

Industry Agenda

Industry Strategy Meeting 2014

Infrastructure & Urban Development, Mining & Metals and Chemicals Industries (BASICS) Programme

New York City, USA 21-22 October 2014



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Contents

- 4 Executive Summary
- 6 Industry Transformation Sessions
 - 6 Infrastructure & Urban Development Industries
 - 7 Mining & Metals Industry
 - 8 Chemistry & Advanced Materials
- 10 BASICS Industry: Infrastructure & Urban Development, Mining & Metals and Chemicals Transformation Session
- 13 Urban Innovators: Cities as Drivers of Business Transformation Session
- 18 Disruptive Technologies: Exploiting and Adapting to Game-Changing Effects Session
- 20 Strategic Shifts in Energy and Resources Session
- 22 Industry Agenda-Setting Sessions
 - 22 Infrastructure & Urban Development Industries
 - 23 Mining & Metals Industry
 - 24 Chemistry & Advanced Materials Industries
- 26 List of Participants
- 30 Contact Information

Executive Summary

The World Economic Forum provides a platform for its Industry and Strategic Partners to understand how industries are transforming and to shape their future in the context of rapid changes. This happens through a collaborative process involving the most influential industry leaders and key stakeholders, such as relevant policy-makers, regulators and members of civil society.

To make this process more robust and sustainable, the Forum created a community of strategy officers – senior executives with comprehensive knowledge of their companies' strategic priorities as mandated by the chief executive officer (CEO), coupled with a direct reporting relationship to the CEO. The newly created Strategy Officers community is a crucial addition to the Forum's existing platform for strategic insights into the transformation of industry networks and business models.

The community acts as an independent validator and enabler for ongoing industry initiatives. It focuses on shaping the respective industry agendas, including defining the important opportunities and challenges, finding common solutions and engaging in initiatives to fulfil the Forum's mission of improving the state of the world.

One of the community's areas of focus is to understand and map industry transformations along with opportunities and challenges faced by decision-makers, as the structure of their industries undergoes profound changes. The community was created to identify the most significant transformational trends and their drivers and impacts, within and across industries, while highlighting intersecting points between sectors.

The Strategy Officers community held its inaugural meeting on 21-22 October 2014 in New York City, where participants:

- Brainstormed important drivers, connectors and challenges faced by individual industries
- Contemplated possible value-chain (r)evolutions, in which traditional business models and incumbents could be disrupted to maximize value and minimize cost through an integrated, cross-industry approach
- Learned about the industry transformation mapping tool and exercise, as pioneered by the Forum
- Contributed to framing the Governors Meetings for the World Economic Forum Annual Meeting 2015 in Davos-Klosters, Switzerland
- Engaged in explorative programmes on geopolitics and hyperconnectivity, and the implications for business.

Industry Transformation Sessions

One of the steepest challenges that strategy officers face is to navigate their companies through a period of rapid and extensive industry transformation. Companies able to spot the emerging trends in their industry networks and to align their business models accordingly are more likely to be successful in the future. The industry transformation sessions within the Basic Industries cluster brought together the most influential industry leaders to brainstorm important factors, connectors and challenges faced by individual industries. Participants also validated the respective industry transformation maps and provided inputs to further refine the core dimensions of transformation. Emphasis was placed on identifying important disruptors that could trigger revolutionary changes in the fundamentals of the respective industries.



Urban Innovators: Cities as Drivers of Business Transformation

The convergence of the digital and physical dimensions offers cities a chance to benefit from innovative urban solutions. This session explored the critical urban challenges and emerging urban innovations, as well as solutions covering resilience, smart cities, smart buildings, health, mobility and the circular economy. In addition, participants discussed the future trends facing cities, the new areas of business that cities will need to provide, and solutions for harnessing cities as hubs of urban services solutions.

Disruptive Technologies: Exploiting and Adapting to Game-Changing Effects

Emerging technologies can create huge business opportunities as well as huge risks for those who miss them. The World Economic Forum's list of Top 10 Emerging Technologies 2012-2014 included those as diverse as 3D and 4D printing, screenless displays, organic electronics and photovoltaics, remote sensing, nanostructured carbon composites, body-adapted wearable electronics, human microbiome and RNA-based therapeutics, nanoscale precise drug delivery and grid-scale electricity storage. These technologies are disrupting business models and connecting previously independent value chains to create new value networks, necessitating new collaboration models. Some, such as big data, have saved billions of dollars. Emerging technologies will play an important role in the need to address new consumer demands by demographics and to deal with global mega trends, as they arise.

Strategic Shifts in Energy and Resources

The future of energy and resources will rest on strategic developments in the important areas of geopolitics, technology, financing and the environment. At this session, participants explored the impact of emerging geopolitical trends on energy production and the role China could play as a major influencer. The need for a collaborative approach and creation of a uniform regulatory landscape were emphasized in addressing global environmental concerns. Technological advancements and innovation were identified as critical drivers of change and areas of tremendous opportunity. Companies will need to leverage technological developments to drive operational efficiencies, in order to remain relevant and access new sources of energy and resources.



Industry Transformation Sessions

Palm Room, Waldorf Astoria Hotel,
New York City, 21 October 09.15 - 10.15

Infrastructure & Urban Development Industries

Description

The future of the infrastructure and urban development sector will be shaped by critical transformations within its industries (real estate, engineering and construction) and across its value chains. During this session, participants explored the outcomes of the Forum exercise to develop an industry transformation map – a structured process to generate insight, action and deeper value for business leaders. The session provided an opportunity for participants to get to know the newly created Strategy Officers community and share their experience on important transformation questions.

1. What important challenges will the infrastructure and urban development sector face in the years to come?
2. What are the drivers behind each of these issues?
3. Who are the key people, communities and institutions related to these issues and what cross-industry interactions are required to provide solutions?

Discussion Leaders

John M. Beck, Executive Chairman, Aecon Group, Canada
Barry M. Gosin, Chief Executive Officer, Newmark Grubb Knight Frank, USA
Aaron B. Schwarz, Principal and Executive Director, Perkins Eastman, USA

Moderated by

Pedro Rodrigues de Almeida, Director, Head of Infrastructure & Urban Development Industries, World Economic Forum

Key Points

- Technology is key to business innovation – from intelligent buildings to intelligent cities, using big data and new interconnectivity approaches.
- True interdisciplinary and integrated planning, including design for climate change, will become indispensable.
- Demographic Challenges - ageing communities and contracting markets will challenge existing businesses.
- Regarding the skills gap: how can new talent be attracted? New skill profiles, new jobs and increased mobility will be observed.

- Maintaining standards in health, safety and the environment, while living with global competition, will be a challenge.

Synopsis

- In the future, the leading companies will be those managing to attract the most talented and skilled people in order to stay competitive and provide sustainable solutions. True interdisciplinary teams and new integrated project planning and development tools are needed to face the increasing complexity of infrastructure projects. How can the skills gap be closed as new job profiles emerge?
- The fast advancement in smart systems is silently redesigning the whole industry value chain, driven by the Internet of Things (IoT). The increasing interconnectivity within buildings, thanks to the use of big data, will be extended to neighbourhoods and beyond city boundaries. As one participant noted, we will go from “intelligent buildings to intelligent cities and intelligent regions”.
- Participants explored how rapid urbanization and the developed world’s ageing society would affect the industry.
- Europe, Japan and China are presented with new infrastructure challenges and needs, which also present new business opportunities. New cross-industry services must be offered, and tailored infrastructure solutions delivered, especially in health, transportation and urban services. Urban planning and efficient operations and maintenance are now critical to the sector.
- Climate change and pollution are two pressing issues that must be considered in current and future infrastructure projects. Businesses and regulators have to cooperate to achieve a more sustainable world, and they must embrace the concept of a circular economy. They have to collaborate to save energy, reduce pollution created by municipal and industrial waste, and encourage the reuse of materials.
- In today’s hyperconnected world, resilience and an appropriate crisis-management policy are needed more than ever. Additionally, new global players such as emerging economies, terrorist groups and cyberactors are challenging the geopolitical status quo. Collaboration between governments to establish common strategies and responses to these challenges may help to preserve stability and peace, and enable the flow of infrastructure projects and investments.



Mining & Metals Industry

Description

The future of mining and metals will be shaped by critical transformations within the industry as well as across its value chains. During this session, participants explored the outcomes of the Forum exercise to develop an industry transformation map – a structured process to generate insight, action and deeper value for business leaders.

1. What are the most important issues or challenges that the mining and metals industry is confronting?
2. What are the drivers behind each of these issues?
3. Who are the important people, communities and institutions related to the issue?
4. What cross-industry interactions are required to address or discuss these issues and developments?

Opening Remarks by
Gillian Davidson, Director, Head of Mining & Metals Industry, World Economic Forum

Moderated by
Stephen D'Esposito III, President, RESOLVE, USA; Chair, Industry Agenda Council on the Future of Mining & Metals

With
Lisa Sachs, Director, Columbia Center on Sustainable Investment, Columbia University, USA; Vice-Chair, Industry Agenda Council on the Future of Mining & Metals

Key Points

- Irresponsible supply-demand reactions are leading to overcapacity in certain industry sectors. For example, in the next two years, a significant oversupply of steel is anticipated globally.
- The mining and metals industry can play an important role in responding to the Ebola outbreak by leveraging its logistics infrastructure to help local governments.
- Downstream users and consumers are potentially the next big disruptors. Changes in the consumer mindset can have significant impact (e.g. a shift from a low-cost, disposable society to a willingness to pay).
- Producers and consumers are increasingly demanding responsible sourcing from the industry. They also want more transparency – for example, an app that could be used to scan a product and provide information on where it was produced and how it was supplied.

