. Shale oil and gas production allows both industrial and power sectors to maintain a cost advantage that enables an industrial renaissance in the US. Companies increase investments in physical assets and the labour force returns to near full employment, with the fastest growth occurring in sectors such as healthcare and social assistance, computer system design, technical consulting, planning and logistics. Large production volumes of shale oil, liquid gases, and condensate allow the US to emerge as a massive energy exporter, putting pressure on the Middle East and Russia as dominant energy players.

Although Europe is also on a healthy track, fuelled by productivity increases out of the recession, it sees weaker growth compared to other geographical areas, primarily because of higher labour costs, stagnant domestic demand, and a strong dependency on imported energy. Europe benefits only indirectly from the shale oil and gas revolution, as a source for the diversification of energy sources. Eastern Europe grows more than the rest of Europe, but will continue to be strongly exposed to geopolitical instability.

China is on track to becoming the world’s largest economy by 2020, but intentionally slows down its own growth rate to accommodate deleveraging of the banking sector. The transition from being the world’s factory to being the world’s consumer continues. Japan keeps struggling to maintain even very low levels of growth. India, on the other hand, grows faster than China, driven by reforms and increasing consumer purchasing power.

Some emerging economies surprise on the upside when it comes to growth and dynamic development - South American and African countries in particular. The new Trans-Pacific alliance will give a boost to productivity increases through less energy consumption. Carbon emissions caps and taxes are also being implemented on a regional level to ensure efficiency improvements and thereby fuels further growth.

The relatively healthy recovery of the US economy, along with its near self-sufficiency in energy supply has strengthened its geopolitical position of power. The US focuses on building a strong Pacific alliance to ensure that American companies have access to the rapidly growing Asian market. With some manufacturing returning to the US, the trade relationship between US and Asia becomes more balanced with products and services flowing in both directions. China is on the rise as a global power, but is in no rush for a showdown against the US. China builds a strong alliance with Russia, primarily focusing on getting Russian energy to Chinese consumers. The Middle East struggles to be relevant as the US has lost interest due to its energy self-sufficiency. Saudi Arabia and Kuwait are producing oil as fast as they can to capitalize on their reserves while trying to keep at bay competition from Russia, unconventional and renewable energy sources by pushing the oil price down. Oil producing countries in the Arabic world have long periods with stable political climates and less terrorist actions enabling supply resumption from Libya and later also Iraq.

The world is governed by global and centralized power structures. National governments and international organizations, such as UN and WTO, set the main directions for policies and regulations.

The current powerful companies and institutions maintain their commanding positions. Rigid structures, regulations, and processes governed at a national level are used to maintain high barriers to entry into many industries. The exception is the electrical power industry where distributed power generation is gaining market share at the expense of large utility companies.

Strong lobby groups reinforce the concentration of power between big corporations and national Governments.

Climate wake-up call

Industrialized societies around the world are experiencing numerous extreme weather events disrupting businesses and everyday life. The public and politicians are associating this to climate change, and energy companies are using climate change exposure as a parameter when setting premiums. Migration is, more and more, a way of adapting to climate change. The UN has established an organization dedicated to running camps for climate refugees as a way to mitigate the effects of unmanaged urbanization. This gives political ground for implementing ever stricter policies related to climate emissions.

Asia, Africa and South America are facing serious water problems due to melting glaciers, reduced snow melt and industrial pollution. A water industry is emerging with offshore freshwater generation and water transportation over long distances.

Made in the world

A steadily improving world economy positively influences trade growth. Increasing integration of emerging economies into the global market and globalization of value chains facilitates further trade growth. The relative importance of Asia increases as the region brings huge domestic markets, massive infrastructure investment, and rising consumer purchasing power. Africa sees several positive developments towards getting on track towards being a real factor in global trade. As emerging economies develop, they increase their activity in the competence driven parts of the value chains, such as innovation, R&D, design, and financial services. Companies relocate part of their production processes out of China and India to new low-cost hubs, allowing population-rich countries with decreasing literacy problems like Vietnam, Bangladesh, and also sub-Saharan African countries, to embark on an export-led growth cycle.

