



# DELIVERING TOMORROW

Logistics 2050  
A Scenario Study





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A Scenario Study**

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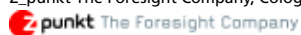
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“To expect the unexpected shows a thoroughly  
modern intellect.”

*Oscar Wilde, 1854 – 1900*

*Irish poet, novelist, and playwright*

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# Impressions

Five Visions of the Future







# Introduction



Dear Reader,

How does one shed light into the black box we call the future? Today's complex economic and political landscape renders accurate forecasts virtually impossible. In our volatile and connected world, traditional, linear forms of analysis have repeatedly proven wrong. They, alone, simply aren't enough to help us anticipate and prepare for change.

In the search for robust strategies, we need to widen our perspective, think in alternatives and consider different paths leading into different futures. With this in mind, Deutsche Post DHL, the world's leading mail and logistics Group, has prepared another issue of our pioneering "Delivering Tomorrow" series: namely, a scenario study on "Logistics 2050." This latest publication presents five far-ranging, at times even radical visions of life in the year 2050 and their implications for the logistics industry.

It is important to keep in mind, however, that none of these scenarios reflects our definite view of how the future will, in fact, develop. But knowing our limits should not prevent us from stretching our imagination and considering what might transpire.

The scenarios were derived by observing the key influencing forces around us, such as trade and consumption patterns, technological developments or climate change and considering how they drive behaviors and shape values. This exercise helps us plausibly sketch out different shapes that our future could take. By covering a comprehensive spectrum in the "space of future possibilities," such

alternative visions help us to sense a shifting environment much better than any extrapolation of isolated trends could do.

However, assessing the future is a complex and multi-faceted undertaking. That's why we have invited renowned academics and distinguished experts from a variety of fields and disciplines to provide valuable insights for the scenarios. We have asked them to share their views and analysis of the trends most likely to influence the world and our industry in the years to come, including any relevant economic, societal, political, technological or environmental ramifications. This valuable input formed a sound basis for the creation of our five future scenarios.

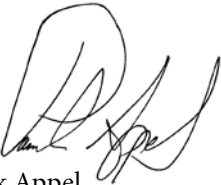
Aside from the scenarios, we have also included a variety of thought-provoking essays from distinguished contributors. These external and internal perspectives cover a broad spectrum of themes connected with the future. We hope they will enrich the panorama of future topics contained in this issue and provide additional food for thought.

Numerous people – both externally and within Deutsche Post DHL – have contributed their time, expertise and energy and have added great value to this project. I would like to thank everyone involved for these important contributions which made this publication possible. There is no question in my mind that it was worth all the effort: As the pace of change seems to have increased in the past decades, it is more important than ever to stay prepared for the unforeseeable – not only in our industry, but in any business.

With this in mind, I invite you to join us on this journey into the future. Pack your virtual suitcase and explore life in five vastly different worlds. Some scenarios may surprise or even astonish you at first. Nonetheless, I trust you will return with a broadened perspective.

Finally, let us know if our study made an impact on you or your organization. Feedback is welcome and encouraged.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Frank Appel', with a stylized, flowing script.

Frank Appel  
CEO Deutsche Post DHL

# Executive Summary

## Inception

### *On Looking into the Future and Scenario Planning*

This study starts with two essays laying the groundwork for the very idea of futures studies and future scenario forecasting. The first, by renowned futurist from the University of Hawaii, Professor James Allen Dator, introduces the discipline. In the second, respected futurist and business strategist Peter Schwartz describes the scenario planning context, process and application for business and policymakers.

Professor Dator, Director of the Hawaii Research Center for Futures Studies at University of Hawaii at Manoa, sketches the historic context and rationale behind futures studies. He argues that, before strategic plans are formulated, organizations should engage in alternative futures forecasting. Strategies and plans based on a preferred future, after having considered a wide range of alternatives, are typically more robust. Few organizations or govern-

ments, however, routinely engage in futures research and so are largely unprepared for the challenges and opportunities ahead.

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*Scenarios allow new strategies to emerge and existing ones to be tested, improving the quality of strategic thinking.*

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For renowned futurist and business strategist Peter Schwartz of Monitor's Global Business Network (GBN), uncertainty is the "new normal" in today's fast-changing times. Scenario planning has emerged as a proven approach to navigating through this uncertainty. Scenarios allow new strategies to emerge and existing

ones to be tested, improving the quality of strategic thinking. They enhance an organization’s ability to respond and adapt to change and enable leaders to make decisions with insight, clarity, and confidence.

**Imagination**

*The Project and Expertise*

This study aims to foster a dialogue about the future of logistics by describing a number of different scenarios, or pictures of the world, in 2050. The Deutsche Post DHL “Logistics 2050” scenario process was designed and conducted by experts from Z\_punkt The Foresight Company. The scenarios were developed based on input from internal logistics experts of Deutsche Post DHL and renowned external experts from diverse fields.

The experts included high-ranking representatives from organizations like the International Energy Agency (IEA), The World Economic Forum (WEF), Volvo Technology Corporation, the Rocky Mountain Institute, Copenhagen Institute for Futures Studies, World Business Council for Sustainable Development (WBCSD), Fraunhofer-Institute for Material Flow and Logistics (IML), and Greenpeace International.

Participating academics came from Istanbul University, University of Erlangen-Nuremberg, Germany, Polytechnic Institute of New York University, Hong Kong University of Science & Technology, Freie Universität Berlin, MIT Center for Transportation and Logistics, and Jacobs University Bremen. And, of course, top executives and senior managers from across the Deutsche Post DHL divisions shared their insights and expertise.

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*Each of the five different scenarios presented for the world in 2050 posits a future driven by a particular series of developments over the ensuing four decades.*

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*The Futures*

There are five different scenarios presented for the world in 2050, each positing a future driven by a particular series of developments over the ensuing four decades.

**SCENARIO 1, UNTAMED ECONOMY – IMPENDING COLLAPSE**, looks at a world characterized by unchecked materialism and consumption, fed by the paradigm of quantitative growth and the rejection of sustainable development. Global trade has flourished through elimination of trade barriers. Global economic power has shifted to Asia and the formerly “emerging” countries have surpassed the West. A global transportation supergrid ensures rapid exchange of goods between centers of consumption.

This untamed economy, propelled by unsustainable lifestyles and uncontrolled exploitation of natural resources, carries the seeds of its own demise: as massive climate change inches closer, natural disasters occur more often and disrupt supply chains frequently.

The implications for the logistics industry include a massive increase in the demand for logistics and transport services.

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*A world characterized by unchecked materialism and consumption.*

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Companies even outsource production processes to logistics companies. While climate change opened up shorter and more efficient trade corridors through the Arctic ice, an increase in extreme weather events

interrupts trade routes on a frequent basis and raises capital costs for logistics companies.

**SCENARIO 2, MEGA-EFFICIENCY IN MEGACITIES**, describes a world in which megacities are both the main drivers and beneficiaries of a paradigm shift towards green growth. To overcome the challenges of expanding urban structures, such as congestion and emissions, megacities have become collaboration champions, fostering open trade and global governance models in partnership with supra-national institutions. Rural regions have been left behind and the nation-state has become a second-tier actor.

Robotics has revolutionized the world of production and services. Consumers have switched from product ownership to rent-and-use consumption. Highly efficient traffic concepts, including underground cargo transport and new solutions for public transport, have relieved congestion. Zero-emission automated plants have helped to cut carbon emissions. A global supergrid with mega

transporters, including trucks, ships and aircraft, as well as space transporters, has opened important trade connections between the megacities of the world.

The logistics industry is entrusted to run city logistics, utilities, as well as system services for airports, hospitals, shopping malls and construction sites, along with part of the public transport infrastructure. It also manages the complex logistics planning and operations for advanced manufacturing tasks. In response to “dematerialization” of consumption, logistics companies offer an array of renting and sharing services, as well as secure data transfer. Thus, advanced logistics services not only encompass the fast and reliable delivery of goods, but also the safe transfer of information and knowledge.

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*A world in which megacities are both the main drivers and beneficiaries of a paradigm shift towards green growth.*

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**SCENARIO 3, CUSTOMIZED LIFESTYLES**, describes a world where individualization and personalized consumption are pervasive. Consumers are empowered to create, design and innovate their own products. This leads to a rise in regional trade streams, with only raw materials and data still flowing globally. Customization and regional production are complemented by decentralized energy systems and infrastructure.

The new production technologies like 3D printers accelerate the customization trend and allow developing countries to leapfrog classical industrial production patterns. However, the extensive production of personalized products has increased energy and raw materials consumption overall, resulting in a global climate on course to a 3.5°C temperature increase by the end of the century.

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*A world where individualization and personalized consumption are pervasive.*

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The implications for logistics include a vastly reduced need for long-distance transportation of final and semi-final goods due to the localization of value chains. At the same time, logistics providers organize the entire physical value chains. They also handle the encrypted data streams required for the transmission of construction and design blueprints for 3D printers, and have expanded into the online fabbing market. The decentralized organization of production turns strong regional logistics capabilities and a high-quality last-mile network into important success factors.

**SCENARIO 4, PARALYZING PROTECTIONISM**, describes a world where, triggered by economic hardship, excessive nationalism and protectionist barriers, globalization has been reversed. Resources

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*A world where, triggered by economic hardship, excessive nationalism and protectionist barriers, globalization has been reversed.*

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are scarce, technological development is lagging and economies are in decline. High energy prices and dramatic scarcities lead to international conflicts over resource deposits. Under these circumstances, scant effort is made to reduce

greenhouse gas emissions and the world climate is on the path to a 3.5° C temperature increase by the end of the century.

Implications for the logistics industry include challenges posed by the decline in world trade and the resulting regionalization of supply chains. Governments view logistics as a strategic industry. As relations between some blocs and countries are extremely strained, logistics providers in bloc-free countries act as intermediaries in international trade brokerage. The growing complexity and length of the customs clearing process increases demand for specialized customs brokerage and consulting services.

**SCENARIO 5, GLOBAL RESILIENCE – LOCAL ADAPTATION**, describes a world initially characterized by a high level of consumption thanks to cheap, automated production. However, due to accelerated climate change, frequent catastrophes disrupt supply chains

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*A world shifting away from efficiency maximization to vulnerability mitigation and resilience.*

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and lean production structures, resulting in repeated supply failures for all kinds of goods. The new economic paradigm is distinguished by a shift away from efficiency maximization to vulnerability mitigation and resilience. This radical move to-

wards redundant systems of production and a change from global to regionalized supply chains allows the global economy to better weather troubling times.

The resilient world in 2050, with regionalized trade, relies on a logistics sector that ensures supply security as a top priority, with backup infrastructure to guarantee reliable transport in unstable and hazardous times. However, such extensive backup systems are asset-heavy and conflict with the aim of carbon reduction. To counter this effect and balance energy efficiency and supply chain resilience, sophisticated logistics planning is used to achieve high capacity utilization. In addition, instead of complex just-in-time delivery processes, huge warehouse structures located close to the manufacturer are seen as indispensable buffers.



## Issues

### *Secure Communications*

Jürgen Gerdes, member of the Deutsche Post DHL Board of Management responsible for MAIL, suggests that ensuring its customers' trust, including through secure communications, has always been at the core of Deutsche Post DHL's business model. Guaranteeing the identity of the sender and recipient and the inviolability of the contents of the message is also the rationale behind its E-Postbrief secure electronic post product. This and other efforts the company is making to help safeguard the Internet will likely transform the company by 2050.

### *Sustained Prosperity in Asia*

Jerry Hsu, CEO, DHL Express, Asia Pacific and a member of the DHL Express Global Management Board, believes that the future of the world lies in Asia. The growing depth and sophistication of Asia's economies, coupled with the rapidly increasing number of consumers in the region, is good news for DHL. As large Asian businesses grow and evolve in the future, DHL will continue to be there to meet their needs. However, the real growth opportunity is with small and medium enterprises. For this market, especially, the local touch and serving its customers in accordance with local customs and business practices is paramount to future success.

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*The future is Asia.*

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### *A Bright Future for Africa*

Amadou Diallo, CEO Freight at DHL Global Forwarding, Freight and an expert on the forwarding business in Africa and South Asia Pacific, reflects on the future of Africa. He draws on his own experience to illustrate both the formidable challenges that confront this vast continent and the tremendous opportunities that await it. DHL has long understood how important its services are to the competitiveness of the African economy, as the only logistics company operating in every country on the continent, for the last 30 years. As DHL is equally present in all other geographies of the globe, it is best placed to connect Africa to the world.

## Security in the 21st Century

Herfried Münkler, Professor of Political Theory at the Institute of Social Sciences, Humboldt University of Berlin, addresses the question of security in the 21st century. As the forces of social and

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*The transition to renewable energies is already taking place.*

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technological evolution weaken the conventional security regime, new forms of security will be called for, including privatization of security in certain areas. New gray areas will emerge and the new provid-

ers of security as a privatized good will inevitably feel the need to expand their business models and find ways to spark unrest and foster instability.