- The real estate industry and those who invest in it, as well as urban planners and governments, have to address new demographic requirements (particularly the ageing population). They must also respond to the new challenges arising from the internet, such as how to service a sharing economy (e.g. with shared workspaces), e-commerce, and a growing demand for warehouse space concurrent with a shrinking demand for space in retail. They must also try to understand the new real estate end user – for example, the flexible needs of the internet generation and new customer expectations.
- Growing populations and increasing urbanization are creating a large need for social housing. How can people be helped with purchasing a home? Doing so could help achieve social stability and might lead to the emergence of a middle class in places where it is not yet developed.
- Traditionally, real estate markets have been local or regional. Now, real estate investment is concentrated in an increasingly small number of cities. This may cause wider issues of financial or investment stability, since real estate assets in those cities are increasingly correlated with financial assets, particularly during downturns.
- Infrastructure plays a critical role in guiding real estate activity and economic development, and reinforces the need for close coordination between land-use planning and infrastructure planning. The quality of infrastructure systems, such as transportation, utilities and telecommunications, is the most important factor in real estate investment and development in cities, according to a survey by the Urban Land Institute.

Synopsis

- The steel industry is in a crisis of oversupply as a result of market speculation and a build-up of inventory in the supply chain. Together, these have created artificial demand when market conditions were favourable. Structural changes are required if supply is to match real end-user demand.
- Ebola is a global crisis and can potentially change mineral supply in a very disruptive way. Particular focus is on the leadership role that the mining sector can play in the near term and the economic response once the crisis is contained. Further, the Mining & Metals group felt that the World Economic Forum could play an important role, through the Industry Agenda Council on the Future of Mining & Metals and more broadly.
- Governance structures, as well as development of partnerships and centres of excellence to tackle the Ebola outbreak, are required. A mutually beneficial multistakeholder framework needs to be adopted.
- A big appetite exists for Mining & Metals leadership to define “responsible” as a means of supporting supply-chain differentiation and transparency, and to support brands and non-governmental organizations (NGOs) in telling positive stories about mined material.
- The mining and metals industry for example, in Alaska needs to start communicating more with other industries. Fishing, as well as oil and gas, face many of the same issues that the mining industry is encountering.
- The mining and metals industry will need to change to become proactive, instead of being reactive to changes in it’s business environment. Government should be proactively engaged in dialogues communicating industry issues and expectations. “We need to move our money from fighting legislation towards getting things done,” according to one participant.
- Financing will become increasingly difficult, as many banks will incorporate elements like inclusive development and supply-chain transparency into their compliance requirements.



Chemistry & Advanced Materials

Description

Chemicals industries are solution providers to all industries. Solutions are provided mainly in the form of emerging and disruptive technologies, as well as advanced materials, which initiated a transformation meeting for Chemistry and Advanced Materials.

During this session, participants explored the outcome of the exercise pioneered by the Forum to develop an industry transformation map – a structured process to generate insight, action and deeper value for business leaders. Moreover, a Blue Paper developed by Sibur, the company of the group’s current Governor, was presented and critically assessed with the community of strategy officers.

1. What are the opportunities and challenges that Chemistry and Advanced Materials is confronting?
2. What are the drivers behind each of these issues?
3. Who are the key people, communities and institutions related to the issue?
4. What are the cross-industry interactions required to address/discuss these issues/developments?

Opening Remarks by
Andrew J. Hagan, Director, Head of Chemistry and Advanced Materials, World Economic Forum

Moderated by
Dmitry Kolobov, Director, Corporate Strategy, Sibur, Russian Federation

Key Points

- Both the transformation map initiated by the Forum, and the Blue Paper developed by Sibur (Russian Federation), are excellent inputs for a strategic discussion on the future of the industry, and will be developed by the Strategy Officers community.
- The industry’s important workstreams, such as advanced materials systems, feedstocks, emerging technologies and nutrition systems, are highly relevant for the community, especially for the strategy officers.
- Critical additions are the importance of human capital for providers of chemical solutions, and the public perception of the industry.

Synopsis

- The transformation map shows the landscape of the various industries, including chemistry, advanced materials and biotechnology. The map’s purpose is to help with understanding the important developments in the industry and link these to other industries and issues.

- The following transformations were confirmed to be crucial for chemistry, advanced materials and biotechnology: nutrition systems, energy harnessing and new feedstocks, emerging technologies, climate change, environmental solutions, renewable energy, human capital, public perception, commoditization, overcapacity and advanced materials.
- Nutrition systems play an important role, as agriculture, healthcare, consumers and chemicals industries are currently not aligned (i.e. everyone is working in isolation). Building the links between existing value networks is important for effective collaboration.
- Emerging technologies could dramatically change the industry and should be closely monitored.
- Climate change, environmental solutions and renewable energy are linked to sustainability, and would need to be closely monitored as well.
- Human capital is strongly relevant for the chemicals field and is an area the industry needs to focus on. Attracting young talent to the industry is difficult; potential solutions need to be found.
- In its public perception, the industry's image needs to change from polluter to solution provider.
- Commoditization and overcapacity are hugely relevant at the moment, especially for particular areas such as rubbers.
- The area of advanced materials is developing at a strong pace and, especially on the cross link with computing systems, could provide interesting solutions for the market.
- The circular economy is a highly topical issue; it should be added, seeing that the Forum has a project in this area. This is an opportunity to work with companies across the value network, and the chemicals industry is interested to be at the top of developments in this area.
- Life-cycle analysis was also raised in addition to the circular economy. It was noted that companies should invest their time and effort in this area.
- Trade is a strong area of focus for the chemicals sector, and especially the focus on green free trade (special taxation for green products) should be accentuated. Exploring ways of how different countries could collaborate in this area is important.
- One participant said public policy plays a huge role in the area of chemicals, as it largely influences the industry, especially the biotechnology end. Recent adoptions in regulation, such as a carbon tax, could have implications for the whole sector.
- The need for customers and regulators to be added in the area of impatient capital (i.e. investors demanding quick returns) was also discussed.



01: Rosemary O'Brien, Bernard Meyerson, Peter Florenz and Alan Hiltner at the Chemistry and Advanced Materials session

BASICS Industry: Infrastructure & Urban Development, Mining & Metals and Chemicals Transformation Session

Palm Room, Waldorf Astoria Hotel,
New York, 21 October 10.15 - 11.15

Description

Infrastructure & Urban Development, Mining & Metals and Chemicals are capital- and labour-intensive industries committed to enhancing sustainability in various ways. This cross-industry session addressed strategic issues around sustainable financing, trends in material systems and the business case for a circular economy. In particular, the session was an opportunity for participants to interact and share experience on one of the following cross-industry topics:

1. Where the money is going: The future of financing and investing
2. Advanced materials systems: Exploring emerging paradigms
3. Closing the loop: Transitioning to a circular economy

Firestarters

Jeffrey Carbeck, Co-Founder and Chief Technology Officer, MC10, USA; Industry Agenda Council on the Future of Chemistry, Advanced Materials and Biotechnology; Meta-Council on Emerging Technologies

Ron Gonen, Co-Founder and Managing Partner, Closed Loop Fund, USA

Barry M. Gosin, Chief Executive Officer, Newmark Grubb Knight Frank, USA

Discussion Leaders

John M. Beck, Executive Chairman, Aecon Group, Canada
Stephen D'Esposito III, President, RESOLVE, USA; Chair, Industry Agenda Council on the Future of Mining & Metals

Moderated by

Alex Wong, Senior Director, Head of the Centre for Global Industries and Head of Basic & Infrastructure Industries, World Economic Forum

Where the Money Is Going: The Future of Financing and Investing

Key Points

- Despite an abundance of liquidity, political paralysis restricts the availability of capital.
- Investors are facing increased political risks, such as terrorism, Ebola and corruption.
- A rigorous process and strong muscles for investment and public-private partnerships (PPPs) are required; an independent procurement body, robust regulatory frameworks and long-term stability to reduce political risk pave the path for success.

Synopsis

To enable public-private collaboration models such as PPPs, transparent and robust schemes are urgently needed. Creating independent and supranational bodies, able to introduce and enforce measures that mitigate risk and to establish a reliable PPP regulatory framework, will ensure long-term stability and reduce the perception of political risks. They would also allow infrastructure to emerge as an asset class and a driver of sustainable development.

Infrastructure projects are facing a severe increase in complexity, size and cost. This makes it necessary to introduce new private-to-private collaboration models that will mobilize the abundance of liquidity being held by pension funds, hedge funds and sovereign wealth funds (SWFs), among others. Are these investors becoming key shapers of the industry?

From the aftermath of the last crisis until today, trends in real estate markets have become increasingly hard to predict. To safely navigate this challenging environment, the focus must always be on the long-term perspective. Policy-makers are currently debating whether asset-pricing dynamics can, or should, be managed with the public interest in mind. New market players are emerging in real estate finance; this includes foreign private investors, hedge funds, institutional investors and SWFs. The shadow banking sector and SWFs can drive asset bubbles because both are still barely regulated.

Governance and sustainability drive the real estate industry. Government and central bank policies can significantly affect the development of real estate asset markets, enable capital flows and reduce risk perception and corruption. On the other side, municipal leadership becomes crucial for guaranteeing sustainable real estate projects, encouraging a circular economy and incubating innovation in advanced materials and urban planning, especially since cities are growing in size and influence.



01



02



03

Advanced Materials Systems: Exploring Emerging Paradigms

Key Points

- Advanced materials systems are synergetic combinations of advanced materials that provide new properties and consequently open new markets.
- Several industries have already been – and will continue to be – impacted by these systems.
- Many industry sectors are carefully monitoring developments in these areas, as they create opportunities yet also have the ability to disrupt existing markets by providing alternatives.