World trade and production is centred on the globalization of value chains, which will bring further fragmentation of production. Countries tend to become specialized in tasks and business function rather than in manufacturing specific products. The trade in the world concept will become more and more common with only a few countries able to keep some degree of specialization in niches of product categories. Globalization of trade will also be supported by lowered trade costs, such as transport, insurance, and duties. Trade liberalization is further pursued through regional trade agreements, such as the Trans-Atlantic Trade Agreement.

Shale in the world

The increasing contribution of unconventional resources to the overall energy mix supports global growth through low prices of energy. Unconventional oil and gas production rates are looking optimistic in China, Russia, Algeria, and Argentina. Australia is embarking on its second wave of upstream investment.
Scenarios

Distributed generation

In order to justify extensive use of expansionary fiscal policies, governments aim to direct public investments towards infrastructure investments, which will lead to productivity increases and facilitate future growth. Transmission and distribution grids become key recipients of public investment for all the technology development opportunities it opens up.

Distributed power generation is another area that is supported politically for its positive effects on jobs and local activity levels. Solar power is installed broadly at public level, company level, and even by end consumers. Low cost, low complexity, and the fact that they can be scaled from any application from private homes to remote gigawatt desert installations, makes solar power a very attractive energy choice of the future.

For Europe, energy security concerns triggered by unreliable gas supplies from a heavily sanctioned Russia have forced EU to restructure its internal energy market. From 2020 energy flows almost seamlessly across all EU countries, the volatility of prices across countries is reduced and the stability of electricity grids is improved. This allows for a rapid implementation of distributed solar and wind based power generation.

Volatile energy prices

Energy markets are disturbed by the constant switching of balance between drivers for low and high oil and gas prices. Ample access to onshore reserves, especially in North America, drives down prices internationally. OPEC contributes to the same by increasing production to drive prices down in order to defend its market share and to capitalize on their oil reserves while they are still in demand. At the same time, the fundamentals of oil and gas dictate that the long-term trend is toward higher cost and higher prices. Oil and gas prices will have a rising need to ensure that quality, safety and sustainability standards are met along the value chain triggered by changing consumption patterns. Furthermore, increasing food production from ocean based sources will raise the complexity of value chains.

The automotive industry is moving fast towards electric vehicles with attractive long-range cars and bikes from most established makers with market penetration in Europe and in some big East Asian cities. In some cities, the majority of cars sold are electric or plug-in hybrid.

Arctic out, Africa in

With highly volatile oil and gas prices, it is difficult to reach investment decisions for Arctic development projects. Generally, projects remain shelved awaiting an upturn in prices but Russia and NATO countries keep some activity to show presence. The US-Russian collaboration on Arctic safety and infrastructures is broken, making shipping through the northern sea route very difficult.

Global value chains

The globalization of value chains and emergence of the ‘made in the world’ concept sees supply chain-based inspection activities grow, mostly driven by large corporations and retailers. The ISO market follows general economy development with growth mostly concentrated in certain Asian economies and Africa. Economic growth in the US will trigger an increasing demand in Testing, Inspection & Certification (TIC) services, especially in sectors such as healthcare, genomics and food, where safety remains the main driver.

Increased focus on product assurance services is expected; the evolution of international trade agreements may be a significant game-changer in the industry and produce disruptive effects. Winners will be those able to combine a global footprint with a low cost base, by leveraging technologies and economies of scale.
Austerity take the wind out of the sails of the western economies. The EU is hardest hit, while in the US, cheaper labour and energy enables a painful claw-back to positive growth by 2020.

The world is uncoupling. Europe and the US are caught up with domestic policy and (for the US) energy self-sufficiency. The Middle East descends into further violence and fragmentation. China manages steady growth and steers a shift towards knowledge-based products and services. It strengthens its ties with Russia, makes further massive investments in Africa, and dominates a rapidly-growing Asian trading bloc.

Mega cities face ever-more complex problems, and emerge as regulators and trend setters. While slow-moving national authorities and international agencies dither in the face of scary signs of climate change, the big cities of Europe and coastal USA pursue innovative interventionist policies. Beijing aggressively tackles the air quality crisis in its cities by moving polluters out of the cities, cleaning up what can be cleaned, and incentivizing a rapid swing towards low polluting renewable power sources. This leads to rapid development of more efficient and lower cost technologies, opening the door for the rest of Asia to bypass expensive fossil fuel and go straight to renewable options for power generation - the start of a green tide rising after 2020.