## Renewable Energies

Professor Klaus Töpfer, founding Director and current Executive Director of the Institute for Advanced Sustainability Studies (IASS), based in Potsdam, shares his thoughts on progress towards renewable energies. Both market-based instruments and regulation will be required to achieve emissions reductions, he finds. At the same time, energy markets will be increasingly influenced by renewable energies and energy efficiency in the future. The transition to renewable energies is already taking place and technology in these fields will continue to improve drastically.

## Implications

### Decarbonizing Logistics

Professor Alan McKinnon, Director of the Logistics Research Center at Heriot Watt University in Edinburgh, UK, argues that, to achieve the objective of limiting the increase in average global temperature to within 2° C by 2100, emissions of greenhouse gases (GHG) worldwide will have to be cut by 50% by 2050. This will

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*Demand for logistics services is expected to rise steeply over the next 40 years.*

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necessitate subjecting carbon emissions to much tighter regulations and stronger price mechanisms than today.

The European Commission has set a 60% GHG-reduction target for transport by 2050, but achieving even a modest absolute reduction in total GHG emissions will be hugely challenging for the logistics industry. This is mainly

because demand for logistics services is expected to rise steeply over the next 40 years. The Commission proposes a modal shift from road to rail or water for freight traveling more than 300 kms, though this is fraught with difficulty. A move away from just-in-time manufacturing, a reversal of globalization back to localized sourcing, or clustering of manufacturing capacity in low carbon locations are other prescriptive remedies under debate.

### *Unlocking Global Trade*

Roger Crook, member of the Deutsche Post DHL Board of Management responsible for DHL Global Forwarding, Freight, believes action must be taken to keep global trade on the growth path in coming decades. To move towards a more robust global trade environment, infrastructure bottlenecks must be removed; carbon efficiency of transport improved; levels of supply chain visibility and security raised; customs regulations simplified; and barriers to trade eliminated. Only if governments, businesses and society work together can global trade overcome its current obstacles to growth and accelerate again, unlocking its huge economic benefits.

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*Only if governments, businesses and society work together can global trade accelerate again, unlocking its huge economic benefits.*

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### *Customers' Future Needs*

Rob Siegers, President Global Technology Sector at DHL Customer Solutions & Innovation, outlines how DHL works closely with its top global customers in preparing for the next decade and beyond. Through customer logistics boards, conferences and other forums in which DHL and customers consult, the company listens to their needs. This level of engagement helps DHL understand the major trends that play a role for customers and find solutions for their strategies going forward.

### *Logistics of the Future*

Petra Kiwitt, Executive Vice President of Solutions & Innovation at Deutsche Post DHL, and Steffen Frankenberg, Vice President of Solutions & Innovation, argue that it is vital for logistics service providers to test alternative transport solutions and work continuously to improve supply chain efficiency. To create an environment ripe for ideas and innovation, DHL actively pushes for

progress through Solutions & Innovation. And, through the DHL Innovation Initiative, it works closely with many world-class companies and research institutes to develop and implement game-changing innovations.

## Intelligence

### *Achieving Robust Long-Term Decisions*

Robert Lempert and Dr. Johanna Zmud of RAND explore the question of how to make decisions today about the freight trans-

port sector that are robust enough over a wide range of alternative futures. The authors suggest that scenarios be considered as succinct summaries of the vulnerabilities of proposed policies or plans – as sets of future states of the world in which a proposed policy or plan

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*Scenario planning can help leaders envision the future of logistics and connect these visions to the near-term choices they face today.*

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may fail to meet its goals. Such scenarios could help decision-makers more confidently craft policies and plans that can take advantage of future opportunities, avoid potential risks, and engage diverse stakeholders in the planning process. Scenario planning can help leaders envision the future of logistics and connect these visions to the near-term choices they face today.

### *Corporate Strategy in the Face of Volatility*

Markus Reckling, Executive Vice President for Corporate Development at Deutsche Post DHL, and Dr. Jan Thido Karlshaus, Vice President Strategy & Alliance Development at DHL Supply Chain, suggest that, in this increasingly volatile and complex business climate, the shelf life of corporate strategies and competitive advantage is ever-diminishing. Thus, companies must respond with added strategic agility. This calls for simplification, flexibility and innovation. Only those companies that systematically prepare for change can ensure that the future not only holds challenges and risks, but also opportunities.



# 1 Inception



## On Looking into the Futures

*by Professor James Allen Dator*

It is often said that all humans are futurists. It is certainly true that it is a distinctive human capacity to imagine, plan, and act to turn imagination into reality. But, if humans are futurists, then they also are historians, nurses, psychologists and priests. They have beliefs about the past; they care for the sick; they attribute motives to other people's behavior; and they pray and console. Still, most people find they prefer the judgment of professional historians, nurses, psychologists and priests and seek their opinions. Nonetheless, throughout most of our existence on Earth, humans lived in a world where the past, present, and future were essentially the same. No one asked a child, "What do you want to be when you grow up?" There was simply no choice: you would be what your mother or father were, just as they were like their parents before them. Individual fortunes might vary and for that one might consult a soothsayer or an Oracle at Delphi, but society and social roles generally did not change much from generation to generation. When in doubt about the future, following the ways of the ancestors, as represented in the lives and teachings of living elders, was by far the best thing to do. To innovate was dangerous, strongly discouraged, and scarcely imaginable.

However, a new way of thinking and acting emerged – first in Europe in the 17th, 18th and 19th centuries and, eventually, worldwide – called the scientific-industrial revolution. New lands were discovered with people acting in foreign ways. Telescopes and microscopes allowed us to peer farther and deeper than the human eye could see. New technologies permitted new behaviors.

The future was no longer entirely prefigured by the past. Some people began to imagine utopias – perfect societies – that lay elsewhere on Earth or in space. Science fiction was born. The idea of progress blossomed, and some people began to believe that, every day in every way, their lives were getting better and better, with the lives of their children and grandchildren to be better still.

Modern futures studies (also called futures research, futuristics, futurology, forecasting and strategic foresight) arose during the Second World War from many roots. One consisted of scientists attempting to forecast future military technology and to determine what modes of warfare were most likely to encourage people to surrender and which might encourage them to fight on even more fiercely.

Shortly after the war, sociologists noted that, in the U.S., and later in some other countries in Europe and Japan, most people were no longer working in agriculture or industry. Rather, for the first time, they were engaged in occupations that did not produce anything: in white collar, professional, service, entertainment, sports and other such jobs. Industrial nations were turning into “post-industrial nations,” which eventually were labeled “information societies.”

In retrospect, societies were seen as moving from small, mobile hunting and gathering societies of many tens of thousands years ago, to agricultural societies beginning about 8000 years ago, to industrial societies beginning perhaps 300 years ago, and to information societies, now about 75 years ago. Some would argue today, following the same logic of changing dominant occupations driven by changing technologies, that information societies are transforming into “dream societies,” where performance, attitude, icons, and “meaning” are more important than either information or the physical products which exude those qualities.

If that typology is correct, among other things, it indicates that the rate of social and environmental change is increasing exponentially; that the rate of change itself is increasing.

Many futurists today focus on technology as an agent of social change, adopting as their mantra the statement by the Canadian media theorist, Marshall McLuhan, “We shape our tools, and thereafter our tools shape us.” As different generations are “born into” technologies with which older generations are struggling to cope, societies change, as changing age-cohorts, with significantly differing worldviews, move into positions of power and older cohorts move out.

But, at the same time, other futurists (perhaps also focusing on technology as the causal agent, but coming to differing conclusions about it) are concerned that the biosphere upon which all life depends has become stressed by rapid human population growth and so altered through technologically-augmented human activities that the global climate is changing. They hold that oxygen-producing trees are being cut down; entire species whose existence as well as functions are unknown are being wiped out; oil – only understood to be a valuable resource in the late 19th century – is rapidly depleting with no cheap or abundant replacement in sight (many alternative energy systems have been touted in principle, but none exist that can replace oil in efficiency, abundance, price, or multifunctionality, they feel).

Other futurists focus on war – or rather how to end state-sponsored violence, and create societies based on non-killing. Still others emphasize issues of identity – of women, minorities, indigenous peoples – and patriarchy.

While corporations have always studied markets in order to develop new products ahead of their competitors, and to catch on first to new fads and opportunities, some also engage futurists to help them anticipate changes and continuities in the broader society around them that might impact their bottom line.

Some governments, too, exercise foresight on behalf of their citizens. Among the most surprising has been the development of “judicial foresight” among judiciaries in Common Law areas where judges have considerable responsibility for making public policy when none has yet been made by legislatures. Judges in these parts of the world often find themselves confronted with controversies that deal with cutting-edge technologies or social behaviors that are completely new to them. They find they are, in effect, “applied futurists” for their societies, and so have sought help from futurists in becoming better at it.

Futurists use many methods, based on various theories about what “society” is; how and why it changes, or does not change; what parts change easily and what may not change at all. Some techniques, such as trend analysis and computer modeling, are quantitative, often based on complex theories and systems of linear equations. Some methods, such as Delphi forecasting, combine quantitative and qualitative modes. Others, such as scenario planning, emerging issues analysis, alternative futures forecasting, and age-cohort analysis, are largely qualitative, though based on rigorous theory and data collection and analysis.



Although the terminology is not always used precisely, many futurists agree that the future is no longer predictable in the literal sense of that word (“pre” “dict”: “to say” “before”). It is no longer possible accurately to state what “THE future” “will be.” Instead, futurists forecast alternative futures. A forecast is a logical statement, a contingent statement, an “if...then” statement. Forecasts are not meant to be “truthful” (though, nor are they intended to be “wrong!”). They are meant to be logical and useful – to illustrate a number of possible futures that need to be taken into consideration before acting.

As an applied activity, futures research is related to planning, just as planning is to day-to-day decision-making. Day-to-day decision-makers (administrators) typically make specific decisions on the basis of established strategic plans. Futurists argue that, before strategic plans are formulated, organizations should engage in alternative futures forecasting, and preferred futures envisioning and inventing. Without the prior futures work, plans tend to be based mainly on past experiences, and not on future possibilities. Plans should be based on a preferred future which itself has only been determined after considering a wide range of alternative futures. Such plans, and specific decisions made according to them, typically are more robust than decisions made on plans that are not based on a proper prior futures exercise.

Moreover, because the futures are changing so rapidly, it is advisable that each organization or community have a futures research unit (or engage the continuing services of a futures consulting firm) in order to routinely scan the futures for new threats and opportunities rushing towards them.

Unfortunately, few organizations, and fewer governments, engage in futures research routinely, and so are largely unprepared for the challenges and opportunities lying ahead. Worse, they may engage in a single futures exercise and then stubbornly act on the basis of that single “snapshot” of the future, rather than on a dynamic, continuing monitoring process. Worse still, they may be convinced that they know (typically on the basis of some ideology) what The Future Will Be and thus do not need to consider alternative futures or envision preferred futures at all.

Even though futures studies is not yet well established in academia, there are very successful academic programs in many parts of the world that have been in existence for 20 or 30 years, and more are being created every day. Among the better-known and well-established are at the Universities of Houston and Hawaii in the US; the Turku School of Economics in Finland; Corvinus

University, Budapest, Hungary; Tamkang University, Taiwan; Swinburne University of Technology, and University of the Sunshine Coast, Australia; to name a few. If there is not an academic program near you, you should inquire why not, and seek to establish one. There also are futures studies organizations in most parts of the world. The World Future Society and The World Futures Studies Federation are among the better-known global organizations.

The most important things to take away from all of this are that:

1. THE Future cannot be predicted, but alternative futures can and should be forecast, and preferred futures envisioned and invented, on a continuing basis.
2. In a world where much of futures study is novel and unprecedented, such as is the case today, Dator's Second Law of the Future applies. This states: "Any useful idea about the future should appear to be ridiculous." Remember that and consider it carefully. If a statement said to be about the future makes sense to you, it is probably about the present and therefore not very useful. If it shocks or disgusts you, or seems ridiculous science fiction, it may be about the futures, and hence useful to you.



*James Allen Dator is Professor and Director of the Hawaii Research Center for Futures Studies, Department of Political Science, of the University of Hawaii at Manoa; Co-Chair, Space and Society Division, International Space University, Strasbourg, France; former President, World Futures Studies Federation; Fellow and former member of the Executive Council, World Academy of Art and Science. He also taught at Rikkyo University (Tokyo, for six years), the University of Maryland, Virginia Tech, and the University of Toronto. Professor Dator is a Danforth Fellow, Woodrow Wilson Fellow, and Fulbright Fellow.*

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## **Winning in an Uncertain Future Through Scenario Planning**

*by Peter Schwartz*

It's not hard to make the case today that we face profoundly uncertain times. The magnitude of the economic, political, social, environmental, and technological changes encountered by nearly every organization in the world is unprecedented. Whether it's continued financial volatility in global capital markets, or political upheavals across the Middle East, or technology-driven transformations in industries like media that then reverberate more broadly, uncertainty is the "new normal."