Synopsis

Advanced materials systems offer a mechanism for manufacturing sectors to pursue opportunities in large markets, enabled by materials technologies where innovation moves beyond the frontier of new molecules and materials. This thinking has the potential to enable growth, value creation and a renewal of innovation by delivering functional solutions to markets and customers that desire or require those solutions.

Advanced materials systems have combined several materials technologies, especially in aircraft manufacturing and electronics, to form novel structures that have transformed the industries. This is expected to continue and, moreover, spread to new areas such as chemicals, automotive and healthcare. While this trend has opened and will continue to create new opportunities for industries, it can also challenge existing markets by offering more cost-effective alternatives or systems with additional benefits.



04

01: Breakout session on the future of financing and investing, with Barry Gosin (second from left)
02: Breakout session on the future of financing and investing, with John Beck (second from right)
03: Breakout session on advanced materials systems, from left:

Andrew Hagan, Bernard Meyerson, Louis Vega, Shinichi Koizumi and Kiyoshi Matsuda
04: Breakout session on advanced materials systems: Jeffrey Carbeck addresses the group

Closing the Loop: Transitioning to a Circular Economy

Key Points

- A circular economy is really the old style of economy – reuse and barter. Real interest exists in better understanding the role that recycling can play in a circular economy.
- The value of pursuing a circular economy depends on the business model. This can vary from benefits such as creating new sources of supply (e.g. mine tailings, urban waste), producing more cheaply with new carbon regulations and recycling expensive components, to broader issues like sustainability, meeting changing customer preferences and developing efficient cities.
- Prominent bottlenecks include inadequate technological development, lack of expertise and appropriate business models, financing, getting to an economic scale, lack of infrastructure, accreditation and policy/legal obstacles. Further, a major challenge is bringing competitors together for collaborative action.
- Technological innovation can be used to drive the transition to a progressively circular world. The likely solution areas identified were: creating new value chains and collaborations; educating consumers, partners and government; and engaging government to incentivize growth of the recycling industry.

Synopsis

As a concept, the circular economy is becoming increasingly topical on the global agenda. The current “take-make-dispose” approach results in massive waste in, for example, the fast-moving consumer goods sector, where about 80% of the \$3.2 trillion value is lost irrecoverably each year.

One of the first questions addressed at the session was if it is possible to outsource service for the circular economy. A company would require significant effort to engage in a circular economy’s business model; as such a model is not part of its core business. Third-party organization could provide great insights and link different players in the market.

Cities are a key stakeholder in the dialogue on the circular economy. In the future, they would need to break out of their usual ways. For example, 35% of their waste stream is currently organic, and 90% ends up in landfill at tax payers’ cost. How can this waste be processed, instead of paying the cost to send it to landfills? The key bottleneck identified was the cost of creating a collection system and building infrastructure.

The circular economy’s profitability spurs a lot of debate. While the concept is very attractive as concerns sustainability, it is often questioned from the business standpoint. The financing mechanisms are not clear; banks are not certain about how to create loans for such a first-of-a-kind business. It is important to start a dialogue in that space and work with clear data to make sure everyone is on the same page. The banking sector should have a system that favours sustainable companies.

In terms of public policy, a carbon tax was referred to, but in places where it is used, people are not clear why the money is taken and what it is used for. More transparency is needed in this area. The key for success would be creating collaboration across value chains. Dialogue between companies in different sectors would help to make this a reality, and the Forum is in a great position to contribute to this.



01: Breakout session on the circular economy, with Ron Gonen, Co-Founder and Managing Partner, Closed Loop Fund (standing)



02: Participants at the breakout session on the circular economy

Urban Innovators: Cities as Drivers of Business Transformation Session

Sutton Suite, Waldorf Astoria Hotel,
New York, 21 October 13.15 - 14.45

Description

Cities are facing accelerated migration, unprecedented demographic changes, economic boom and bust, and shifting lifestyle and consumer preferences. These trends challenge the way cities provide physical, social and recreational infrastructure, yet the convergence of the digital and physical dimensions offers cities a chance to benefit from innovative urban solutions. Cities have the opportunity to rely on new virtual and networked solutions to enhance their liveability, sustainability, efficiency and productivity.

1. Will we witness the emergence of new urban services?
2. Are we ripe for rethinking and transforming business in cities?
3. Who will be the winners in this multitrillion-dollar urban services industry?



01: Stephen Cross, Chief Innovation Officer, Aon during the session on urban innovators

Firestarters

Michael Berkowitz, Managing Director, 100 Resilient Cities, Rockefeller Foundation, USA; Global Agenda Council on Risk & Resilience

Jerry Hultin, Senior Presidential Fellow, New York University, USA

Niels Lund, Vice-President, Corporate Public Affairs, Novo Nordisk, Denmark

John M. Mandyck, Chief Sustainability Officer, Building & Industrial Systems, United Technologies Corporation, USA

Hans Ristner, Senior Vice-President, Business Development, Volvo, Sweden

Tom Szaky, Founder and Chief Executive, TerraCycle, USA; Social Entrepreneur

Moderated by

Pedro Rodrigues de Almeida, Director, Head of Infrastructure & Urban Development Industries, World Economic Forum

Key Points

- Cities are increasingly facing physical, social and economic challenges that require resilience. The 100 Resilient Cities network is dedicated to helping cities around the world address this challenge.
- Gains in efficiency, urban innovation and behaviour are required to meet the global population's needs. Efforts made to date in urban innovation and smart cities are to be applauded, but if urban innovation is to be progressed at the required speed, technology empowerment, living labs and citizen engagement will be needed.
- The “smart” construction and operation of buildings remove constraints and reduce the costs to design systems, select components, and construct and start up buildings.
- Drastic lifestyle changes associated with urbanization have led to unhealthier lifestyles and increased type 2 diabetes and obesity. Well-developed public transportation systems encourage individuals to drive less and walk more. Available recreational facilities through parks are another factor built into a city's blueprint that can also have a positive impact on individuals' average daily physical activity, especially for children.

- Rapid motorization often accompanies the development of new emerging cities. The Volvo Group looks to deliver sustainable transport solutions that contribute to a highly effective transport system, with safe and secure energy-efficient solutions for people and goods.
- Virtually every product consumed will become waste, with 9% of the total material flow in the United States becoming garbage within six months. Technically, however, even non-recyclable materials can be recycled. TerraCycle aims to upcycle and recycle through the collection of difficult-to-recycle packaging and products, and repurposes the material into affordable, innovative products.

Synopsis

Resilience

Michael Berkowitz provided an overview of the 100 Resilient Cities network, pioneered by the Rockefeller Foundation. The network is dedicated to helping cities around the world become more resilient as they increasingly face physical, social and economic challenges, which include high unemployment, an overtaxed or inefficient public transportation system, endemic violence, chronic food and water shortages (currently in Detroit), and difficulties that New York City experienced in responding to extreme weather conditions.

Cities in the 100 Resilient Cities network are provided with the required resources for developing a road map to resilience along four main pathways:

1. Financial and logistical guidance for establishing an innovative new position in city government – a chief resilience officer, who will lead a city’s resilience efforts
2. Expert support for developing a robust resilience strategy
3. Access to solutions, service providers and partners from the private and public sectors as well as NGOs, which can help cities develop and implement their resilience strategies
4. Membership in a global network of cities that can learn from and help each other

By taking these actions, cities in the network will not only become more resilient, but will facilitate the building of a global practice of resilience among governments, NGOs, the private sector and individual citizens.

Innovations in cities

Jerry Hultin advised that six earths would be needed to meet the needs of the world’s population, given the UN’s estimate of global population growth to 9 billion people by 2050, and if all those people were to have the same standard of living as in the United States. Therefore, gains in efficiency, innovation and behaviour are required.

In addition, this population will be largely urban, with 70% (6.3 billion people) expected to be living in cities by 2050, a marked increase from levels in 2010 (50% and 3.5 billion people, respectively). The result will be continued development of new cities at a pace never before experienced. This presents, and will continue to present, mobility, energy and built-environment challenges that will need to be addressed through innovative urban practices.

Some cities have already begun embracing urban innovation and have created specific innovation zones, for example:

- Living Innovation Zones (USA) – The Living Innovation Zone Program in San Francisco seeks to create a flexible framework that harnesses the city’s creativity by using city-owned assets, such as public spaces as well as partnerships with leading organizations, as catalysts for exploration, innovation and play.
- 22@Barcelona district (Spain) – The project transforms 200 hectares of industrial land of Poblenou into an innovative district offering modern space for the strategic concentration of intensive knowledge-based activities. This initiative is also a project of urban refurbishment and a new city model, providing a response to the challenges posed by the knowledge-based society.
- Masdar City (United Arab Emirates) – In 2008, Masdar City broke ground and embarked on a daring journey to develop the world’s most sustainable eco-city. From its inception, city planners knew that taking such a visionary concept to reality would be a challenging and evolutionary process. Today, through smart investments, Masdar City is successfully pioneering a “greenprint” for how cities can accommodate rapid urbanization and dramatically reduce energy and water use, as well as waste. The bold dream has turned into a sustainable operation, pushing the boundaries of smart design and technology.
- Brooklyn Tech Triangle (USA) – This area (the Down Under the Manhattan Bridge Overpass [DUMBO] neighbourhood, Downtown Brooklyn and the Brooklyn Navy Yard) has become a magnet for the world’s pioneering, energetic and creative entrepreneurs, and has emerged as New York City’s largest cluster of tech activity outside of Manhattan, with nearly 10% of the sector calling this area home.