Shale oil and gas remain a largely US phenomenon due to public opinion constraints and technical challenges elsewhere. The US government is determined to keep production up and gasoline prices well below world averages. As the unconventional hype cools, energy prices rise, driven by high demand growth for transportation fuel in Asia and Africa. Good news for Brazil, Mexico, Venezuela and Russia; bad news for other countries hit by the double whammy of costly energy and sluggish economic growth. International Oil Companies expand their Arctic and deep water exploration and also start to become attractive partners for those National Oil Companies seeking to develop complex fields.

Shipping is pummelled by the one-two blows of costly fuel and slowing trade, with growth opportunities restricted mainly to intra-continental trade. The Testing, Inspection and Certification (TIC) market retracts in Europe, leaving only energy and environmental services as growth sectors, but more international players find Asia increasingly accessible.
**Austerity is the flavour of the day**

Governments in the EU and US resort to austerity measures to reduce budget deficits. Expansionary monetary policies, with excess money-printing, are abandoned. Access to public money becomes harder and investment levels in general decrease. The financial stress is most severe in Europe, where loan defaults render the banks undercapitalized compared with Basel III requirements.

Through strong political will, the euro is kept safe from a complete collapse. Spain has moderate success with more business friendly reforms while Italy, Greece and France are swamped in debt. Germany has noticeable economic stress with a lack of export to its European trading partners and Russia. Trade with Asia and USA is now more important than ever for Germany.

In the US, private industry job creation is picking up faster than in Europe due to lower energy and labour costs. With government activities scaling back, there is room for a re-emergence of the American capitalist model. After an initial economic crunch due to austerity measures, prospects are looking good beyond 2020.

The rise of the Chinese empire

China manages a highly leveraged banking sector by support schemes and successful reforms from Beijing, avoiding disruptive events to its financial system. Growth rates are lower than in previous decades, but current growth is increasingly driven by growth in knowledge based products and services. China builds stronger ties with Russia, especially for energy supply, and continues to make massive investments in the African continent. In return for building infrastructure, China receives rights to natural resources. China also pursues bilateral free trade agreements across Asia to ensure market access for Chinese products and services of growing technological maturity. The long-lasting territorial conflicts

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<td>2015</td>
<td>Paris climate congress a long yawn</td>
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<td>2016</td>
<td>Euro referendums in France, Italy and Greece</td>
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<td>2017</td>
<td>Beijing rolls out “electrification of cities” program</td>
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<tr>
<td>2018</td>
<td>Los Angeles says no to petrol cars</td>
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<tr>
<td>2019</td>
<td>Tokyo and Berlin signs nuclear technology exchange agreement</td>
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in the South China Sea and East China Sea are eased in the interest of creating a strong intra-Asian trading block keeping USA at arm’s length. In its foreign relations, China shows all the signs of an emerging imperial force.

Continuing violence and the rise of terrorism in the Arab world makes countries ungovernable. The violence is spreading to sub-Saharan countries including oil producing Nigeria and Angola. Unreliable supplies from these regions on top of Russian and Iranian sanctions are pushing up energy prices.

The US and Europe are focusing on domestic issues, expending most effort implementing austerity measures. The US is becoming more and more self-sufficient in energy and is therefore changing its foreign policies away from securing the stability of supplies towards looser trade relations. Europe is unable to act in any other way than follow US.

**Energy efficiency and emissions reduction require- ments are implemented at local levels to solve im- mediate and local problems.**

This new balance of power also leads to general policy and market reforms, reducing barriers to entry in industries that are key to well-functioning, densely populated cities. This allows niche and specialized companies to enter markets, such as distributed power generation and distribution, at the cost of the large, established corporations.

Still asleep

The environment gets scary but is not yet disruptive to businesses or changing the insurance game. The political agenda on climate topics is strong in some regions and driven by public expectations in a few big cities in Europe, California and East Coast US. Brand based enterprises are reacting with strong Corporate Social Responsibility programmes and energy efficiency is more attractive than ever in a time with high prices on energy. The US and China have taken an observer role in the 2015 Paris Summit, satisfied with their 2014 climate deal.

China implements its 13th five year plan with a genuine green tide. Chinese cities have seen waves of environmental migration as people are driven away from suffocating air quality. It becomes a top priority to improve air quality in Chinese cities, a task Beijing attacks with a combination of direct government investment and regulatory schemes.