This mounting uncertainty is not an accident of time, but a consequence of how the basic conditions for doing business around the world have changed. Firstly, the speed of everything is accelerating. The best example is how rapidly trading takes place on the financial exchanges. Hundreds of millions of shares are bought and sold every second as computers trigger complex transactions based on decision rules.

Secondly, the scale of interconnection is increasing profoundly, especially in telecommunications. The dense web of Internet connections now provides instantaneous and near-ubiquitous global access to information, which flows to and from everywhere. At the same time, the growth of logistics – aviation and shipping – has produced a physical network that extends worldwide.

All of this has created a system that's incredibly complex, interconnected, and fast – and which generates enormous volatility in

the marketplace. So, what methods can we use to manage that uncertainty? How do we anticipate surprise? How do we see the emerging opportunities and take advantage of them in a timely way? Scenario planning is a proven approach to navigating these rapids, thereby increasing the likelihood that your organization will be one of the winners.

## **Informed Perception**

A fundamental premise of scenario planning is that we make decisions based on perception, not on “the real world.” Perception can be informed by the real world, but it is also shaped by our experiences, interests, knowledge base, capacity for denial, and the communities that we belong to. So, when we make decisions based on an informed set of perceptions, it reflects the mental map that we have about how the world works.

The problem that decision-makers in organizations face, particularly those who are senior and successful, is that they have benefitted from good mental maps. But, given the pace and nature of change, it’s highly likely that the mental maps needed to move forward are different from the maps that worked in the past. Scenario planning plays a critical role in challenging the mental maps that we all have, so that we can foresee surprise and re-perceive what the future might be.

A classic example of the failure to re-perceive is IBM’s introduction of the personal computer. When the Apple II, the Osborne, and the Kaypro began taking off, IBM decided to bring a personal computer to the market. But, because their five-year forecasts estimated sales of only a few hundred thousand machines they chose to limit their investment, using a free operating system from a young entrepreneur named Bill Gates and buying chips from Intel, a relatively new manufacturer. The rest is history. Millions of PCs were sold; Gates became one of the richest men in history; and Intel established a dominant position in the chip industry. IBM ultimately sold its PC business.

What did IBM do wrong? Its decision-makers were certainly intelligent and deeply knowledgeable, but they were also prisoners of their pasts. They imagined that most people would want a mainframe, and that the value of, and demand for, a small, weakly powered personal computer with few applications would be very limited. IBM completely failed to see that consumers wanted control, not power. That’s the kind of missed opportunity that scenario planning is designed to prevent.

## Data-Driven Stories

So, what do we mean by scenarios? Scenarios are rich, data-driven stories about tomorrow that address important choices we have to make now. Good scenarios incorporate rigorous analysis and data, but they are also driven by profound and insightful imagination. They are not about getting the future right, but about making better decisions today. Scenarios are not predictions; they are hypotheses that describe very different possibilities for the future. Good scenarios stretch our thinking and provide a coherent framework that allows us to make sense of the complexity around us, explore possibilities systematically, and push the boundaries of plausibility.

Scenarios are often confused with sensitivity analysis. Most people have an “official future” – what they assume will happen – even if it is not explicit. This usually involves projecting the present into the future, and then considering some variations; for example, how would we fare if sales or energy costs turned out to be 15% worse or 15% better? The problem with sensitivity analysis is that it doesn’t really challenge underlying assumptions, but simply runs one model several times.

Scenarios, in contrast, reflect very different interpretations of reality. They start with the future and come together around the “pre-determined elements” and “critical uncertainties” that will drive meaningful change. What trends do we think are inevitable in all scenarios, and where do we think the major uncertainties lie that will lead to big differences, not marginal changes, in the future? In developing scenarios, it’s also important to understand that all companies operate across three distinct environments: the contextual; transactional; and organizational.

Think about these environments as a bulls-eye comprising three concentric circles. The contextual environment occupies the outer ring and includes the external social, technological, economic, environmental, and political (STEEP) trends that are beyond our control but produce change. The middle level or ring is the more immediate transactional environment – the industry trends, financial markets, competitors, customers, and key stakeholders that shape the direct operational and strategic choices of the business. The inner ring is the organizational environment: the organization’s products and services, human and financial assets, brand, cost structure, design, etc.

The “focal question” that the scenarios are developed to address is often anchored in the organizational domain, such as: Should

we make this new investment? How will our talent needs change in the next 10 years? How do we succeed in this new market? The scenarios, however, start from the “outside in” – looking at the meta-forces driving change and how those interact with industry trends, in order to identify the options and decisions at the organizational level. This contrasts with many planning processes that start “inside” with the organization (its vision and objectives, assets, capabilities) and move outward.

## **Diverse Approach**

Actually creating the scenarios is best done by teams in interactive workshops, with the members ideally drawn from different regions, business units, backgrounds, genders, and ages. Diversity is critical – without it, we’re far less likely to really stretch our thinking. A lot of quantitative and qualitative research in advance is needed to inform the workshops – for example, on economic and demographic trends, energy issues, customer portraits, etc. Sometimes, we take learning journeys to see cutting edge laboratories, business innovations, or emerging social phenomena, or to meet political actors and regulators. But, at the heart of scenario planning is collaborating and learning together as a team.

It can only help to bring in original and provocative thinkers, what we call “remarkable people,” to challenge the conventional wisdom. They may be scientists, social activists, rock stars, writers, inventors, economists or anthropologists. These are not just experts. Although uniquely credible in their own fields, they can play with ideas, “connect the dots,” and generate fresh insights. This contributes both rigor and imagination to the scenarios.

The actual scenario building process can employ several approaches. It may be deductive (i.e., crossing the most important critical uncertainties to create a matrix), or inductive (e.g., starting with the “official future” and then imagining how and why things could unfold very differently), or some combination of the two. But the process is not very important; it’s the quality of the conversation and learning that matters.

So, now that we have some novel, challenging, divergent and plausible scenarios, what do we do with them? Well, we rehearse the future! And, in order to do that, we first need to recognize which scenarios are unfolding in front of us. That’s done by identifying early indicators – the types of events, developments, or breakthroughs that are likely to occur as a particular scenario plays out. Good scenarios help us to organize the weak signals we observe,

understand the cause and effect relationships, and then trigger timely contingency moves.

A great example is the scenario work we did many years ago in Shell on the future of the Soviet Union. One of our scenarios described the breakup of the USSR. The early indicators included the rise of a politician named Mikhail Gorbachev who would adopt Lenin's new economic policy as his ideological foundation. When this occurred in 1985, we were confident that by the end of the decade we'd see the end of Communism, the fall of the Berlin Wall, and the transformation of the Soviet Union.

## **Rehearse the Future**

So we've crafted our scenarios and identified their indicators. Now, it's time to rehearse the future – to figure out what to do in these different worlds. Since we “know” the future that each scenario portrays, we answer the original “focal” question in each of them. What would we have to do – or stop doing to succeed? What are the big risks – and opportunities – in each? In effect, we build an initial plan for each world so that later, we can choose among the options. We also look for robust actions: What would we do in all of the scenarios?

Of course, we don't have to get everything precisely right. In the late 1990s, a global financial services company grew concerned about Y2K and how their critical computer systems might be affected by the “Millennial Bug.” After exploring different scenarios, they established a backup center at a distance from their headquarters. Fortunately, Y2K fizzled. But, 18 months later, on 9/11, terrorists attacked New York. Data centers throughout Manhattan were disrupted and the firm's was destroyed. Because of the backup center, however, they restored service quickly – and importantly, were able to find and communicate with their dispersed staff. Did they get the future right? No. Did they make the right decision? Yes. Their scenarios enabled them to rehearse the highly consequential disruption of their systems and to put in place the appropriate solution. The source of the problem was less relevant than having made the right choice.

Moreover, scenarios are not very useful if they sit on a shelf. They must be kept alive through regular strategic conversations among the leadership and ongoing scanning and monitoring of changes in the environment. Which scenario seems to be playing out? What are the indicators telling us? What anomalies are we seeing that don't fit? From time to time, it's also useful to go back and

revisit the scenarios as new information and developments occur. Nor is the value of scenarios limited to huge, long-term investments or strategic bets, as is often assumed. Scenarios are valuable decision-making tools across many outcomes: identifying innovation opportunities; crafting visions; developing a portfolio of strategic bets for growth; building alignment; redesigning the organization; revising product launches in the face of sudden competitive, regulatory, or economic shifts.

Similarly, scenarios can enhance the quality of insight and decision-making at many points in an organization's strategic planning processes. Scenarios can provide the big picture context to inform critical strategic decisions. They can help business units generate plans within macro scenarios, or look at how particular markets may be affected by global scenarios. Existing strategies can be stress tested against scenarios to adjust the portfolio and develop contingency plans and responses to complex changing conditions, including competitor moves, new technologies, or shifting regulations.

### **Improved Prospects**

In the end, scenarios are really about improving the quality of strategic thinking, conversation, and option generation. The real strategy of an organization emerges out of that ongoing conversation, often informal, that gets ratified in the formal process. Good scenarios continually inform and enhance that conversation. They constructively challenge our thinking so we aren't doomed to denial or blindsided by surprise. They add new knowledge, perspectives, and insights. They build and engage internal and external networks. They allow new strategies to emerge and existing strategies to be tested. They improve our ability to respond and adapt to change. Ultimately, good scenarios enable leaders to make decisions with insight, clarity, and confidence. These leaders – and their organizations – are more likely to win in an uncertain future.





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## 2 Imagination

### The Project

This study aims to foster dialogue about the future of logistics through explorative scenarios of the world in 2050. Scenarios assist in identifying and clarifying strategic objectives and preparing knowledge for decision-makers. Since the focus rests not only on the possible future environment, but also on the implications taken from the scenarios, they are the method of choice for reflections on long-term oriented strategies and policy measures.

The Deutsche Post DHL “Logistics 2050” scenario process was designed and conducted by foresight experts at Z\_punkt The Foresight Company. The scenarios were developed based on input from surveys of internal logistics experts from Deutsche Post DHL along with interviews with renowned experts from diverse fields, and a software-supported consistency filter.

This process included identifying and classifying the influencing factors that determine trends in the environment of logistics, and then, in a series of steps, reducing these to a final list of 14 key factors. These included such parameters as energy price, level of climate change, political stability and the development of world trade, and so on. For each key factor, several future developments are possible, and the next step was to conduct interviews with experts in a variety of fields to develop three to four projections for each factor.

After this, it was necessary to conduct a consistency check and reduce the complexity among the more than 15 million projection bundles generated. Then, five of the identified clusters were

chosen as raw scenarios. In selecting these specific raw scenarios, each projection had to appear at least once in one of the scenarios so that the entire scope of possibilities of future developments would be mirrored in the scenario selection.

The raw scenarios were then discussed in workshops of internal Deutsche Post DHL and external experts who had taken part in the expert interviews. The workshop participants further elaborated the underlying logic of the scenarios, as well as possible paths leading to each scenario. They also delved deeper into the implications for the logistics industry and possible strategic options.







**The Futures****SCENARIO 1: UNTAMED ECONOMY – IMPENDING COLLAPSE***Core Idea*

More than ever, the world in 2050 is driven by materialism: all around the globe, the paradigm of quantitative growth continues to reign supreme, enabling a new level of consumption to cater to the desire for material possessions.

While trade barriers have been lifted and the volume of global trade has multiplied over the past 40 years, all attempts at global agreement on a more sustainable path of economic development have failed, due to weak international governance. While countries formerly known as “emerging and developing economies” powerfully pursued their own agenda, bolstered by decades of economic growth, the West’s prosperity has largely stalled in the wake of efforts to bring down its staggering budget deficits. Consequently, the epicenter of finance, trade and consumption has shifted to the East, and Asian countries dominate a number of international institutions, including a new free trade organization that has sidelined the WTO. Between the first group of countries pursuing their narrow economic self-interest and the second group bound up by political repair work, joint institutional and governance frameworks built on the principle of sustainability had no chance to see the light of the day.

Production has been offshored to the periphery of the Asian consumption centers, to the southern hemisphere and, in part, back to Western countries. A global “supergrid” for transport enhances the speed at which goods are exchanged globally. This untamed economy, propelled by unsustainable lifestyles and the uncontrolled exploitation of natural resources, carries the seeds of its own demise: as massive climate change inches closer, natural disasters frequently disrupt supply chains. Just as deep-sea and Arctic mining have become everyday business, resource extraction has destroyed much of what was left of natural environments around the globe.