01: The session on urban innovators

- NYU CUSP & Hudson Yards (USA) – New York University’s Center for Urban Science and Progress (CUSP) is partnering with Related Companies and Oxford Properties Group to create the first “quantified community” in the United States – a fully instrumented urban neighbourhood that will measure and analyse key physical and environmental attributes at the Hudson Yards development in New York City. This quantified community will create an interactive, data-driven experience for tenants and owners of the 28-acre, mixed-use development now being built on Manhattan’s West Side. In line with the overall aim of improving operational efficiencies, productivity and quality of life, CUSP will use the data to help New York – and, ultimately, cities around the world – become more productive, liveable, equitable and resilient.

In addition, some cities are completely transforming themselves to become smart, for example:

- Ginko, Bordeaux (France) – With its bioclimatic architecture, very high energy performance, low-energy buildings, renewable energies and rational water use, this innovative, sustainable neighbourhood has its roots in the most advanced environmental principles.
- Wuxi (China) – It moved from essentially a large-scale processing city to a smart city with more than 600 core IoT enterprises. The focus on IoT has led to the city being home to 1,000 high-level IoT researchers and more than 50 research institutions. Wuxi has involved key national telecom service providers in its quest for modern infrastructure, and has generated roughly \$4.8 billion of economic output in the process.

Indeed, China and India are actively pursuing a smart-city policy:

- China: The Smart City Coalition is a group of businesses and institutions that collaborate with the simple goal of making better cities in China. China’s urbanization will create and transform hundreds of cities in the coming decades; it is desired that these cities be green, more innovative and more liveable. The nine smart cities identified include: Guangzhou, Wuxi, Chongqing, Hunan, Xuzhou, Taiyuan, Linyi, Zibo and Zhengzhou.
- India: The Minister of Urban Development has indicated that the challenge is not to repeat the mistakes of what has been done in the United States – cities like Atlanta, where 98% of people travel by car. It is important that countries like India set the example of having compact, dense cities which are sustainable. The Indian government is therefore seeking to develop 100 smart cities.

The efforts made to date on urban innovation and smart cities are laudable, but technology empowerment, living labs and citizen engagement are needed if urban innovation is to progress at the required speed.

Smart buildings

John Mandyck provided an overview of developments related to smart buildings and of United Technologies’ (UTC) developments in the field.

The construction and operation of buildings in a smart manner means in a way that continually increases occupant productivity through comfort, health and mobility features; removes constraints; and reduces the cost of design systems, select components, construction and start-up of the building. An intelligent building uses technology and process that make it safer, more comfortable and productive for its occupants, and more operationally efficient for its owners.

Mandyck provided an overview of the benefits resulting from smart buildings, including:

- Transaction prices of green buildings are 13% higher on average
- Buildings certified under the Leadership in Energy & Environmental Design programme show an effective rent increment of 7%
- Improved indoor air quality leads to a 41% improvement/reduction in symptoms of health problems such as asthma
- Optimized central plant system generates 50% energy savings
- Open system architecture enables customization and flexibility
- Elevator destination dispatch results in 27% energy savings and 46% faster travel times

UTC has been involved in Hong Kong’s iSQUARE project, which provides indoor climate and controls, system retrofit, control optimization and remote monitoring; elevator and security (video-based elevator dispatching, remote monitoring); and integrated building management (heating, ventilation and air conditioning; elevators; lighting).

01: During the urban innovators session



Health

Niels Lund provided an overview of the principal health issues facing the global population and the role of cities in addressing these challenges.

Today, nearly two-thirds of the 382 million people with diabetes live in cities. If this trend continues, as many as half a billion people will have diabetes by 2035 – and nearly all of them in cities. Urban diabetes is an emergency in slow motion, but its growth is not inevitable.

Related to this is the global increase in obesity, a public health issue with severe cost implications for healthcare systems. In the United States, approximately 35% of adults (about 100 million people) are obese.

Drastic lifestyle changes associated with urbanization have led to the rise of unhealthier lifestyles and increased type 2 diabetes and obesity. Urban design in the past half century has largely centred on cars, allowing people to commute from the suburbs instead of walking or taking public transit. Additionally, people living in cities are more likely to have sedentary office-based jobs. As a result of these two factors, relatively few opportunities exist for city residents to engage in enough physical activity. Maintaining a healthy eating plan in cities can also be challenging because of easy access to fast-food restaurants and convenience shops, as well as the decreased availability of fresh produce.

A major factor in a city's role in public health is transportation infrastructure. Over the past 10 years, cities like Seattle and Denver (both USA) have significantly upgraded their infrastructure by adding bike lanes on major roads, helping cyclists take back the roads from the dominance of cars. Well-developed public transportation systems encourage individuals to drive less and walk more. Available recreational facilities through parks is another factor built into a city's blueprint that can also have a positive impact on individuals' average daily physical activity, especially for children, an important target group in efforts to prevent future cases of type 2 diabetes and obesity.

Lund referred to Novo Nordisk's Cities Changing Diabetes, a programme committed to pushing for urgent action against urban diabetes on a global scale. The aim is to map its extent, share solutions and tackle the growing challenge of diabetes in the world's largest agglomerations, and transform cities into healthier places to live, work and play. Houston (USA), Mexico City and Copenhagen (Denmark) are collaborating with Novo Nordisk on the programme in order to fight the urban diabetes epidemic.

Mobility

Hans Ristner provided an overview of the challenges of urban mobility resulting from the demographic and economic growth of cities; namely, the need to improve the quality of life and, therefore, to reduce the environmental impact of urban activities and corresponding emissions levels.

Many countries around the world are experiencing dramatic urban growth, in terms of both economic development and physical expansion of housing areas, industries and

transport systems. New emerging cities are often accompanied by rapid motorization. At the same time, many inhabitants are still dependent on non-motorized modes of transportation, a fact that creates new mobility challenges for decision-makers at all levels of society.

On the other hand, consumption patterns have made citizens evolve (e.g. growth of e-commerce), and the development of new services and research continues to improve the efficiency of the supply chain and freight. In addition, social issues and the need to reduce the environmental impact of mobile people and goods in urban areas are driving a taxation system that aims to restrict certain modes of transport (e.g. car). However, such taxation mechanisms have pros and cons. The advantages are that they encourage the use of alternative, more sustainable modes of transport and raise revenue; as for the disadvantages, they often merely represent another tax, and governments do not invest the revenue back into the transportation system.

The Volvo Group looks to deliver sustainable solutions that contribute to a highly effective transport system, with safe and secure energy-efficient solutions for people and goods. Solutions include the following:

- Bus Rapid Transit, an efficient public-transport concept, is designed to meet growing transport demands in cities around the world, reducing traffic congestion, lowering environmental impacts and increasing passenger safety.
- The city mobility scheme runs buses powered entirely by renewable electricity on the respective city's public transport network.
- The climate smart city project is replacing conventional diesel-fuel distribution trucks with vehicles using three different technologies: renewable fuels, such as biodiesel, biogas and dimethyl ester (DME); hybrid technology; and methane-diesel fuel.
- Commute Greener is a mobile-based application developed by the Volvo Group that calculates and keeps track of carbon dioxide emissions.

Circular economy

Tom Szaky provided an overview of the circular economy and introduced the work of his company, TerraCycle.

Virtually every product consumed will become waste, with 9% of the total material flow in the United States becoming garbage within six months. Garbage goes to a landfill or incinerator, where it releases carbon emissions that have a negative impact on the environment. Landfilled garbage also takes up the limited space available on earth, and produces other side effects, such as toxins that leach into the soil and groundwater.

Recycled garbage goes to a processing plant and is converted into new raw materials for making new products. This not only eliminates the negative effects of landfilling or incineration, but also, by processing garbage into new raw material, releases fewer emissions than the production of new materials.

Technically, non-recyclable materials can be recycled. However, these materials must be collected, sorted and processed differently than the traditional recyclable materials, which are really just the most easily recyclable ones (glass, metal, paper and some plastic).

Society must embrace the circular economy, which is what TerraCycle aims to do. An international upcycling and recycling company, it collects difficult-to-recycle packaging and products and repurposes the material into affordable, innovative products. TerraCycle is widely considered the world's leader in the collection and reuse of non-recyclable, post-consumer waste. Among its solutions, TerraCycle launched the world's first recycling programme for one of the most commonly littered items on the planet – cigarette butts. The collected cigarette butts are recycled into plastic pellets and used to make industrial products, such as shipping pallets. TerraCycle also upcycles – for example, by turning used chip bags into tote or lunch bags.

Breakout discussions

These discussions facilitated exchanges on the following questions:

Question 1: What are the future trends facing cities across all geographies?

Participants believed that urban transport will be redefined to reflect limited car ownership, connective sharing of cars and discontinued use of personal transport for commuting to work.

Sharing will not be limited to resources in the transportation sector, but will affect energy, manufacturing, lodging and reusing products. However, the success of the sharing economy will depend on trust.

Question 2: What are the new areas of business that cities will need to provide in the future, and what are the implications for existing business models?

Specific business opportunities exist in a shared economic ecosystem, creative economy, garden cities/urban agriculture, the delivery of urban infrastructure and de-risking the concentration of intellectual property and people.

Participants discussed that new, untapped customers are available, given that the opportunity exists to move beyond producing products to providing services.

Question 3: How can we harness cities as hubs of solutions for urban services, while ensuring they are liveable and competitive?

Participants considered that data on mobility, energy and security are required to harness cities as hubs of such solutions; they believed that current and future infrastructure will drive the location of business services. Cities can be facilitators or accelerators of change, set measurable outcomes and appoint chief officers for city data and city services. Cities will act as competitors – in relation to people, talent and investment.