Made in Asia for Asians

The slow global growth translates directly into slow global trade growth. The US focuses on boosting domestic production capacity, while Europe struggles with slowing consumption. As a result, the Asian focus becomes facilitating growth inside the region itself. China takes the lead in a trade growth model that benefits all of Asia.

Shale in the USA

Development of unconventional oil and gas is not progressing outside of the US due to environmental concerns as well as underestimated reserves and technological constraints. In the US, shale oil production decline rates are faster than expected, and new developments become more difficult and more costly; one result is onshore oil and gas production from shale and tar sands peaking around 2020. In order to maintain a competitive advantage with low energy costs, the US government maintains its export ban on oil and gas.

Renewable investments go east

With austerity being the main agenda item for governments in EU and US, there is not much public investment in electricity transmission and distribution grids, making it more difficult for new electricity technologies to win market access. They are still being developed and implemented in niche areas, but a broad implementation with a significant impact on the global energy mix is hindered by a lack of funding.

Through its robust investments aimed at reducing local pollution, China demonstrates the performance of low carbon technologies, and through broad application in that country, cost curves for renewable energy sources see very positive development. The strong Chinese drive for renewables has global impact beyond 2020: boosting energy efficiency initiatives, raising green investment, promoting e-mobility and enhancing corporate commitment towards green procurement and sustainable supply chain initiatives.

Stable and high energy prices

In general, fossil fuel exporting countries continue to thrive with high prices. Brazil, Mexico, Venezuela, and Russia continue to target domestic growth driven by fossil fuel activity. Countries like Japan, India, and many African countries relying heavily on fossil fuels imports, have to accept a double whammy of a bad economic environment and high energy prices.

As the unconventional oil and gas hype has calmed down, the US government is more concerned about maintaining a low energy price advantage than following free market principles and opening for export of fossil fuels. The 40 year old federal ban on crude oil export still prevails. Reinforced by a government which has promised to keep gasoline prices low for a financially stressed middle-class, US gas prices continue to trade significantly below global averages.

Outside the US, oil and gas prices trend steadily upwards as production constantly struggles to meet a growing global consumption driven by Asia and Africa. As a result there is a stable difference between domestic US and global market prices for both oil and gas. The high prices improve the competitiveness of renewable energy sources, and this sector sees significant investment. However, due to lack of public investment in transmission and distribution grids, the implementation rate for renewable sources is limited by the abilities of utility companies and their grids to handle intermittent generation sources, such as solar and wind.
**Intra-continental shipping**

Transportation takes a direct hit from the global economic problems and high fuel costs. Austerity measures and anxiety about the future lead to reduced public and private consumption, especially in Europe. In turn, this reduces the need for seaborne goods, especially in the traditional trade routes from the production centers in Asia to OECD consumption centers. Moreover, ton-miles are reduced as the Panama Canal and new ports in Myanmar ensure more efficient east-west transport routes. As North America is more or less self-sufficient in energy, transport of petroleum products to and from this continent is also significantly down. The result is a prolonged and significant slump for shipping. Shipbuilding will remain at a minimum causing significant challenges to shipyard survival. China has the most aggressive support regimes for its shipping industry, and, by the end of the slump, a major share of both tonnage and shipbuilding capacity is effectively transferred to Chinese hands.

Shipping activity on the African continent is on the increase, primarily based on Chinese investments in African port infrastructure, and the ambitions of African nations to enter the global trade markets. For road transport, oil is still king. Electric cars are continue to increase in popularity owing to high gasoline prices, but a broad switch to this technology is hindered by slow development of access to charging locations, and in struggles to secure raw materials necessary for battery production.

**Slowly moving north and deep**

The stable and high prices of oil and gas motivate IOCs to go further in exploring Arctic reserves as well as deep-water areas offshore Africa and Brazil. The IOCs are becoming attractive partners to National Oil Companies like Pemex, Petrobras, Sonangol and Petronas for the development of complex field solutions. Along with a stronger presence of oil and gas operators comes support infrastructure, such as bases, ice-breaking and rescue services. The high oil prices have tempted Russia to ease its foreign policies to restore access to the market for a people suffering from tough western sanctions. This provides an opening for more use of the northern sea route, allowing more efficient transportation of goods from East Asia to the Atlantic Basin.