*The World in 2050*

**More of the Same, Too Much of the Same**

The world has again grown richer in the first five decades of the 21st century. Average income has increased considerably – however, much more in the dynamic growth markets in Latin America and Asia and less so in those countries formerly called “developed.” As a result, the global income gap has almost closed. In 2050, the economic power of Asia and the economies on the southern hemisphere greatly surpasses that of the traditional OECD countries. Billions more people have meanwhile joined the “global middle class,” shopping for everything their parents and grandparents were never able to afford. Mass consumption has reached a staggering level. For instance, there are more than 4 billion cars congesting the world’s roads and motorways.

“I want it all and I want it now” remains a fashionable sentiment in “old” and “new” developed nations. Consumers who subscribe

to the idea of a sustainable lifestyle remain a minority worldwide. Their main motif is fear: they anticipate that the massive degradation of the environment will negatively impact the quality of life of all.

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*The global expansion of material wealth decreases the global income gap.*

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Rising incomes and consumption opportunities for both the wealthy and the less affluent have softened social tensions. Even migrant workers living in the slums on the city outskirts feel that they are better off. Rising per capita incomes, however, cannot paper over the cracks: income inequality remains a major problem in

many societies. And, environmental problems due to air and water pollution as well as uncontrolled waste disposal make life difficult in many

developing areas. While pockets of outright poverty persist, the effects of accelerating climate change are becoming more severe, causing an increase in migration flows from affected coastal areas.

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*Consumption opportunities for the masses calm social tensions.*

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In many countries, material wealth is found more in private households than in public and urban structures. In developing areas as well as in developed countries, the more affluent gather in closed communities with privately-funded infrastructures which offer more comfort and security than their publicly financed equivalent. Only a few metropolitan centers receive adequate funding to maintain or modernize their infrastructure. But,

SCENARIO 1

generally, governments suffer from the effects of demographic change like falling tax incomes and the financial burdens of an aging society.

While the urban population in many Asian and Latin American second and third-tier cities continues to grow uncontrollably, the number of inhabitants of most of the world’s megacities stagnates as traffic congestion, unsolved waste disposal and choking air pollution pose massive problems.

Mega-Hubs Catering to the World’s Mega-Consumption

Compared to 2011, the volume of world trade has multiplied and the number of participating countries is far higher. Former emerging countries have turned into high-tech locations of global importance and centers of consumption. Low-cost production has shifted to their periphery and to other regions that previously had been economically less relevant.

*Asia is the center of a thriving world trade.*

African nations, for example, are now well integrated into global trade. Companies have become far more specialized, and supply chains are spread all over the globe. With high energy and resource prices, both off-shoring and near-shoring are popular options in a highly dynamic economic environment. Asian companies are major investors in Europe and the U.S., a fact that has heavily influenced business culture.

The logistics industry has benefited tremendously from the steady increase in the movement of parts and goods. Of all transport modes, maritime transport has seen the largest increase. With climate change influencing shipping routes, a number of Arctic routes have become navigable, while ever more extreme weather phenomena impact traditional routes and threaten to do even more so in the future. Long-distance global transport systems are particularly efficient. A “supergrid” covers the entire world: Every economic region has one hub with spokes for global logistics optimized for intermodal transport. Huge international hub-and-spoke systems for global logistics have been growing rapidly and cover all economic regions – only a few secondary regional hubs remain. The design of ports allows for the adaption to new generations of vessels and transporters: Cargo vessels for global transport are far bigger today than they were four decades ago. However, they are not necessarily faster – given the high cost of fuel. Ports are optimized for continuous flows of huge volumes of goods with ring-shipping and highly automated container management.



Dimensions of trailers, containers and pallets are internationally standardized.

Neither enough political will nor sufficient investments could be mobilized to develop renewable energy into a competitive offering – thus, technological breakthroughs have not been achieved.

Accordingly, renewable energy sources have not succeeded in broadly substituting fossil fuels.

Consequently, the demand for conventional fossil fuel is higher than ever. Energy prices have skyrocketed

– since 2010, the oil price has roughly tripled. As most of the easily accessible fossil fuel reserves are depleted by 2050, unconventional deposits are extracted: Tar sands in Canada and shale deposits in Venezuela have become major sources for oil.

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*Economic growth is fuelled by massive resource extraction around the globe.*

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Generally, in 2050, natural resources are extracted in regions where this had not been economically or technically viable 40 years ago. Rare earths, for example, are dug up from deep sea floors. Other metals and minerals are mined in the melting permafrost grounds of Siberia and Canada. Resource extraction has begun even in Greenland and Antarctica: here, mining consortia are melting deep pits into the glacier cap to reach the resource deposits. Such extraction techniques do great harm to the environment, and hardly a week passes without miners dying in accidents.

The economy's hunger for supplies (rather than ecological motives) has turned recycling into a key industry sector. Damaged products are meticulously collected and dismantled. Engineers implement cradle-to-cradle designs wherever feasible. In areas such as wastewater processing, phosphorus and nitrates are recycled and reused. However, savings realized by improved efficiency are offset by consumers' insatiable demand.

## Free Trade, Few Rules

Asia's new economic predominance is also reflected in the world trade regime's balance of power: In the past, emerging and developing countries had often criticized a double standard applied by developed countries when it came to trade, in that they demanded the removal of trade barriers for their high-tech products while retaining barriers for agrarian products from developing areas. Now, former "emerging" countries

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*Asian countries set the terms of the world trade regime.*

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SCENARIO 1

dominate decision-making in international organizations and the liberalization of world trade has advanced in great leaps. The regulatory framework has been internationally harmonized for goods and financial as well as other services, allowing for short-term labor migration.

In most countries, national regulatory policy has achieved a delicate balance of not imposing too many restrictions on the economy while maintaining those elements of regulation that provide the necessary economic stability. Moreover, the majority of governments have privatized most of their countries' assets. Even a large extent of the public road network has passed into the private sector.

Most national transportation and logistics regulations are designed to bolster national budgets or to optimize the bottom lines of private infrastructure owners: they mainly focus on creating revenues. In most countries, the use of highways, for example, is subject to considerable toll fees. All highly developed countries rely on electronic solutions for tolls and customs, significantly facilitating the customs process. In many less developed countries, however, clearing customs means jumping many bureaucratic hurdles.

To increase transport security and provide protection against smuggling and terrorist attacks, randomly selected containers and trucks are scanned with internationally standardized systems. Desire for efficient transport with minimal disruptions, however, outweighs arguments for stricter security checks.

There have been instances of international collaboration to solve problems of a global scale, but these attempts have never led to a formal institutional framework, and states prefer to deal with

*Governments consider raising their countries' material wealth more important than finding solutions to global challenges.*

problems on their own. In fact, a strong competitive spirit dominates the international political climate: Each country considers its own prosperity to be most important regardless of consequences for other nations. While the number and

intensity of international conflicts have remained roughly stable over the last decades, regional clashes have increased as the result of disputes over access to natural resources, food and fresh water. Countries zealously watch over their spheres of interest, vehemently protecting investments abroad.

## Heading for the Climate Crash

The environment has suffered immensely from an economy that is based on mass consumption by 9 billion people. In the constant race for resources, the pollution or even destruction of ecosystems is implicitly accepted. Resource extraction has left scars on all continents and on the ocean floor. In Canada, extraction and processing of oil sands has destroyed wide areas. In the Pacific, deep-sea mining is destabilizing subtly balanced ecosystems. Off Norway's shores, deep-sea oil drilling has gone awry and oil has been spilling from the bottom of the sea for over two years. Antarctic mining operations are threatening what little animal life there is on the icy continent.

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*Resource extraction causes destruction and pollution in environmentally sensitive areas.*

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Greenhouse gas emissions are high and the world is heading for a 6°C increase in temperatures by the end of the century. In most regions, global warming has so far been relatively slow and the effects remained manageable. But now it seems that the pace of increase is becoming more rapid, following an exponential curve. Floods, droughts, storms and other extreme events have already increased noticeably, and will become more frequent in the near future. The rise of sea levels has accelerated and is starting to require massive expenditure on flood protection and other near-shore infrastructures. Experts are discussing the possibility of building new substitute cities further inland. Furthermore, the melting of ice sheets and permafrost soils is set to accelerate climate change even further in coming years.

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*Unchecked greenhouse gas emissions lay the ground for disastrous global warming.*

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## Work Hard, Play Hard

Technological development has been slow and progress was achieved by refinement and diffusion, not through groundbreaking innovations. The Outernet has permeated the infrastructure in all major urban areas worldwide. Goods, vehicles and infrastructures are equipped with enhanced RFID tags (including sensor and memory functionalities) and can thus be identified and located in realtime.

Beyond tracking and tracing, sensors deliver various types of information on the condition of goods at all stages of the supply-chain. The implantation of subcutaneous chips in humans is not

SCENARIO 1

exceptional. Fields such as medicine benefit from the technology, e.g., people’s health status can be monitored in their everyday environment and, if necessary, automatic emergency calls are made or the individual is advised to consult a doctor. This option is very popular in aged societies such as Japan or South Korea, both of which have to take care of their elderly and maintain the productivity of their workforce.

Contactless user interfaces and 3D video conferencing (with touch and smell impressions) in combination with augmented reality technology guide and inform people, resulting in highly efficient working processes as well as a wide array of entertainment options: Sports fans are able to attend their favorite events virtually, experiencing everything as if they were at the venue – with the exception of refreshments from the hot dog stand. Subscriptions for virtual tickets to the 2051 cricket world cup promise to make it the most viewed sports event in history.

Research into new materials technologies has yielded only limited results. Improvements are achieved mainly by further developing and modifying existing materials. In addition to the dearth of technological breakthroughs, the attitude of society towards many new materials remains cautious. Nano-technology is a poster child of this situation: from a purely technological perspective, some progress has been achieved, yet governments have put very strict regulation in place as potential, vague health threats of nano-materials remain unresolved.

*How It Came About –  
Looking Back on Four Decades of Developments*

Old habits die hard, so the saying goes. In particular, those that made you wealthy. Based on the traditional economic growth paradigm, the developed countries had been expanding their material wealth for nearly 200 years by exploiting natural resources and using destructive and polluting methods. With the turn of the millennium, especially in Europe, the political will grew to protect eco-systems, combat climate change and switch production and consumption to a more sustainable path. But real progress in this direction remained slow. By this time, the emerging and many developing countries were increasing their populations’ standard of living following the above paradigm and claimed the right to make the same mistakes the developed countries had made in the

*The world continues to follow the traditional growth paradigm.*

past. Internationally binding agreements, though long fought over, could never be reached.

In the 2010s, the developed countries were struggling with different, more immediate problems: deleveraging excessive public debt, low economic growth rates, and the financial and productivity impacts of aging societies. Yet politicians procrastinated, preferring temporary “quick fix” solutions to courageous, unpopular decisions. Thus, public debt continued to grow while economic and political stability decreased.

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*Advanced economies fall behind as governments delay taking courageous decisions.*

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The long prophesized new economic crunch came about a decade after the global economic crisis of the late 2000s. Threatened with inability to continue paying pensions, unemployment benefits and other entitlements, Europe’s governments yielded to factual constraints and re-purposed funds from climate and environmental protection projects and subsidies for entitlement spending and Keynesian impulse packages. By this time, dreams of sustainable societies were on the back foot in Europe and had become a thing of the past in the United States.

Environmental concerns were gradually pushed aside to foster economic expansion in order to secure the expected standard of living. The emerging countries were hit as well, but less hard. Wary of the developed countries’ problematic political and regulatory framework, they had made their macro-economic choices wisely, deregulating their economies on many levels, while maintaining or introducing regulations that increased the stability of their economies. Moreover, their treasuries were better able to afford tremendous spending packages to boost their economies in times of crisis. While most developed countries struggled for years to recover and reform their economies, the emerging economies maintained robust growth.

Some unexpected consequences accompanied the shift of economic power. Led by China, which had surpassed the U.S. as the largest economy early in the 2020s, a coalition of emerging countries established an institution in competition with the WTO. In the following years, this rival was widely embraced and set up a new framework for world trade accepted by many countries around the globe. Globalization of economic activity continued. In the 2030s, the

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*A new WTO substitute, championed by Asian countries, replaces the old world trade regime.*

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SCENARIO 1

efficiency of world trade was greatly increased by the creation of a global transport “supergrid,” mostly financed by public-private partnerships, which combined highly efficient regional transport hubs and spokes with high-capacity interregional transport routes. While not everyone profited, incomes kept rising for the majority of the world population, especially in the emerging economies. The massive exploitation of resources, however, led to soaring energy prices and the need to develop other sources. Efficiency measures were implemented, of course, but the rebound effects devoured any savings. An energy oligopoly controlled the world fuel market, critical resources were in short supply and the long awaited breakthroughs in nanotechnology failed to materialize time and again.