01: Tom Szaky, Founder and Chief Executive, TerraCycle, USA; Social Entrepreneur
02: The urban innovators



Disruptive Technologies: Exploiting and Adapting to Game-Changing Effects Session

Lexington Suite, Waldorf Astoria Hotel,
New York, 21 October 13.15 - 14.45

Description

Emerging technologies can create huge business opportunities, as well as huge risks for those who miss them. The World Economic Forum's list of Top 10 Emerging Technologies 2012-2014 included those as diverse as 3D and 4D printing, screenless displays, organic electronics and photovoltaics, remote sensing, nanostructured carbon composites, body-adapted wearable electronics, human microbiome and RNA-based therapeutics, nanoscale precise drug delivery and grid-scale electricity storage. These technologies are disrupting business models and connecting previously independent value chains to create new value networks, necessitating new collaboration models. Some, such as big data, have saved billions of dollars. Emerging technologies will play an important role in the need to address new consumer demands by demographics and to deal with global mega trends, as they arise.

1. When should an enterprise allow and encourage disruptive innovation to avoid being in an industry or company that is destroyed by the innovative technology, as in case of digital cameras?
2. Which emerging technologies will disrupt traditional industries, and how can new technologies and their effects be scouted more quickly?
3. What new forms of collaboration are needed and with which new partners, for companies to understand and extract value from emerging technologies?

Discussion Leaders

Jeffrey Carbeck, Co-Founder and Chief Technology Officer, MC10, USA; Industry Agenda Council on the Future of Chemistry, Advanced Materials and Biotechnology; Meta-Council on Emerging Technologies

Andrew Hagan, Director, Head of Chemistry and Advanced Materials, World Economic Forum

Bernard Meyerson, Chief Innovation Officer, IBM Corporation, USA; Meta-Council on Emerging Technologies

Key Points

- Innovation should be proactive, not reactive. At present, most innovation comes from problem-solving rather than solution-seeking. Support from social systems and governments is needed to inverse this.
- For disruptions to occur, the people aspect in organizations needs to be addressed; the “antibodies” in an organization prevent change, when the next big thing may endanger the existing “elephant” that has generated the profits.
- Regulation is lagging innovations in technology and needs to be more proactive for some emerging technologies, due to the speed of their arrival and big risks. However, care needs to be taken not to stifle innovation, as it can be very beneficial to and advantageous for society. Achieving a balance – to have checkpoints and allow for innovation – will not be easy.
- Approaches with ecosystems, even beyond value chains, are needed to enable innovation. However, it concerns not only the technology and the players, but the whole economic ecosystem, and how each part of the system is evaluated.

01: Jeffrey Carbeck, Bernard Meyerson and Andrew Hagan set the scene





01: Jeffrey Carbeck, Co-Founder and Chief Technology Officer, MC10, addresses a breakout group

Synopsis

Technological disruption is accelerating and having broad societal impacts. These technologies, however, are still restricted by “inertia to change” within organizations where new technology might affect existing products and markets. Moreover, internal resistance can hamper products, especially when disruptive technologies may impact existing markets and products that create significant revenue. However, and with foresight, many industries have spun off new technologies and created new subsidiaries to successfully mitigate this effect. Nevertheless, technological innovation, in general, outpaces policy, and risks could emerge from this. A priori regulation, however, could stifle innovation and make it less attractive to develop technologies with significant societal impact. Utilizing holistic ecosystem-based approaches that consider the economic ecosystem for enabling innovation, especially in technology, will be critical for both businesses and policy-makers.

Innovation has to become proactive rather than reactive. Currently, innovation in waste recycling or clean energy is trying to solve critical current issues, while innovation should also seek to be future-oriented and anticipate issues.

Strategic Shifts in Energy and Resources Session

Metropolitan Suite East, Waldorf Astoria Hotel,
New York, 21 October 13.15 - 14.45

Description

The rise of shale energy, changing dynamics of natural resources, geopolitics, national competitiveness, the increasing share of alternative fuels and feedstock, and the prospect of new sources of materials from the bottom of the ocean to the reaches of outer space are all impacting industries' and governments' decision-making.

1. What major disruptions could create a significantly different landscape in the supply of energy and resources?
2. What are the tipping points?
3. What are the implications for the economy and society at large?

Stephen D'Esposito III, President, RESOLVE, USA; Chair, Industry Agenda Council on the Future of Mining & Metals
Iftikhar Nasir, Co-Founder, Inaverve, United Kingdom
Madhu Vuppuluri, President and Chief Executive Officer, Essar Americas, USA

Moderated by
Duncan Wood, Director, Mexico Institute, Woodrow Wilson International Center for Scholars, USA; Industry Agenda Council on the Future of Oil & Gas



02

01: Iftikhar Nasir, Founder of Inaverve, reporting back on the finance breakout session
02: Madhu Vuppuluri, President and Chief Executive Officer Essar Americas, addressing the technology breakout session



01

Key Points

- Technology will remain an important factor for economics and efficiency – continuous re-engineering is essential. Utilization of big data is low in traditional industries and could be a potential disruptor.
 - Availability of finance is not an issue. However, in order to access financial streams, the energy and resources industry will need to demonstrate its attractiveness for investors.
 - Major shifts in the global geopolitical landscape can have significant impact on the energy and resources industry. Some of the big geopolitical changes discussed were: the changing energy equation with the development of US shale gas, OPEC's role in checking overproduction by some of its members, and possibilities of China collaborating internationally on issues such as climate change and public health.
 - Collaboration with value-chain partners and new development partnerships will be essential to remaining relevant in the rapidly transforming business landscape.
- Opportunities exist in the industry to take a pioneering position in green technologies. Alternative energy sources, such as renewables and biofuels, can boost public image while reducing the energy impact on the environment. However, implementing global standards and developing strategic partnerships in the downstream value chains are critical prerequisites.

Synopsis

- Technological shifts at the consumer end can have significant implications. At the same time, consumer needs will also drive technological innovations in the industries. GE's example of crowdfunding and gamification is a way to solve problems. At the industry level, disruptive technologies offer huge potential for enhancing low-grade materials (e.g. 28% Fe to 62% Fe) or for skipping energy-intensive stages of processing (e.g. bypassing pelletization in steel).
- The energy and resources industry can still access finance, but competition for financing has increased, and investors are more risk-averse. No major issues exist in accessing finance for projects where risk can be limited. However, in projects and areas where this is not possible, companies need to build a portfolio of partners that would allow them to offset the risk. This new model seems to be providing investors with the reassurances they need.
- Technological advancements coupled with communication tools will lead to significant improvements in energy efficiency. In the energy sector, converting all conventional (candescent and florescent) lighting to LED lighting could reduce global energy consumption by 8%.
- Existing technologies can be selectively adopted and reconfigured to drive efficiency gains. The big-data technological domain has great potential – companies that build capacity to leverage big data will enjoy competitive advantages.
- New disruptive trends are emerging; for example, connected lighting and the digitization of lighting are changing the industry landscape. Future success will be determined by how fast the transformation can be made.

Industry Agenda-Setting Sessions

Infrastructure & Urban Development Industries

Palm Room, Waldorf Astoria Hotel, New York, 21 October 16.30 - 17.30

Description

Based on the key takeaways from discussions on industry transformation and cross-industry sessions, the participants identified and ranked the priorities for Infrastructure & Urban Development Industries in 2015 and beyond. Moreover, the discussion served to assess those important factors of change and the issues that may disrupt the industry in the near future.

The strategic priorities identified by the participants during this meeting will contribute to framing the Governors Meetings at the World Economic Forum Annual Meeting 2015.

Discussion Leaders

John M. Beck, Executive Chairman, Aecon Group, Canada
Barry M. Gosin, Chief Executive Officer, Newmark Grubb Knight Frank, USA
Aaron B. Schwarz, Principal and Executive Director, Perkins Eastman, USA

Closing Remarks by

Pedro Rodrigues de Almeida, Director, Head of Infrastructure & Urban Development Industries, World Economic Forum

Moderator

Michael Buehler, Associate Director, Head of Real Estate, World Economic Forum



01



02



03

01: Michael Buehler, Head of Real Estate, World Economic Forum, moderates the session
02: Barry M. Gosin, Chief Executive Officer, Newmark Grubb Knight Frank, USA, addresses the breakout session
03: Laurent Auguste from Veolia

Key Points

- Technology and innovation, two factors in change, are facing poor governance.
- Sustainability is now a central strategy for adding value; increased know-how is needed to build efficient buildings.
- Political risk in emerging markets prevents investment in infrastructure assets and projects in those markets, despite an excess of liquidity.
- The lack of talent burdens infrastructure projects, in the context of increasing complexity.

Synopsis

- Poor governance and the lack of efforts to cooperate with new technologies and innovation are a barrier to adapting to change. Moreover, innovation to improve services in cities is not moving fast enough, despite the aim of new generations to live in more intelligent cities. Additionally, it should be assessed if progress is fast enough to address future shocks.
- Sustainability has become a central point in businesses' strategies to add value. For that reason, increasing the know-how to erect efficient buildings is required instead of locking people into inefficient buildings.
- Today, despite the excess of liquidity, financing projects is becoming increasingly difficult, especially in emerging markets. Political risks in those countries are chasing away investments in infrastructure assets and projects. Additionally, they burden the emergence of local capital markets, provoking the prospect of local financing of infrastructure through crowdsourcing as one of the only mechanisms to overcome the perception of risk.
- To respond to current technological challenges creating new societal demands and increasing project complexity, talent and education are required more than ever as important factors driving the infrastructure and real estate industries. How to provide the market with this talent, and to attract talent to these industries to help create jobs, have become critical challenges not only for business, but for a society facing increasing unemployment rates.
- Interconnecting infrastructure represents an opportunity for the real estate industry, especially in the context of cities facing massive urbanization. The scarcity of space obliges developers to design and plan more efficient buildings, requiring an adapted infrastructure.
- The concept of a circular economy is creating new opportunities to upcycle and move away from landfills and wasting resources.
- The engineering and construction industry needs to bridge and respond to smart cities' needs, pivoting on the opportunities offered by innovation and new data-processing tools, in the context of a hyperconnected world.
- Policy-makers must take ownership of the challenges and issues arising from the densification of cities, since citizens will increasingly expect that this densification is being effectively addressed.
- Participants also considered the impact of oil's price development on real estate, Japan's ageing population, the capabilities needed to implement the circular economy, the challenges created by demographic trends and the need for standardization of projects globally.