Africa struggles to find its role in the global marketplace with high energy costs slowing GDP growth. Asia, led by China, is developing energy reserves on the African continent, but this activity has only minor positive effects on spurring domestic growth in the African countries. Europe and the US are too busy sorting out macroeconomic problems and kick-starting domestic activity to assist Africa in entering global markets.
SCENARIO 3: REBOOTING

All leading economies are exposed to a faltering China and spiral into a global depression. A return of manufacturing to Europe and the US reduces demands for Chinese export goods. China’s domestic market fails to close the gap; bankruptcies and financial distress follow.

Europe struggles on between austerity and expansionary monetary policy. The US convulses through a series of debt ceiling crises, while its economy suffers an initial austerity contraction. In general, the global economy moves downwards and sideways, with the first shoots of recovery only appearing at the end of 2018.

China deflects attention from its struggling economy via ambitious foreign policy. This, combined with a Russia constantly positioning for relevance, see a global rise in regional conflicts, leaving the US playing a tricky ‘Globocop’ role.

The broad public is more worried about their immediate needs, however. The result is a strengthening of local and city governments. Extreme weather causes alarm, but, again, more proximate concerns like unemployment trump the combating of carbon emissions. Without public backing, strong policies for a 2°C scenario fall by the wayside, and renewables are buffeted both by this and by low prices for hydrocarbons.

50 dollars is the ceiling price for oil. There is a time-out on greenfields oil & gas projects; the Arctic remains the domain of the polar bear.

In all this there are opportunities to be found. The collapse in China makes way for other Asian countries, expanding the world’s manufacturing base. Low prices, along with technical and environmental complexities, inhibit new shale developments, creating more room for conventional. LNG and electric vehicles also lose out to cheaper oil, while small, often solar-based, power generation makes real gains.

Trade volumes knock shipping, offset somewhat by new, shorter trade routes and cheaper fuel. The bulk and liquid bulk market is hit both by slower demand and lower oil, gas and coal imports due to an increase in distributed energy production. TIC players are also recession-hit, but heightened risks see a new wave of regulation in the OECD. The stronger players, as in most other industries, position themselves for a post 2020 recovery.
The bubble bursts in China

China is unable to grow a domestic market fast enough and large enough to compensate for the fall in export demand, bad investments accumulated over the past few decades are written down, and companies go bankrupt, leading to a distressed Chinese banking system and high unemployment amongst graduates.

Growth remains sluggish in Europe and the US, and combined with return of manufacturing to both regions, this means a reduced demand for Chinese export goods.

The crash in China leads to a downwards spiraling effect in global trade. Europe, North America, Japan, and Korea all have significant export exposure towards China, and is hit by slower demand. The result is a global contraction popularly referred to as “the Greater Depression”.

Europe struggles with high and increasing unemployment, GDP growth is negative, and budget deficits remain troublesome despite ever tightening austerity measures. Still, through active use of monetary policy, major disruptions to financial systems are avoided. Stability and predictability becomes top priority, and restructuring of businesses, new business models, and new trade patterns become harder than ever to establish.

In the US, the maximum amount of national debt issued by the Treasury, referred to as “the debt ceiling”, is a recurring theme. The debt ceiling crisis of 1995, 2011 and 2013 are followed by ever shorter periods between each time the debt ceiling needs to be raised. The US resorts to austerity measures to bring the budget deficit down with a long term plan to start repaying national debt. The immediate result of the austerity is a slowdown of activity in all sectors.

The global depression started with the financial crisis in 2007 and, except for a short upturn, before the hard austerity medicines take effect, continued to 2018 when signs of recovery are seen at last. The world is starting to recover slowly from a situation with low international trade and unemployment levels above 25% in many countries.

The great balancing act

In the face of economic challenges, geopolitical powers keep testing their strengths against each other. Domestic trouble leads Beijing to seek international conflicts to divert public attention. Border issues in the South China Sea and Chinese presence and ownership of natural resources in Africa become sources of conflict and demonstration of power. North Korea is facing desperation from a starving population and is trying to strengthen bonds with surrounding countries through increased trade.

Russia keeps positioning for increased global relevance, through establishment of new trade agreements and partnerships, primarily towards China and other emerging economies in Asia.