While the impact of climate change had been initially delayed, it was felt more strongly by the late 2030s: sea levels rose more rapidly and weather conditions became increasingly extreme. Migration flows from the most affected areas increased steadily. But the world seemed stuck in the old ways of increasing material wealth and hungering for energy and new resource deposits. By

*Environmental consequences of greenhouse gas emissions and resource extraction threaten economic stability.*

the mid-2040s, consortia of multi-national companies began to actively melt the glacier cap of Greenland and the Antarctic ice in various places to start mining the resources hidden underneath. Inflamed by these events and the indifference

shown by the world public, ecologically motivated terror groups gained infamy in the 2040s. Now, global warming is on track for a disastrous 6°C temperature increase by 2100, international supply lines are threatened by natural disasters and eco-terrorists, and the world still seems to be unable to move to a more sustainable growth path.

### Key Take-Aways: Implications for the Logistics Industry

- The robust growth of the world economy and global trade entails a massive increase in the demand for logistics and transport services offering rich opportunities for both big and small logistics players. As a result, local heroes as well as global powerhouses are participating in the global logistics market.
 

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*Economic expansion will multiply the market size for logistics, especially benefitting freight forwarding and express.*

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- Freight forwarding, supply chain and express businesses alike benefit from this development. Maritime transport is enjoying the most rapid growth, with air transport as the runner-up, driven by a continuously rising demand for express logistics.
- Manufacturers increasingly outsource their logistics needs, as logistics providers are capable of planning and controlling the respective processes more efficiently.
- OEMs even outsource large parts of their standardized mass production processes and, in many instances, logistics companies are handling the entire manufacturing and/or assembly parts of their value chain.
- In the OECD countries, classic mail has been, to a large extent, replaced by electronic mail solutions. In some Asian economies, rapid development and vastly increasing demand initially led to growing markets for classic commercial letter mail. However, due to the quick diffusion of information and communication technology, they were also replaced by electronic mail solutions.
- The effects of climate change influence value generation in logistics in several respects:
 

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*Climate change impacts value creation in logistics on all levels.*

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  - Firstly, global warming affects trade corridors. Shorter and more efficient trade corridors open up with the melting of Arctic ice. But, an increase in extreme weather events threatens to interrupt trade routes on a frequent basis. Disaster response and contingency planning thus become more important in logistics operations.
  - Secondly, insurance companies and financial markets tighten their risk assessments for logistics companies due to the increased frequency of extreme weather events. Logistics companies face higher capital costs.

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- Due to high energy prices, comparative advantages shift: not only offshoring, but also near-shoring is a common strategy. Large logistics companies lend valuable consulting support to manufacturers in this area.
- Profit margins come under pressure due to high energy and resource prices – due to the fact that not all costs can be passed on to customers
- As the importance of recycling increases as a source of valuable materials, reverse logistics becomes a field of growing importance. Repair and return services also present business opportunities in this environment.
- In advanced economies facing the financial burdens associated with aging societies, public investments into infrastructure are lacking. As privatization of infrastructures is a popular policy measure, some logistics companies start to invest in and even operate parts of the infrastructure.

EFFECTS OF SCENARIO 1

	Untamed Economy – Impending Collapse	Mega-Efficiency in Megacities	Customized Lifestyles	Paralyzing Protectionism	Global Resilience – Local Adaptation
World GDP development	↑	↗	↗	↘	→
Quantity of global flows	↑	↗	↘	↓	↘
Environmental quality	↓	↗	→	↘	→
Regulatory openness	↑	↗	→	↓	→
Classic logistics growth potential	↑	↗	↘	↘	→
New business perspectives for logistics	↘	↗	↗	↘	↗
Transformation intensity for logistics	→	↗	↑	↑	↑









**SCENARIO 2: MEGA-EFFICIENCY IN MEGACITIES***Core Idea*

In 2050, megacities have become the epicenter of social, economic and political development. They are both the main drivers and beneficiaries of a paradigm shift towards green growth. To overcome the challenges of expanding urban structures, such as congestion and emissions, megacities have become collaboration champions, fostering open trade and global governance models in partnership with supranational institutions. While progress and prosperity are fast-paced in these new centers of global culture, rural regions have been left behind – and, in many respects, the nation-state has become more of a second-tier actor.

Far-reaching innovations in information and communications technologies have resulted in a previously unknown degree of automation. Robotics has revolutionized the world of production and service. Manufacturing takes place in large-scale robotized plants nearby the world's huge agglomerations. While gainful employment is at a lower level due to the high degree of automation, one-person companies have sprung up mainly in the service sector, supported by public subsidies such as basic income. Consumers have changed their behavior and switched from product ownership to rent-and-use consumption.

Highly efficient traffic concepts, including underground cargo transport and new solutions for public transport, have relieved congestion. Zero-emission automated plants have helped to cut down carbon emissions. Megacities in some parts of Latin America and Africa still lag behind in their greening process, but by 2050, they are at the point of catching up. A global supergrid with mega transporters, including trucks, ships and aircraft, as well as new space transporters, has opened important trade connections between the megacities of the world.

*The World in 2050***The Global Metropolis**

Worldwide, the majority of the population resides in urban areas, which is also where most economic activity takes place. As populations age in old industrialized economies, urban populations remain more or less stable. Medium to larger cities (with more than 500,000 inhabitants) have become islands of high living standards: they provide a vast array of attractive and easy-to-reach cultural, educational and job offers. Living quarters and urban centers are well guarded. Infrastructures are fully accessible to people with disabilities, making it possible for everyone to move freely. In general, people enjoy good incomes; even a basic income provides everyone with guaranteed minimum revenues.

Second and third-tier cities continue to grow rapidly, especially in Brazil, Mexico, China and India, but also in countries like Vietnam, Indonesia, Egypt, and Nigeria. Principal first-tier cities have reached their limits. Even though the supply of services and educational and cultural offerings in these cities is roughly the same as in Western metropolises, social imbalances remain huge.

The most important source of social tensions, however, is the widening gap between urban and rural areas. While city-dwellers regard the countryside as primarily a recreational area and promote its transformation into nature reserves, the rural population is feeling left behind. The supply situation is worsening, due to an eroding distribution infrastructure. Particularly in newly developed countries, people have to fend for themselves and live self-sufficient, hand-to-mouth lives. Migration into the urban areas to benefit from the social systems of the cities remains attractive. In many Western countries, nation states are scrambling to maintain infrastructure in rural areas – a problem that is exacerbated by shrinking overall populations.

The high degree of automation deeply affects day-to-day life. Consumers in more recently developed countries leapfrog to immaterial consumption. Many activities have been transferred to virtual spaces and are physically carried out at home. 4D virtual reality worlds, which provide holo-graphic, smell and tactile feedback effects, can be experienced at home, while personal telepresence devices allow people to chat with other people from all over the world as if they were sitting next to them. Even holidays can be enjoyed at home on a virtual Caribbean

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*Fully automated way of life.*

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SCENARIO 2

beach, smelling the sea and lying in the sun. Services like home-care for the elderly have been largely automated: Seniors living at home have their weekly medication delivered to an automated box which dispenses the daily ration and controls patients’ compliance. The patients’ daily routines are monitored by an array of sensors, measuring a person’s fluid intake, for example, or, using an RFID sensor in the shoe to measure their mobility.

The remaining material consumer goods are smaller, lighter and produced and transported in environmentally-friendly and fair-trade conditions. Product recycling is included in the product design and pricing. Consumers place great emphasis on additional knowledge and consulting services, such as learning about CO<sub>2</sub> reduction possibilities in everyday life and receiving information on how to live a healthy and socially responsible lifestyle.

The high degree of automation helps shrinking and aging regions to maintain productivity. However, employment rates have fallen, even though dramatic drops have been avoided and partly com-

pensated by the global economic miracle. In coming decades, a rock-bottom level of only 20% gainful employment could be reached, but this is still a long way off in 2050.

*New sectoral division of labor in an age of automation.*

Those who find themselves without a job are engaged in the informal sector. This includes social work, such as neighborly help or handmade products. A large share of the service sector consists of self-employed one-person businesses operating at the blurring border between the formal and the informal sectors. The informal sector has progressed and now offers reliable incomes and a new status and acceptance in the automation age. Social systems have been overhauled, including financial redistribution mechanisms such as an unconditional basic income. In particular, in the South, some states’ meager fiscal capabilities entail a greater personal responsibility for one’s income.

Cities as Hubs for Global Value Chains

Being located in the urban agglomerations, manufacturers are fully connected to the data and material infrastructure. In a world of strong value chain fragmentation due to global supply chains, connectivity to suppliers and the market is the cornerstone of entrepreneurship. Headquarters, in particular, are located in the first tier cities with the best global hubs.

Recently developed countries in Asia and Latin America, as well as in parts of Africa, have become new centers of consumption and production. It is their development, in particular, which drives the continued economic miracle and global growth. But the mature economies also continue to flourish. As a result, the world sees an increase in the number of centers of excellence for the production of specific products. Where there was only a single center of excellence 40 years ago, there are now several on different continents, e.g., for the development of robots. Organized in sectoral clusters, they are both competing and collaborating with each other.

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*Multiplied centers of excellence – increase in global supply chains.*

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Clusters of excellence in one sector depend on supplies from clusters in other sectors, such as the machine communication software cluster or the sensor cluster. In a highly automated world, outsourcing to very specialized suppliers with capabilities in cutting-edge technologies and applications has become the foundation for developing and manufacturing products. The high degree of fragmentation leads to a high interconnectedness within the global economy. Low customs duties and few regulatory obstacles to exports and imports keep transaction costs low and allow global trade to run smoothly, leading to a high intensity and high volumes of exchange.

### **High-Tech Infrastructure Keeps Urban and Inter-City Exchanges Flowing**

Due to the cities' high growth rates, providing a functioning infrastructure for basic services has become a huge challenge, in particular in the cities' older quarters with their legacy buildings and infrastructure. The low flexibility of most of the infrastructure which was built at the beginning of the 21st century or earlier drives the search for new types of transportation, which are better able to deal with the limitations of existing infrastructure. In contrast, newly planned greenfield satellite cities offer fresh opportunities for systems solutions. These typically consist of a mix of conventional public transport systems, such as rapid transit bus systems or bicycle renting networks, and new means like the Chinese-built high bus system. New satellite settlements rely on the successor of the Maglev/Transrapid train and underground cargo cabs. Important benefits of these are the reduction of transport energy consumption and emissions.

SCENARIO 2

Inner-city cargo transport systems are of lightweight design with materials such as carbon fiber and are powered by highly efficient electric propulsion. Huge distribution and logistics centers are located at urban peripheries and in city quarters where transport is pooled to minimize traffic. The distribution centers are ports optimized for a continuous, intermodal flow. Container flows are highly automated to optimize the supply of necessary resources, still influenced by the parcel sorting center design of global logistics firms some 40 years ago.

*City transport technologies.*

Megacities worldwide are well connected to each other. With the increase in global trade, hubs have grown considerably to handle the larger ships, aircraft, trucks and trains – the size and capacity of which has expanded with each new generation. Global hubs and spokes have become concentrated, with only one dominant first-tier global hub within each economic region winning the race to be the central stepping stone to the rest of the world. These first-tier hubs are usually close to a region’s preeminent first-tier city. They offer direct connections to all relevant global megacities. Other major cities are interconnected with efficient intermodal transport networks and allow for a more effective use of transport capacity, providing a well-balanced choice between speed and energy-efficient transportation.

*Global transport technologies.*

Advances in rail, ship and truck design have increased fuel efficiency by a factor of 3. Intercontinental vessels have grown tremendously in size yet have become relatively lightweight as a result of new materials. Short to medium distance vehicles are also lightweight. New ICT technology helps to save fuel by automated signal recognition or coordinated steering to allow drafting. Unmanned scramjet transporters were introduced in 2040 for high value express goods. These tiny spaceplanes fly above commercial air lanes with high speed at heights of 15,000 to 20,000 meters to escape the overcrowded air routes. Huge cargo aircraft, particularly if operating on long-haul routes, are also flown mostly unmanned.

ICT technology is used to deliver goods “wrapped in data”. The data contains information on all contents and conditions along the product’s entire lifecycle. This makes it possible to monitor the material and energy load included in the final product. This, in turn, is used to calculate the carbon tax that has to be paid by the product’s user. As customer demands for high quality products



grow, these data allow for an assessment of the quality of the material used for the product, the social conditions of production (e.g., fair trade) and ensure the failure-free cold chain needed in the delivery of foods. Furthermore, these data support the automated recycling processes that ensure the extraction of all secondary raw materials.