Mining & Metals Industry

Sutton Suite, Waldorf Astoria Hotel,
New York, 21 October 16.30 - 17.30

Description

Drawing on the discussions in the Mining & Metals industry transformation and cross-industry sessions, participants identified the most significant trends. This integrated the views on critical factors and impacts within and across industries, while highlighting intersecting points in value chains.

Participants also discussed how the industry's strategic priorities would contribute to framing the Governors Meetings at the World Economic Forum Annual Meeting 2015.

Moderated by

Gillian Davidson, Director, Head of Mining & Metals Industry, World Economic Forum

Discussion Leaders

Stephen D'Esposito III, President, RESOLVE, USA; Chair, Industry Agenda Council on the Future of Mining & Metals
Lisa Sachs, Director, Columbia Center on Sustainable Investment, Columbia University, USA; Industry Agenda Council on the Future of Mining & Metals

Key Points

- Mining and metals companies need to position themselves as "development partners". There is a growing need to work closely with all stakeholders and make them a part of the business strategy.
- China will play a prominent role as a major transformer in mining and metals – as, for example, an investor, producer, consumer and regulator.
- Geopolitics was identified as an additional core dimension of the mining and metals transformation map; geopolitical instability can lead to a supply-demand imbalance, and alternatives will need to be explored.
- Global financial/market disruptors will continue to influence access to capital.
- Consumers are increasingly sharing and repurposing things like cars, so in the future there will be less demand for them. This should free up some of their money to spend on other things. This won't cause supply chains to disappear, but they will have to be more flexible. They will have to adapt to be able to deliver the things consumers are not buying now.

Synopsis

- A critical factor for future success in the mining and metals industry is partnership with communities and other stakeholders. Labour, union and community instabilities can have large-scale impact, and in some cases threaten business survival; they need to be seen as part of the solution rather than the problem.

Businesses will need to empower people and bridge existing gaps to drive profits and minimize risks. For example, partnership with environmental NGOs could open up opportunities presented by “go zones”.

- Technological trends like using waste for 3D printing, when applied to the mining and metals industry, could have significant impact. For example, it could help replace the current process of briquetting in the steel industry.
- Many small towns owe their existence to the mining and metals industry. The decision by some companies to reduce their operations can have a significant – and sometimes catastrophic – impact at the local level. The industry will need to find novel ways of creating alternative employment opportunities and must support the development of appropriate delivery systems. This would also help build trust and reduce risk.
- Collaboration is key. One company from the industry collaborated with local government to set up a microfinance company to support small and medium-sized enterprises. When it had to lay off people during the crisis, the unemployment rate in the region was not affected.
- While artisanal and small-scale mining is an important issue, it is more relevant to precious metals than to bulk commodities.
- Downstream industries are increasingly seeking stability of supply, and this could become a major factor with some sectors, such as automobiles. Supply security is an important issue in this sector, and the mining and metals industry must ensure consistency as a key-input raw material supplier.
- Transparency across supply chains, as well as transparency in contracts and payment flows, among others, will continue to gain significance. New models of transparency are likely to emerge, and mining and metals companies must adapt accordingly.

- As the industry undergoes gradual transformation, new skills will be required to address the change. A shortage of skills, especially technical ones, is likely to occur as the industry transitions to more automation.
- Industry reputation will need to be effectively managed. Leveraging downstream partners can help to change perceptions and thus improve the industry’s image.
- The mining and metals industry needs to be ready for step changes. The pace of change in other sectors is different, and the industry will have to synchronize with those transformations to remain relevant.



02



01

01: Mining and Metals partners at the agenda-setting session
02: Jason Pau, Director, Global Government Affairs and Business Development Alcoa Inc. USA, addresses the group

Chemistry & Advanced Materials Industries

Starlight Roof-North Terrace, Waldorf Astoria Hotel, New York, 21 October 16.30 - 17.30

Description

Based on discussions from industry transformation as well as cross-industry sessions, a comprehensive outline of the most significant transformational trends was prepared. Participants reported back from all relevant sessions and discussed different viewpoints. Important factors and critical impacts within and across industries were assessed.

Moreover, participants assessed which strategic priorities identified during this meeting would contribute to framing the Governors Meetings at the World Economic Forum Annual Meeting 2015.

Opening remarks by
Andrew J. Hagan, Director, Head of Chemistry and Advanced Materials, World Economic Forum

Discussion Leaders
Jeffrey Carbeck, Co-Founder and Chief Technology Officer, MC10, USA; Industry Agenda Council on the Future of Chemistry, Advanced Materials and Biotechnology; Meta-Council on Emerging Technologies
Bernard Meyerson, Chief Innovation Officer, IBM Corporation, USA; Chair, Meta-Council on Emerging Technologies
Thierry Sueur, Vice-President, European and International Affairs, Air Liquide, France

Moderated by
Dmitry Kolobov, Director, Corporate Strategy, Sibur, Russian Federation



Key Points

- The Forum’s community on chemicals and advanced materials is addressing critical industry issues such as feedstock security, emerging technologies and talent acquisition. Additional topics raised will be included in the Forum’s workstreams.
- Cross-industry sessions are highly relevant for the community, as it is a classic business-to-business industry.
- Advanced materials systems are critical for the chemicals industry, and will be discussed as part of the Governors Meeting for Chemistry and Advanced Materials at the Forum’s Annual Meeting 2015.
- Feedstocks such as natural gas, biomass and petroleum are highly relevant for the competitiveness of the industry, and the strategic input from the work of the Forum’s team is critical and appreciated.
- Nutrition systems are growing in importance and are a strategic focus for many in the industry. Therefore, the new project within the Forum’s group will create value for the partners of the Chemistry and Advanced Materials community.

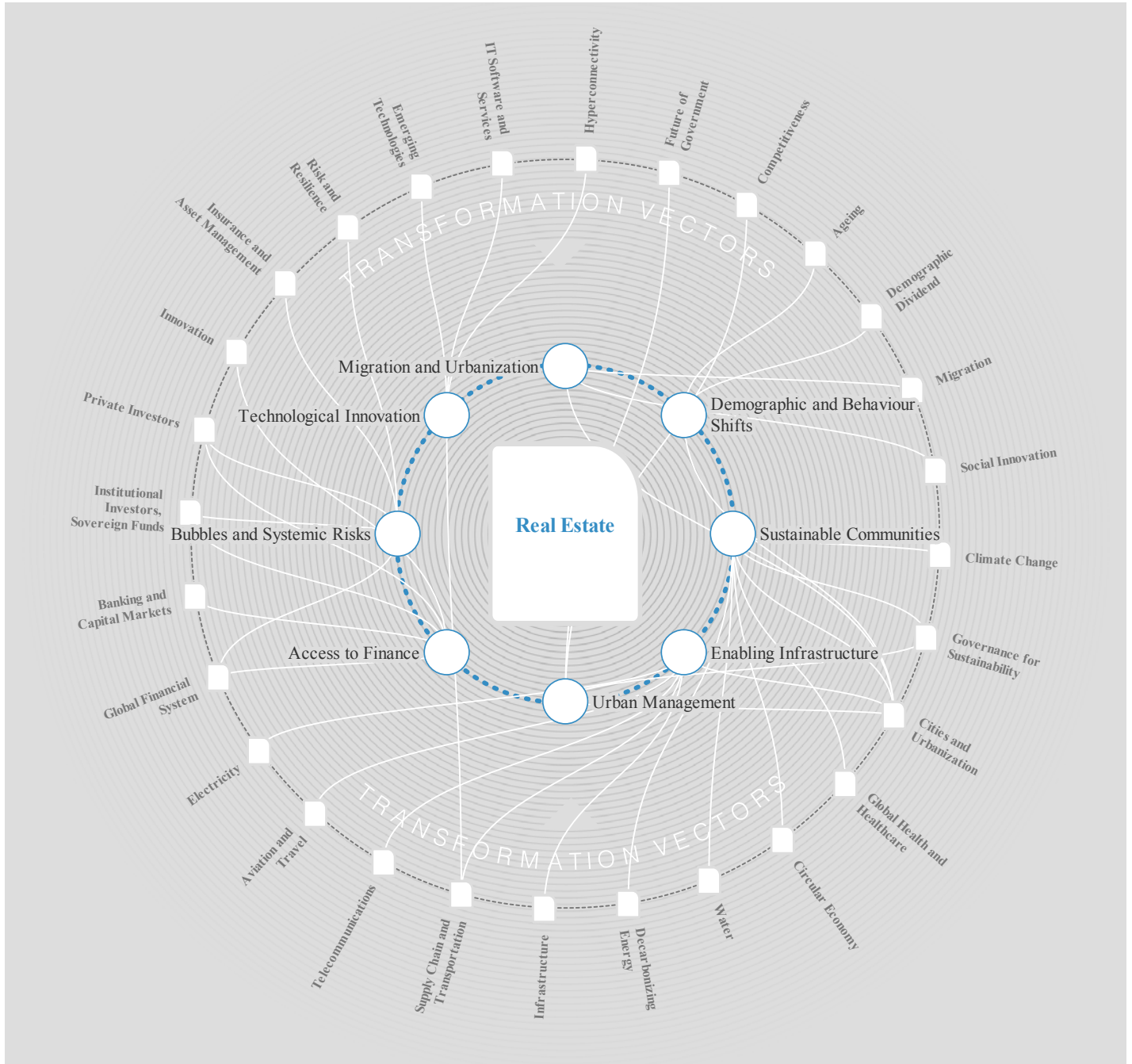
Synopsis

- The strategy officers have expressed great interest in Chemistry and Advanced Materials’ current projects.
- Cross-industry collaboration is critical for the industry, and current workstreams are aligned with this need.
- The Strategy Officers community will review projects on an ongoing basis and provide input on future needs.
- This strategic steering will be based on regular issue surveys, the new transformation mapping process as well as the Governors calls.
- New projects on feedstocks, nutrition systems, biotechnology ecospheres and advanced materials systems have the go-ahead of the Strategy Officers community.