The US maintains its position as the only real geopolitical power, but is continuously challenged, and performs a tough balancing act to avoid conflicts from escalating out of control.

Global distrust

With extensive global and national macroeconomic problems, trust in global governing bodies is deteriorating fast. The public becomes less interested in the big global questions, and more focused on their own immediate needs. The result is a strengthening of governance at local levels where an understanding of homegrown problems and requirements is more evident.

Not able to react

Around the world, people are increasingly experiencing weather events beyond what they consider to be normal. This increases public concerns and awareness on environmental issues, but with a strong economic downturn and high unemployment they have other priorities than combating carbon emissions. Without sufficient public pressure, governments continue to fail in reaching any global agreements on climate change action. Policies are insufficient to motivate a switch of investment to low carbon sources, and staying within the agreed limit of 2°C temperature rise appears less and less realistic. Fossil fuel subsidies are cheap to maintain for developing countries and an effective instrument for minimizing social tensions in difficult times.

REBOOTING WILL BE REMEMBERED FOR CENTURIES:

2015: Chinese bank crisis
2016: A US Republican Congress refuses to raise the debt ceiling
2017: China implements Hong Kong as special economic zone
2018: Unemployment in Europe is turning around from record high levels
2019: UN and WTO are finding their way back

The US resorts to austerity measures to bring the budget deficit down with a long term plan to start repaying national debt. The immediate result of the austerity is a slowdown of activity in all sectors.

AVERAGE GDP GROWTH:

- EU: -4 to -2 %
- USA: -2 to 0 %
- China: 2-3 %

OIL PRICE: < 50 $/BBL
CARBON PRICE: 1-5 Euro/t
Onshore US, production rates start declining sooner than anticipated. With a shrinking global demand for oil, there is enough capacity in conventional reserves to produce at a lower cost than from any unconventional sources. Co-lateral distrust and different interests have made OPEC ineffective and in practical terms dissolved. Venezuela and Russia are selling their oil as fast as they can to fuel their very stressed economies. Middle East countries with a relatively stable political situation, including Iran, are flooding the market with oil in times of less demand and high regional stability.

**Cheap is good - coal & solar**

Energy markets in general are experiencing lower and flat demand curves, leading to lower prices for most energy sources. Oil prices trend lower, but a natural floor ceiling of around 50 dollars per barrel is established due to break-even prices for the marginal volumes. Natural gas prices converge, so that the price difference between USA and Asia no longer warrants exports from the USA. Natural gas is no longer the fastest growing source as it keeps losing to renewable energy and in certain areas to a coal business released from environmental restrictions.

With low earning potential for oil and gas and no capital, we will see a time-out on greenfields developments requiring a price higher than 50 dollars and also a freeze on capital intensive projects that in principle can withstand low energy prices. This opens opportunities for less capital intensive energy projects. The low fossil fuel price is a barrier for e-vehicles and LNG as a fuel for ships.

The difficult global macroeconomic situation leads to slower growth in emerging countries while many developed countries are seeing recovery towards the end of the period on the back of low energy prices. There is less money available for public investment in infrastructure, but through new electricity technologies, projects see day light with private capital. Small, often solar based, power generation is established to power local communities.

Regional interconnections of transmission lines and measures to increase stability of large grids are diminishing.

**Local sourcing**

As all of trade is generally down, so is shipping and other forms of transporting goods. The container trade suffers from lower volumes of finished goods, both because of a general downturn in demand, but also because many products are now being manufactured in their end markets. Bulk and liquid bulk transport suffers from slower demand in general but also specifically from distributed energy production replacing imported volumes of oil, gas, and coal. The offshore market, including drilling rigs, supply vessels, and various service vessels, is significantly depressed because of the collapse of investments in offshore oil and gas development.

**The flat world**

With a global economic crisis unfolding, there is no opening for new emerging nations and geographies to be included in the global market place. The African continent may be gearing up for taking part in the next wave of growth, but nothing of significance happens before 2020. The Arctic remains the domain of polar bears as oil and gas prices don't warrant any activity in this area.
The greatest scenario planners

Children are the future; they are also the greatest scenario planners - actively using their vivid imaginations to make sense of a complex, often dangerous world. A growing body of theory shows how important fantasy, role playing and make-believe is for cognitive development. Leading educationalists are constantly seeking new ways to spark and guide children's imagination.
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