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*Ubiquitous data exchange enables full automation.*

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## Power to the Cities: Striving for Sustainability

Cities are collaborating globally to fight the challenges that come with growth: infrastructure bottlenecks, emissions and social tensions. A huge share of the public budget flows into the expansion of infrastructure and the construction of new transport means to escape the congestion trap. This infrastructure development boosts the economy and, in turn, allows for generous social investments into basic income schemes and education. Such policies are successful in highly developed and rich cities, but find some limitations in rapidly growing cities in emerging and developing countries where only high-priority projects can be financed.

Almost all cities introduce stringent environmental regulations both for industrial manufacturing and everyday life. This is accompanied by international climate protection agreements and their implementation in national policies to improve environmental quality and quality of life. This type of regulation internalizes the external effects of a product's carbon footprint throughout its lifecycle. Carbon pricing is used for all products. Any new product has to match benchmarks set by best available technologies with regard to energy consumption and material efficiency. The resulting carbon efficiency gains help to reduce climate change; ultimately, mankind has managed to reach the 2°C maximum warming target.

Most of the world's megacities have also introduced strict transport regulations. For instance, logistic concepts have to be proposed and approved for each new shop or manufacturing site to facilitate consolidation of transport. Motorized individual transport, in particular, is strictly regulated. As a consequence, the majority of citizens use cars only on a carsharing basis (pay-per-use).

### **Rise in Global Governance**

The power of the nation state has decreased now that the big metropolises exert a lot of economic and regulatory influence with the aim of strengthening their role as sustainably prosperous urban clusters with strong international competitiveness.

On the other hand, national power has also shifted to international organizations that organize global trade policy - like the World Trade Organization (WTO). Similarly, the United Nations Climate Change Mitigation Organization, which handles the global carbon tax covering carbon emissions along the entire lifecycle of a product, has become an influential actor on the international stage.

### **Transnational Corporations as Global (Political) Actors**

Global companies have also taken over a part of what previously were national responsibilities: Multinational corporations and value chain networks orchestrate huge swarms of collaborating manufacturing firms worldwide. These firms are headquartered in the first-tier cities. Here, where economic power is concentrated, decisions are made that influence the development of the world economy and impact the relevance of particular locations in the global supply chains. In the face of these highly influential policy networks, nation states are trying to safeguard the functioning of their social systems to let rural regions share, to some degree, in the wealth of their economies.

### **Curbing Climate Change Through Technology**

Sustainability is not only the driving force behind the cities' infrastructure approach, but also behind their overall policy, influencing public procurement as well as economic, social and regional plans. The globally-agreed carbon tax on goods has succeeded in greening manufacturing and services as well as consumption, prompting energy and material efficiency and triggering a shift towards immaterial consumption. Low-carbon technologies such as carbon capture and usage (CCU) – carbon dioxide from power plants is used as a raw material in construction – and a wide range of renewables make power generation almost CO<sub>2</sub> free; in other areas, like heating and transport, the use of fossil fuels is almost entirely substituted. Compared to 1990 levels, the developed world has achieved an 80% reduction in CO<sub>2</sub> emissions.

## *How It Came About – Looking Back on Four Decades of Developments*

The 2008 financial crash was followed by a volatile phase, particularly in the OECD countries. The economic miracle that began in 2015, recording sky-rocketing growth rates of 8% to 10% annually in global trade, was the result of stable economic conditions worldwide. Development was not uniform, however; booms and busts saw winning and losing regions and the emergence of new technologies and products. Overall, however, development was positive. Low energy prices and a high degree of automation in the production of goods and services promoted strong consumption levels which in turn drove the global economic miracle. The shift to immaterial consumption meant that GDP growth was increasingly decoupled from energy and resource use.

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*Globally stable economic conditions based on a new cooperative mindset of decision-makers and global city networks.*

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Two developments resulted in the global mood shift toward collaboration and coordination:

1. A new generation of decision-makers had grown up with on-line social networks and enjoyed connections to and personal exchanges with people from around the world. The priorities of this generation lie less with their country of origin and more with being a global citizen. These new cosmopolitan elites are globally interconnected and want to contribute to a common world with smooth exchange flows and trade conditions. This open mindset proved to be a boon to the institutions of global governance. Global trade became fully liberalized world trade while developing and emerging countries were given the opportunity to catch up with the industrialized world. This paradigm of openness paved the way for the rise of the WTO, which in turn secured global trade conditions that minimized transaction costs for duties and customs procedures.
2. The mayors of the world's cities came together to exchange best practices for making cities more livable and for overcoming problems of density like congestion, emissions or social tensions. This cooperation between cities in the global North and South brought forth surprising new solutions for the participating partners and resulted in a better understanding between the different cultures, which in turn intensified collaboration in various fields.

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*Transition to the automation age turns the working world upside down.*

The transition from the age of industrialization to the age of automation was similar to the shift from the agricultural age to the industrial age: employment in the agricultural sector dropped from about 75% of the labor force to 3%. At the dawn of the automation age, machines took over an increasing share of standardized processes.

Today, robotized production lines, including tiny manufacturing robots able to undertake even the minutest of tasks, dominate manufacturing plants, overseen by just a handful of human controllers.

To some extent, the impact of this process on the labor market was cushioned by economic growth. Over time, people changed their concept of self, focusing less on gainful employment as their major goal in life and started to be more entrepreneurial, finding new options for work and social commitment outside the conventional labor market, such as social and creative jobs, providing neighborly help, and so on. People in the emerging economies already had a strong culture of developing new, creative jobs. An extensive reform of the social system was an important precondition. Also, the social system in the mature economies had already been exhausted as a result of demographic change.

*Strong metropolization of economic activities.*

Most manufacturers have moved to urban regions to be connected to high quality data and transport infrastructure. Major global firms relocated mainly to metropolises close to global hubs. In addition, the availability of highly skilled engineers to run the automated production lines was important during the developing stages of automated production. These employees were available predominately in cities. Some four decades ago, already about 80% of the GDP was generated in cities, and this concentration has increased to 95% of GDP by 2050.

The centralization of production and services in agglomerations in turn has boosted the attractiveness of cities as places to live and work. The migration of rural populations to the cities has been further increased by an erosion of infrastructure in rural areas as result of a lack of investments.

In order to deal with urban growth, the mayors connected with each other in global networks such as the “C40 Cities - Climate Leadership Group” initiative to exchange best practices and learn how to reduce traffic jams and emissions. From this starting point,

the cities implemented more and more measures to boost energy efficiency and sustainability, moving forward the greening of industry and transport.

National and international regulations and activities to mitigate climate change impacts led to global agreements, including an individual carbon tax. Particularly in the industrialized countries, the economic rationale changed customer behavior towards more immaterial consumption.

*Cities sustainability initiatives become reality and prove effective.*

The threat of resource scarcity stimulated a race to become the most sustainable city with the most efficient solutions for urban manufacturing, transport and living. The process was supported by global city benchmarking. The cities launched a coalition with the United Nations Climate Change Mitigation Organization – which was the successor to the successful 2014 agreements under the United Nations Framework Convention on Climate Change – to establish a global incentive system for sustainability activities. Powerful research and development efforts were initiated. Countries in Asia and the Middle East competed in establishing the first sustainable city. Early examples for newly built satellite cities were set up. These pilots of decentralized high-tech city infrastructures were copied and further developed, in particular for the construction of satellite quarters of fast growing cities South America, India and Asia. In a next step, the refurbishing of in old cities became a central issue.

Urban concepts for zip cars, bicycle renting schemes and city logistics had already enjoyed long pilot phases in the late 2000s. As congestion problems grew, these pilots were rolled out widely in cities all over the world. New technologies like underground cargo transporters were introduced in pioneering cities and, after they proved a success, implemented widely.

*Megaefficiency in transport.*

Strong investment in transport infrastructure, along with rehabilitation and expansion of existing and development of new infrastructure, are central drivers for economic growth. Investment not only comes from the cities and states. Large sums of private money also flowed into infrastructure to be refinanced by tolls and other usage concepts.

Renewable energies have been developed and implemented consistently and globally. Their prices fell with mass production and the

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replacement of rare earths previously used in photovoltaics and other products. By 2020, renewable energy had become cheaper than fossil fuels. This led to an increase in the share of renewables in the overall electricity supply to almost 100% by 2050, and to 60% of the primary energy supply in some world regions. Major investments in powerful electricity grids and transportation infrastructure were necessary for this change. This substitution resulted in an oversupply of fossil fuels. The producing countries witnessed an erosion of their sales markets. In addition improved energy efficiency meant a rather low energy usage per unit of GDP.

Key Take-Aways: Implications for the Logistics Industry

- To relax the traffic and emissions situation in the cities, most freight for manufacturing sites and for shops is delivered and dispatched via underground cargo transporters. The automated transport systems run in circle lines around the city centers with freight dispatch centers at the city periphery and loading stations in the basement floors of manufacturing sites and shopping malls in the city region.

City logistics includes a range of new transport segments.

- By running city logistics dispatch centers and underground cargo tube systems, the dominant logistics providers take over the role of megacity utilities. They are becoming crucial for the city to run smoothly.
- Daily deliveries within city regions are carried out by electric vehicles with fuel cells or battery packs.
- Setting up huge infrastructure projects and complex planning requirements foster close collaboration between city governments and private companies. In fact, many inner-city logistics operations are based on a mandate given by local authorities to a particular provider. A related field of activity is system services for airports, hospitals, shopping malls or construction sites.

- The big logistics players take over a key role: running the complex logistics planning and operation processes for advanced manufacturing tasks as well as operating part of the public transport infrastructure, which require sophisticated capabilities. Furthermore, effective pooling and consolidation requires large investments in automation technologies, which can only be provided by big players.
- The bulk of economic activity and transport occurs in and between the global megacities. They are connected with each other through dedicated terminals and direct freight lanes. The traditional hub-and-spokes transport system is still in place, but only to supply the second and third-tier cities with goods.
- To meet the rapidly growing demand for international and intercontinental transport, mega-transporters are in use – with a capacity multiple of the largest aircraft, giga-liner trucks, cargo trains and ships that were common four decades ago. Driving control of the vehicles is assisted, similar to auto pilot systems. Machine-to-machine conversation between these transporters allows safe and efficient driving, for example, by road trains of slipstreaming mega-trucks, which drive in an auto-steered convoy.
- Huge transporters need high vessel occupancy to run efficiently. Dispatch or consolidation centers are instrumental to reach this high capacity by pooling incoming transport from several sources. “Co-opetition” (the cooperation of competitors) becomes a widespread modus operandi in the logistics sector.
- Unmanned low orbit transporters allow high-speed point-to-point express delivery for the highest value goods.
- Simple point-to-point delivery for private customers and for small amounts of goods for firms is increasingly fragmented, as many providers are able to offer this form of service between the first-tier cities. Those rather small courier services are becoming ever more trusted, as further generations of RFID chips allow the tracking and tracing of every product and monitoring of the way it is being handled.

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*Inner-city point-to-point delivery: taken over by swarms of small players.*

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- In contrast to the situation in cities, the logistics situation in rural areas far outside the urban regions is very poor. As most people are ordering their goods online, central collection stations or shops in larger villages are the main delivery options. A formal last mile delivery is a paid extra service.

*The rural delivery situation.*

- Responding to “dematerialization” of consumption, logistics companies offer a broad variety of renting and sharing services. Booking platforms run by logistics providers makes it possible to rent from private individuals.
- Dematerialization of consumption also leads to an increased need for secure data transfer. Thus, advanced logistics services not only encompass the fast and reliable delivery of goods, but also the safe transfer of information and knowledge.