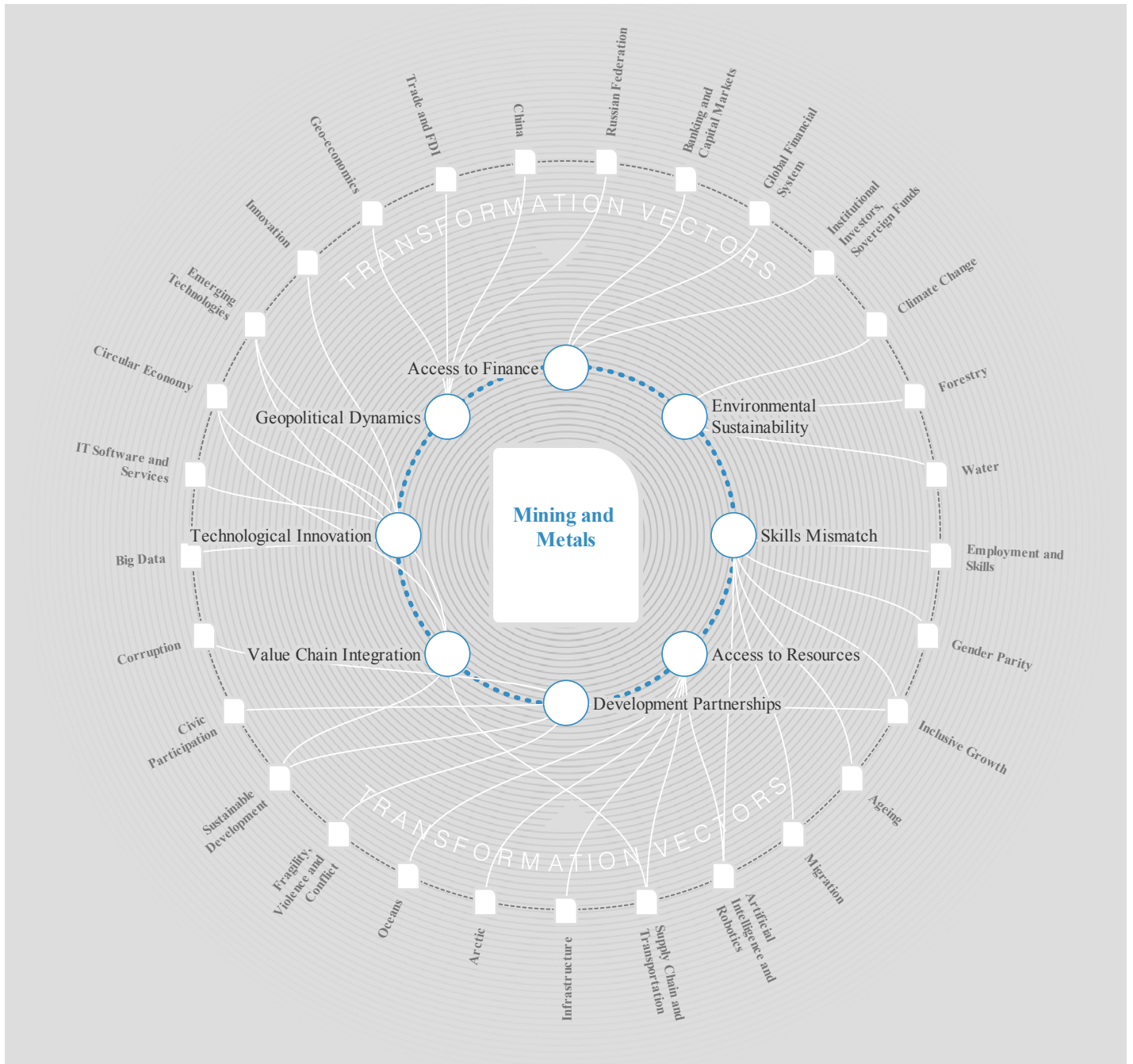
01: From left: Annegrethe Sylvest Jakobsen, Shinichi Koizumi, Kiyoshi Matsuda and Axel Vassen