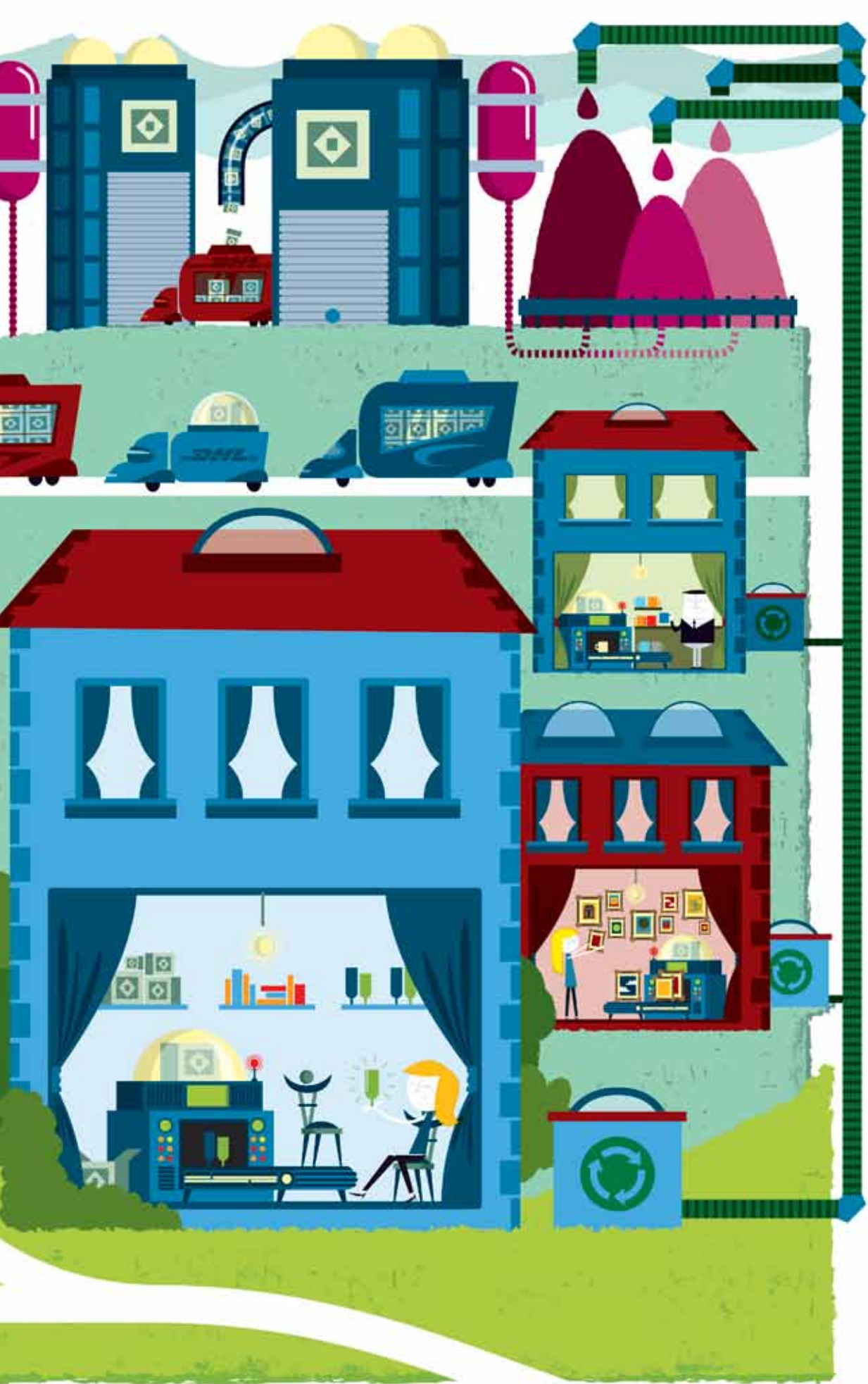
EFFECTS OF SCENARIO 2

	Untamed Economy – Impending Collapse	Mega-Efficiency in Megacities	Customized Lifestyles	Paralyzing Protectionism	Global Resilience – Local Adaptation
World GDP development	↑	↗	↗	↘	→
Quantity of global flows	↑	↗	↘	↓	↘
Environmental quality	↓	↗	→	↘	→
Regulatory openness	↑	↗	→	↓	→
Classic logistics growth potential	↑	↗	↘	↘	→
New business perspectives for logistics	↘	↗	↗	↘	↗
Transformation intensity for logistics	→	↗	↑	↑	↑









**SCENARIO 3: CUSTOMIZED LIFESTYLES***Core Idea*

By 2050, individualization has become a pervasive phenomenon all around the world due to increasing education levels globally, the spread of powerful digital devices and growing global affluence. Personalized consumption patterns dominate. People attach great value to leading a unique lifestyle. Various industries answer to the consumer's desire to differ from the rest by offering individualized items and goods designed according to personal preferences. Consumers are empowered to create, design and innovate their own products. Combined with a regional bias in trade regulation and decentralized infrastructure, the individualized consumption and production patterns lead to a rise in regional trade streams – only raw materials and data still flow globally. Customization and regional production are complemented by decentralized energy systems and infrastructure as well as local food production.

The pace of technological progress is considerable. Depending on the complexity of the product, a host of customization technologies are utilized, the most transformatory and impactful of which are 3D printers. Since price tags for these printers have been getting smaller over the past two decades, this new additive manufacturing technology has by now penetrated both industrial production and numerous households. Applications for 3D printing range from Home Fabbing for simple products to local FabShops for more complicated items and Industrial Fabbing.

Regulation, focusing on safety and security, often lags behind both the technological development and consumer behavior – primarily in the area of IP protection and control of data streams. For developing countries with the right set of institutions and infrastructure, the new production technologies entail the opportunity to leapfrog classical industrial production patterns. Many people around the world now make a living as product designers. On the downside, however, many blue-collar jobs in the manufacturing area have disappeared. And, for people working in the low-paid service sector, life remains a struggle. The extensive production of personalized products has increased energy and raw materials consumption overall. As a result, greenhouse gas emissions have grown. The global climate is on a path to a 3.5°C temperature increase by the end of the century.

The World in 2050

The Economic Apogee of Individualism

Beyond doubt, individualization and the pluralization of life-styles have shaped the world. In the past four decades, demand for customized products and services has increased dramatically. Repeatedly, research has shown that people live longer, healthier and happier lives if they satisfy their truly individual needs. This encompasses their physical needs (physiology, nutrition and hormone level), psychological condition (emotions, behavior and motivation) as well as socio-cultural preferences (values and norms).

*Global individualization drives customized production.*

The individualization trend had begun decades earlier in Western post-industrial societies. With increasing global media penetration and, as income and education levels around the world rose, the trend spread to high and middle-income classes everywhere. Individualization not only expanded, it also went through changes. It is now much more closely linked to personal creativity: Global designer brands no longer create mass awareness; rather, many people now appreciate individually designed clothes. Prosumer (a portmanteau of producer and consumer) communities emerge, not only with regard to apparel, but also for sports equipment, games and toys, tools, interior design, perfumes and cosmetics, food and cooking, consumer electronics and even vehicles.

Worldwide, the number of people that buy and regularly use a home 3D-scan-fabber is growing rapidly. Products for home improvement (e.g., screws, bolts, buttons, new bicycle tires), toys for children or sports equipment for people of any age are regularly fabbed. Theme parties with interior decorations perfectly matching the occasion have become a popular leisure activity. Fabbing also affects hygiene standards everywhere: Between 2040 and 2050, the share of people fabbing new clothes daily rather than washing them skyrockets in developed countries. Similar trends can be observed for all objects of personal hygiene: toothbrushes, towels, hairbrushes and dishes, cutlery and glasses, too. Consumption has grown into a creative experience. A number of companies offer design workshops in cooperation with renowned designers. Other workshops are privately held, such as sports clubs designing their own gear, young parents collectively optimizing baby products and homebuilders sharing their own self-designed, special purpose tools.



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Advanced design-assistance software has enabled a growing number of people to design even more technically sophisticated products. In these digital societies, new ideas are disseminated rapidly and soon become hotly debated topics. Designers also profit financially from successful creations. There is, however, also a downside associated with the new developments: In many regions, a two-speed society has emerged, with those unable to make the transition to the knowledge and design society left behind. In rural Asia and Africa, there are large numbers of self-sufficient farmers, as jobs in the mining and manufacturing sector have become scarce. In the cities, the underprivileged work in low-paid service jobs. However, a small subculture movement also turns away deliberately from the fast-moving consumer world and looks for more durable handmade consumer goods.

The Fabbing Revolution

Naturally, customized products and the integration of consumers into the innovation process goes way back to the dawn of this century, but new technological enablers have accelerated and expanded the phenomenon of customized consumption to a degree previously unimaginable. Even run-of-the-mill restaurants now have beverage dispensers able to read out a guest’s individual preferences and special dietary needs

*The creative divide in the knowledge and design society.*

and mix a soft drink accordingly. The “one Coke for all” paradigm is no more. Shopping for food is also based on a digital personal health profile. This makes it easy to adapt

one’s diet to individual needs, such as avoiding allergens or following special dietary requests. Also, people commonly use personalized soap, shampoo, body and facial cream based on regular tests of their vital functions such as hormone levels and blood values, but also based on texture and fragrance preferences. The products can be produced on-site at local drugstores and can be delivered to one’s home.

*Technological enablers: customization, 3D printing and the Outernet.*

Today, not only can most products be customized, but they can also be self-designed and printed in 3D, either at home or in so-called FabShops. The maturing of ad-

ditive manufacturing – that is, layer-by-layer production using miscellaneous materials like (bio)polymers, composites and metals – was an important technological driver for this development. Compared to 2011, additive manufacturing has improved

significantly with regard to printing speed and accuracy, object strength and surface finish. Also, acquisition costs for a 3D printer have declined to the point that home fabbers can be found in 2 billion households in 2050, similar to the proliferation of washing machines at the turn of the century.

While most home fabbers are only able to produce smaller items, more sophisticated machines in FabShops and, primarily, industrial fabbers, can produce much larger multi-material objects. Today, even highly complex products such as vehicles can be printed out in nearly one piece. However, this does not entail the disappearance of the entire supply chain. Just like private enthusiasts, suppliers have become design providers, such as for batteries, lights, seats and any other components. The crucial task for OEMs and their main advantage lies in integrating these specific component designs into a complete “keyturn” vehicle. Some OEMs have even turned into purely digital factories, outsourcing actual printing of the vehicle to contract manufacturers with physical assets.

The trading of both private and professional design blueprints relies on an improved Internet infrastructure, which allows for secure, high-volume data transfer. Furthermore, the Internet has evolved into an Outernet in which not only goods, but also vehicles and infrastructure are equipped with enhanced RFID tags that include sensor and memory functions. This Internet of Things allows for smart solutions. Should a car’s tires have degraded to a specific level, for example, a signal is sent automatically to a local service station with which the owner has a contract. The service station then prints out new tires immediately to be installed once the vehicle is brought in.

### Creative Consumption, Growing Hunger for Resources

However, most items are replaced long before they cease to function. Compared to consumption patterns at the beginning of the century, product life expectancy has declined massively.

As a consequence, steep increases in energy and resource use as well as waste volumes have become pressing challenges worldwide. The latter two were temporary since businesses, cities and individuals

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*Recycling and closed material loops on the rise.*

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significantly boosted their recycling efforts. Some private households in affluent countries even have small recycling facilities at home, yet most people rely on local recycling service facilities in order to shred, sort and recycle their waste. Besides, high raw

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material prices have motivated many cities to open their old landfill sites for so-called urban mining.

With regard to energy use, additive manufacturing, due to its precise material utilization, is more energy efficient than traditional manufacturing. Additionally, due to the decentralized use of 3D printers in households and FabShops, and the more integrated supply chains with regard to Industrial Fabling, there is less transportation and related energy consumption compared to the global supply chains at the beginning of the century. Renewable energy solutions have also improved the situation. Decentralized energy technologies have been particularly successful: People appreciate energy independence that comes as a result of micro powerplants and solar panels.

However, these improvements are more than offset by the increased volume of consumption that is triggered by the immediate availability of any product through fabbing. As a consequence, energy prices have doubled in real terms compared to 2011 and the world is on course for global warming of 3.5°C, with very little margin to stay below this limit.

Fighting Digital Piracy

Regional trading blocs play a bigger role in 2050 than they did in 2011. The ASEAN region – similar to Europe – has even developed into a monetary and political union that includes many countries.

*Fight against design piracy and the digital black market.*

Analogous developments have also taken place in Latin America and Africa. Many countries have harmonized regulatory frameworks with regard to raw material and fabbing machine standards, at least within

trading blocs. In many countries that have rapidly developed over the last decades, spending policies are aligned. These countries invest heavily in regional infrastructures, Internet access and secure data transfer.

Internet security is a widely debated global issue. Design piracy has become a pervasive problem. Digital data sets, both the blueprints of private designers and companies, are regularly copied illegally. Businesses strongly lobby for IP protection and, through international negotiations, design property rights have now been harmonized internationally. Policymakers in almost every country try to enforce property rights, since illegal printing costs jobs – not only in foreign, but also in local design sectors.



However, IP protection remains difficult in practice and, while both governments and businesses engage security agencies to scan data streams to 3D printers, this cannot prevent a flourishing digital black market for illegal designs. To the consternation of the police, even sophisticated home-fabbed knives and guns are widely available on the streets. At the same time, civil rights groups strongly oppose the massive digital surveillance and accuse governments of deliberately censoring the flow of information.

## A Digitized, Atomized World Economy

What are the consequences for the global economy and worldwide trade? Overall, the world economy in 2050 is far more decentralized than people would have expected in 2012. International trade is mostly limited to raw materials and design blueprints, while semi-final and final products are more or less provided on a local or regional basis – often through fabbing and other advanced forms of manufacturing. Transporting final and semi-final goods makes little sense because, with high transportation costs and extremely flexible industrial production, a comparatively small number of local factories are able to fully meet regional demand. This development is also facilitated by regional trade agreements and infrastructure, as well as decentralized energy solutions.