02: Standing, from left: Dmitry Kolobov, Jeffrey Carbeck and Andrew Hagan

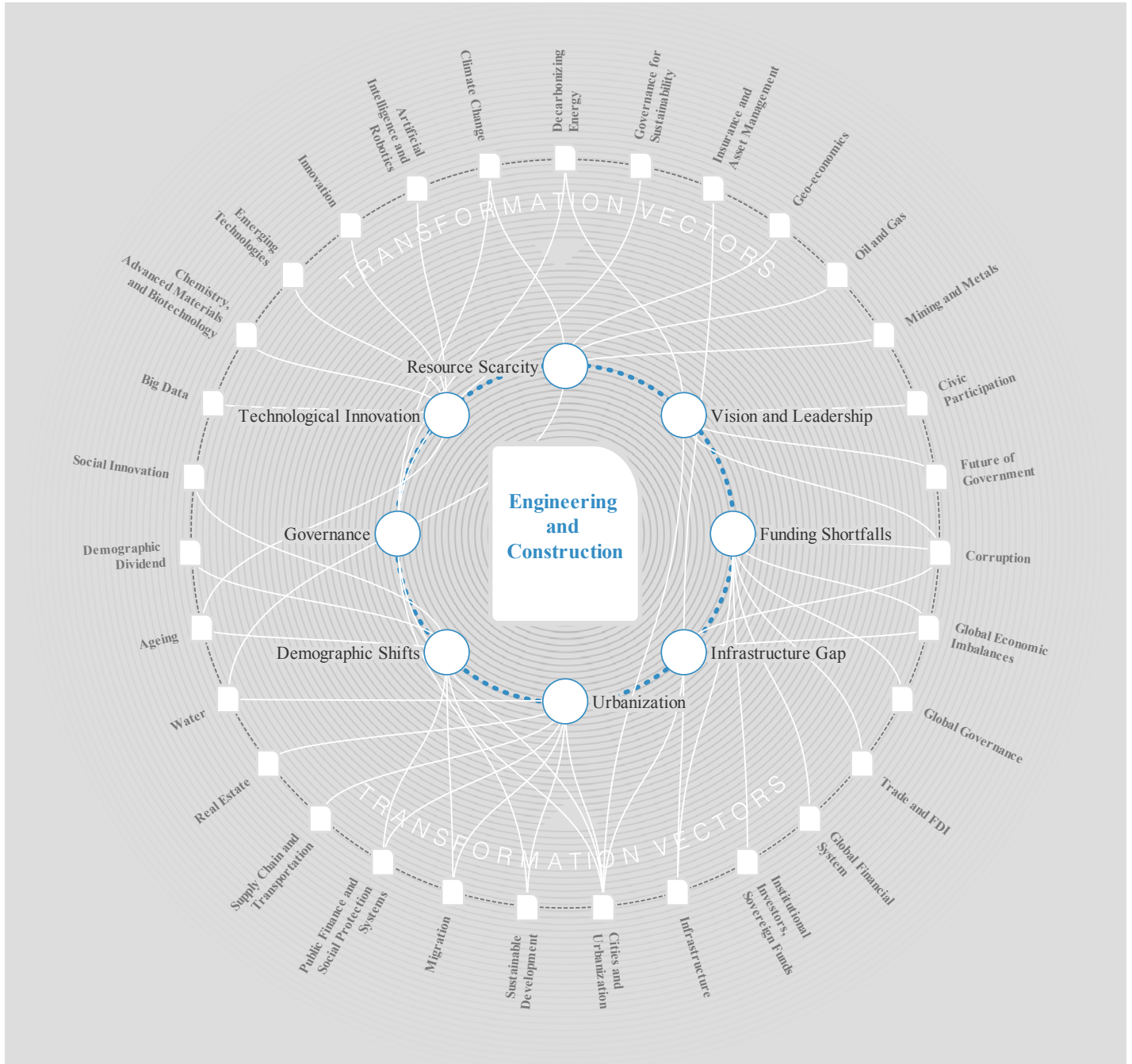
Transformation Maps: Real Estate



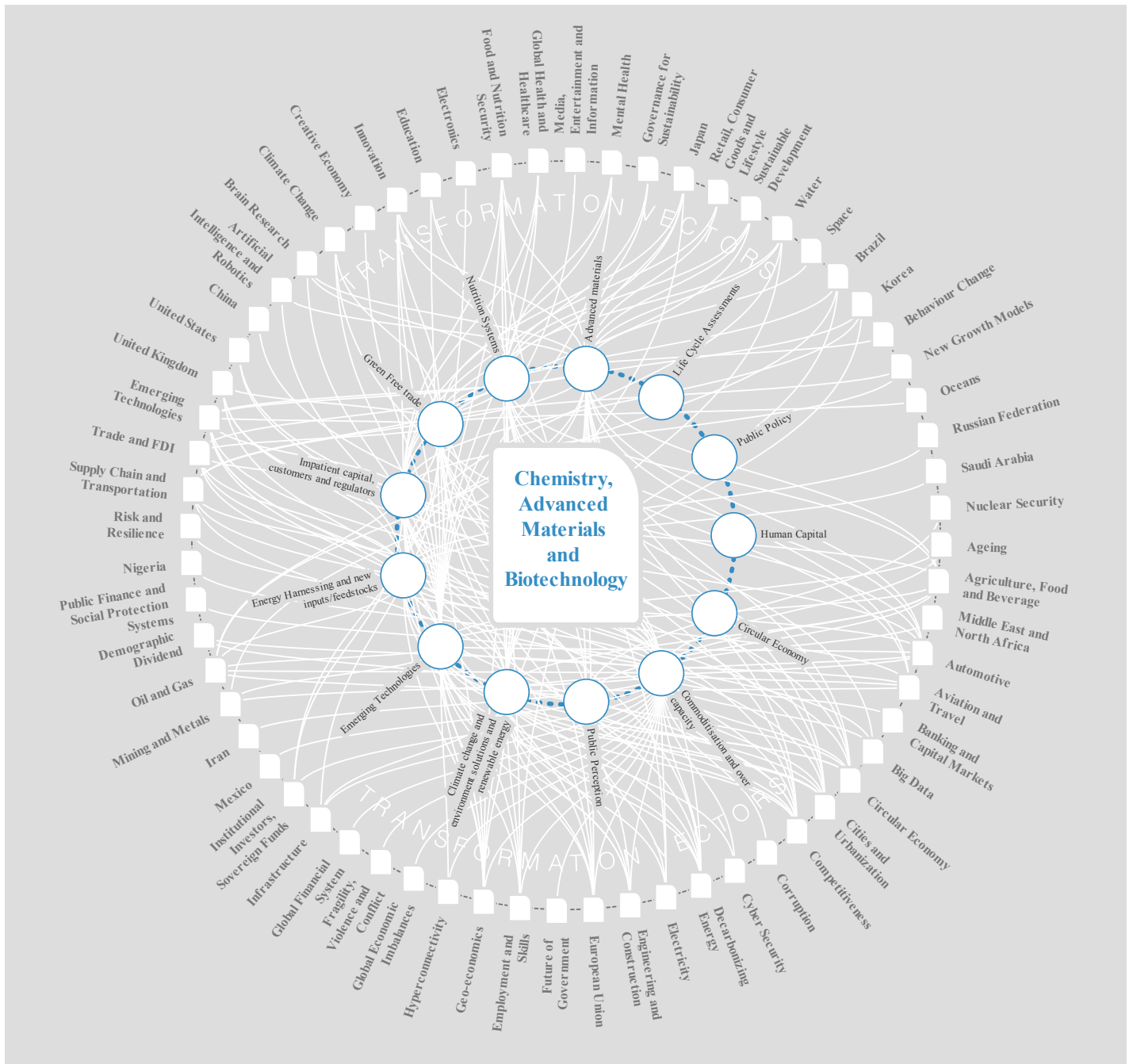
Transformation Maps: Mining and Metals



Transformation Maps: Engineering and Construction



Transformation Maps: Chemistry, Advanced Materials and Biotechnology



List of Participants

Infrastructure & Urban Development Partners

Virginia Requiell Matas	Office Adviser to the Chief Executive Officer	Acciona SA	Spain
John M. Beck	Executive Chairman	Aecon Group Inc.	Canada
Jeff Reilly	Group President, Strategy and Business Development	AMEC Plc	USA
Fiona Cousins	Member of the Americas Board and Head, Sustainability and Mechanical Engineering	Arup Group Ltd	USA
Leon Der-Ohannessian	General Manager, Contracts	Consolidated Contractors International Company	United Arab Emirates
Riad Kiwan	Managing Director	Construction Products Holding Company (CPC)	Saudi Arabia
Fleming Voetmann	Head, Public Affairs and Leadership Communication	Danfoss A/S	Denmark
Roger Smith	Senior Director, Corporate Strategy	Fluor Corporation	USA
Darcy Anderson	Vice-Chairman	Hillwood	USA
Charles Doyle	Chief Marketing and Communications Officer	JLL	United Kingdom
Scot Wrighton	City Manager	Lavasa Corporation Limited	India
Daizo Motoyoshi	Executive Director, External Affairs; Secretary, Global Management Committee	LIXIL Group Corporation	USA
Barry M. Gosin	Chief Executive Officer	Newmark Grubb Knight Frank	USA
Erik Flinck	Head, Group Strategy	Sandvik AB	Sweden
Erik Ryan	Executive Vice-President, Communications, Marketing and Strategy	SNC-Lavalin Group Inc.	Canada
Michael Berkowitz	Managing Director, 100 Resilient Cities	The Rockefeller Foundation	USA
John M. Mandyck	Chief Sustainability Officer, Building & Industrial Systems	United Technologies Corporation	USA
Laurent Auguste	Executive Vice-President, Innovation and Markets	Veolia Environnement	France
Hor Wuen Fung	Global Director, Corporate Marketing and Communication	Weatherford International Inc.	USA
Shyam Pattabiraman	Strategy Officer	Welspun Energy Pvt. Ltd	India
Jeff Herriman	Group Director, Corporate Development	WS Atkins plc	United Kingdom

Global Agenda Council and Experts

Jerry Hultin	Senior Presidential Fellow	New York University	USA
Aaron B. Schwarz	Principal and Executive Director	Perkins Eastman	USA
Tom Szaky	Founder and Chief Executive; Social Entrepreneur	TerraCycle	USA

Industry Guests

Niels Lund	Vice-President, Corporate Public Affairs	Novo Nordisk	Denmark
Hans Ristner	Senior Vice-President, Business Development	Volvo	Sweden

From the World Economic Forum

Alex Wong	Senior Director, Head of the Centre for Global Industries; Head of Basic & Infrastructure Industries	World Economic Forum
Pedro Rodrigues de Almeida	Director, Head of Infrastructure & Urban Development Industries	World Economic Forum
Michael Buehler	Associate Director, Head of Real Estate	World Economic Forum
Alice Charles	Senior Manager, Head of Urban Development	World Economic Forum
Pablo Izquierdo	Community Manager, Infrastructure & Urban Development Industries	World Economic Forum

Chemicals Industry Partners

Thierry Sueur	Vice-President, European and International Affairs	Air Liquide SA	France
Rosemary O'Brien	Vice-President, Public Affairs	CF Industries Holdings Inc.	USA
Alan Hiltner	Executive Vice-President	GranBio Investimentos SA	Brazil
Peter Florenz	Vice-President, Global Affairs	Henkel	Germany
Axel Vassen	Head, Public Affairs and Strategic Initiatives	LANXESS AG	Germany
Kiyoshi Matsuda	Chief Innovation Officer, Corporate Strategy Office	Mitsubishi Chemical Holdings Corporation	Japan
Annegrethe Sylvest Jakobsen	Head, Public Affairs	Novozymes A/S	Denmark
Sergei Sereda	First Deputy Chief Executive Officer	OJSC PhosAgro	Russian Federation
Dmitry Kolobov	Director, Corporate Strategy	Sibur LLC	Russian Federation
Louis A. Vega	Chief of Staff and Global Director, Office of the Chairman and Chief Executive Officer	The Dow Chemical Company	USA
Shinichi Koizumi	Senior Adviser to the Chairman	Toray Industries Inc.	Japan

Global Agenda Council and Experts

Bernard Meyerson	Chief Innovation Officer; Chair, Meta-Council on Emerging Technologies	IBM Corporation	USA
Jeffrey Carbeck	Co-Founder and Chief Technology Officer; Industry Agenda Council on the Future of Chemistry, Advanced Materials and Biotechnology; Meta-Council on Emerging Technologies	MC10 Inc.	USA

From the World Economic Forum

Alex Wong	Senior Director, Head of the Centre for Global Industries; Head of Basic & Infrastructure Industries	World Economic Forum
Andrew J. Hagan	Director, Head of Chemistry and Advanced Materials	World Economic Forum
Tatiana Babakina	Associate Director, Chemistry and Advanced Materials	World Economic Forum
Oliver Inderwildi	Senior Manager, Chemistry and Advanced Materials	World Economic Forum

Mining & Metals Industry Partners

Andries Jacobus Wilkens	Executive Director, Growth and Strategic Development	African Rainbow Minerals	South Africa
Jason Pau	Director, Global Government Affairs and Business Development	Alcoa Inc.	USA
Madhu Vuppuluri	President and Chief Executive Officer	Essar Americas	USA
Mehdi Barkhordar	Managing Director	PAMP SA	Switzerland
Semyon Vavilov	Vice-President, Strategy and Business Development, Asia	Severstal	Russian Federation

Global Agenda Council and Experts

Ron Gonen	Co-Founder and Managing Partner	Closed Loop Fund	USA
Lisa Sachs	Director; Co-Chair, Industry Agenda Council on the Future of Mining & Metals	Columbia Center on Sustainable Investment	USA
Iftikhar Nasir	Co-Founder	Inaverve	United Kingdom
Duncan Wood	Director; Industry Agenda Council on the Future of Oil & Gas	Mexico Institute, Woodrow Wilson International Center for Scholars	USA
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