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*Regionalization as the next economic stage.*

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For many of the formerly developing countries, the new production technologies like fabbing offered an opportunity to leapfrog centralized industrial production. In the villages and cities of poor countries, FabShops with second-hand machines are often used collectively for the local production of goods which were previously hard to get or very expensive. Easy home improvement and much more flexible repair of vehicles and equipment contribute significantly to the rise of living standards. The global income gap has narrowed and many formerly poor countries are now fully integrated into a world economy that is more decentralized physically, but highly connected digitally.

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*Many developing countries catch up.*

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Social change and economic expansion also influence urban development. More and more people move from rural areas to cities. In Asia, second-tier cities experience particularly dynamic growth: Population growth as well as economic expansion enable them to prosper and offer the promise of a better life, with jobs, education

SCENARIO 3

*Asian second-tier cities are the creative hot-spots.*

and cultural activities for all. In 2050, places like Chanchun, Hefei and Yinchuan in China, Johore Bharu in Malaysia or Medan in Indonesia are just a few of the world’s creative hot spots. Nowhere is the percentage of people who enjoy designing and producing items personally higher than in Asia. In most of these cities individual traffic has been banned, multi-purpose vehicles, such as skytrains or underground railways, transport passengers during the day and freight at night. Only a few electric vehicles remain, which deliver high-priority goods to stores and homes.

*How It Came About – Looking Back on Four Decades of Developments*

Changing consumer preferences, in particular their growing aspiration for independence and individuality, was primarily what triggered the developments which resulted in the world as it is today. These two global maxims – independence and individuality – together have contributed strongly to the decentralized and highly personalized lifestyle that many people follow.

*Consumer-driven development towards decentralization.*

As part of this process, decentralized manufacturing and energy generation were established, for two key reasons. On the one hand, demand for individualized products increased over time because, in more and more societies individuals received more freedom of choice – as traditional family structures and conventional role models were increasingly questioned. On the other hand, decentralization was pushed by public concern about increasingly unreliable supply of electricity and consumer goods. Additionally, more extreme weather events endanger maritime regions and upset global mobility and supply chains.

Re-regionalization of production and, to a lesser extent, the decentralization of energy supply were considered as ways to reduce costs in the long run and make everyday lives more reliable. The massive success of fabbing can also be attributed to the fact that, on the one hand, it satisfied demand for regionally produced goods and, on the other hand, provided an answer to the growing interest in personalized products.

At the beginning of the fabbing era, people went to FabShops to get their bodies scanned and then watched a computer software adapt pre-designed clothes to their measurements, modified colors to suit their complexion and suggested appropriate accessories based on lifestyle and cultural background. It was also possible to add personal ideas to the design. Next, over a cup of coffee, one could watch one's new clothes being printed.

A multinational electronic-commerce business offered the first digital marketplace for 3D printing in the 2020s. In cooperation with manufacturers, this company offered an increasing variety of consumer goods on the new platform that could, step by step, be self-designed and printed in 3D at the nearest FabShop.

Later on, furniture manufacturers introduced ways to design ergonomic furniture optimized for one's own body with the help of online software. With augmented reality glasses, finished creations could be pictured in one's apartment and be adapted to suit the rest of the interior. The finished product was then printed in a FabShop nearby and delivered. Over time, traditional retail shops were substituted more and more by FabShops and department stores gave way to do-it-yourself malls. And, with every new generation of machines, more complex fabbing became possible. Today, state-of-the-art hospitals are even able to print tissue and simple organs and manufacture artificial joints with the help of CT and MRI scans.

The customization and fabbing hype reached its next level when the Chinese company Dàyìn! (in English, Print!) made 3D-scan-fabbers affordable for everyone in the late 2020s. This all-in-one device enabled people not only to fab, but also to 3D-scan at home. Within 10 years, one in three middle-class households owned a 3D scan-fabber.

Long-term market success was and still is achieved by companies offering popular design data sets, supplying raw materials or manufacturing sophisticated 3D-fabbing/scanning equipment and related services (including recycling, maintenance and consulting). Additionally, there are also industries specialized in products that cannot be home-fabbed (e.g., cellphones consisting of more than 100 different materials). Other growing sectors include software companies specialized in enabling consumers to be creative with easy-to-use software design kits. These companies offer design tutorials with new input devices or websites featuring design data sets by artisans and creative individuals.

SCENARIO 3

<i>Ecological downside of extensive fabbing and consumption.</i>	<p>On the downside, the era of extensive fabbing and consumption has had serious consequences for energy consumption and the environment. It was not until 2040 that countries finally decided to introduce global carbon pricing. An international agreement on the taxation of raw materials came even later, with the aim of fostering closed material loops as well as to curb excessive fabbing. However, this came far too late to noticeably impact the consumer revolution spreading around the globe.</p>
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Key Take-Aways: Implications for the Logistics Industry

- The production process for most goods changes dramatically. A significant share of households is equipped with 3D printers. Many people produce smaller, less complex items and products at home. Construction blueprints for these products are either self-designed or bought in online shops.
- Products that are more complex with regard to size and material variety rely on more specialized manufacturing technologies and are produced in fab shops or at industrial fabbing sites.
- Supply chains are considerably less fragmented than they were in earlier decades. Due to this re-integration and re-localization of value chains, the need for long-distance transportation of final and semi-final goods drops sharply. The demand for air transportation similarly declines.
- Overall, logistics in 2050 consists of an online and an offline element. The offline segment integrates raw material transportation with manufacturing and reverse logistics. The online segment, based on a secure Internet infrastructure, includes secure data transfer and data retail in online shops.
- There is a growing need for raw material logistics serving 3D printing cartridge manufacturers or fab shops in the city centers. These materials, which include plastic granulates, metal dusts and highly diverse biomaterials, are transported by ship to the target markets' seaports and distributed by rail or truck to the local manufacturing and printing sites.

<i>Transportation of raw materials and recycled goods instead of final products.</i>
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- Cartridge manufacturers and refillers can be found in all cities and even districts.
- Logistics planning develops into a sophisticated service industry that is deeply integrated with industrial production planning. For the production of complex, sophisticated goods, logistics providers organize the entire physical value chains and act as a systems integrator between the asset-lean product design companies, the asset-rich yet flexible contract manufacturers, and local transportation providers. They also handle the encrypted data streams required for the transmission of construction and design blueprints. However, in this area, logistics providers face intense competition with ICT companies.
- Recycling streams grow massively: Logistics providers not only deliver new printing cartridges, they also collect used products which are either shredded on the go or – in the case of multi-material products – at central recycling sites.
- The decentralized organization of production turns strong regional logistics capabilities and a high-quality last-mile network into a highly important success factor.
- Several logistics providers have expanded into the online fabbing market where construction blueprints are traded. Due to the threat of product piracy, this growth market crucially depends on secure online transactions. Thanks to long-standing experience with the secure transfer of digital information, some logistics companies are very successful in this market segment.

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*Growth market: information logistics and data retail.*

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SCENARIO 3

EFFECTS OF SCENARIO 3

	Untamed Economy – Impending Collapse	Mega-Efficiency in Megacities	Customized Lifestyles	Paralyzing Protectionism	Global Resilience – Local Adaptation
World GDP development	↑	↗	↗	↘	→
Quantity of global flows	↑	↗	↘	↓	↘
Environmental quality	↓	↗	→	↘	→
Regulatory openness	↑	↗	→	↓	→
Classic logistics growth potential	↑	↗	↘	↘	→
New business perspectives for logistics	↘	↗	↗	↘	↗
Transformation intensity for logistics	→	↗	↑	↑	↑









**SCENARIO 4: PARALYZING PROTECTIONISM***Core Idea*

Triggered by economic hardship, globalization has been reversed. Global trade volumes have contracted after most countries raised protectionist barriers. Excessive nationalism dominates much of the political behavior around the world. The benefits of open global trade are a fading public memory, as a second generation is coming of age in a protectionist world. While some raw materials are still exchanged internationally, trade takes place mainly within regional trading blocs. Similarly, most supply chains are almost completely regionalized. Trade suffers from a lack of infrastructure development and maintenance, as most funding is consumed to cope with aging societies, particularly in Europe and Asia. All these developments have much reduced the international division of labor, resulting in a general productivity decline. Also, technological development is lagging: the Outernet has been implemented, yet, there are substantial compatibility problems between countries and regions.

Resources are scarce, because newly developed deposits offer low yields and research and development efforts geared towards substitutes have rarely been successful. Protectionism and less efficient production aggravate the effects of resource scarcities. Material consumption remains a leading paradigm, even though real incomes have declined in many of the traditionally industrialized countries and growth in the rest of the world has slowed significantly.

The mood between the dominant economic trading blocs has soured. High energy prices and dramatic scarcities fuel international conflicts over resource deposits. Under these circumstances, there are no international efforts to reduce greenhouse gas emissions, while some occasional national attempts show little effect. Climate change continues and the world climate is on the path to a 3.5°C temperature increase by the end of the century.

*The World in 2050***World Economy in the Trenches, in the Doldrums**

Over the last 30 years, the volume of world trade has steadily decreased. The exchange of goods and products is confined to certain regional blocs. Interregional trade is common only with regard to certain raw materials. In many cases, even trade volumes between neighboring countries suffered. Since markets are geographically limited, today's companies are far more vertically integrated and less specialized than they used to be. They are also much smaller. Supply chains have substantially shortened. In some developed countries, industries with high strategic relevance have been re-nationalized. Four decades ago, goods from all over the world were readily available in many countries. Now, such goods have once more gained exotic status.

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*The world economy consists of regional trading blocs separated by walls of protective measures.*

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Compared to the early years of the 21st century, energy prices have doubled in real terms. Driven by the urge for energy independence, all regions switched, for the most part, to energy sources which were locally available and easy to develop. As a result, the share of renewable energies has risen, although they are still expensive. Fossil fuels still provide for most of global energy demand. Price volatility has remained high and fossil fuels are in relatively short supply, in some cases as a result of political powerplay. Regional energy prices differ considerably according to the respective degree of access to energy sources. Norway, for example, has a rich supply of both hydro energy and natural gas deposits. Germany is exploiting cheap energy from lignite, not only to compensate for fluctuations in the electricity generation from wind energy, but also as the basis for coal-to-liquid processing. On the other hand, resource-poor countries such as Japan or South Korea either use nuclear power, expensive renewable energy or are dependent on the goodwill of the fuel-exporting countries around the world.

Access to resources has become a key issue of national security. Resources that are crucial for a huge share of everyday products have become increasingly scarce. They are hard to procure on politicized markets, and are traded at very high prices. Countries with deposits of crucial resources enjoy a position of considerable power as they can influence where

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*Resource scarcity slows economic growth and threatens national and international stability.*

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**SCENARIO 4**

production (and consumption) of specific goods may take place. While engineers attempt to minimize the use of scarce resources and try to find substitute materials, only seldom do they find satisfying solutions.

In traditional OECD countries, the infrastructure is often in terrible shape as it is close to impossible to dedicate budgets to maintenance and refurbishment. Only few, highly frequented routes that promise considerable toll revenues are built and run by private

*Infrastructure quality is in decline around the globe.*

infrastructure companies. Traffic suffers from congestion and malfunctions, such as temporary breakdowns of railway networks. Energy and data infrastructure are also in bad shape with frequent power and

data blackouts. Particularly problematic is the situation in many of the countries that were once considered emerging markets. They were faced with the consequences of the global economic sclerosis before they could complete many infrastructure projects. China and Brazil are somewhat better off, as they still benefit from the massive investments in their infrastructure that were made earlier in the century.

**A Forced Downshifting of Living Standards**

Over the last 40 years, income distribution is increasingly uniform around the world – however, this is mostly due to de facto stagnation or even decline of incomes in the formerly rich regions. Growth has slowed in the rest of the world. In most non-OECD countries, material prosperity has yet to reach everybody. On average, many people have lower real incomes than their parents or grandparents. Employment is comparatively high, as elevated resource prices favor labor relative to capital inputs.

Protectionism and the regionalization of value chains mean that people on average pay more for food, clothing and electronic devices, as economies of scale derived from the division of labor and from international specialization have suffered. Product choices are limited and consumers may be forced to wait for the delivery of their desired product. People prefer durable products, which can be repaired if necessary. Also, second and third-hand use are common. However, “green” production and consumption are not a priority.

Except for a few dynamic metropolitan centers such as London or Paris, Western cities have been hit hard by population decreases, underfunded infrastructure and the financial burden of aging societies. Remnants of prestige projects such as high-speed trains and shopping malls are reminders of long-gone better days when city centers were hives of activity and international trade was flourishing. In the non-OECD countries, however, the urban situation is even worse. Local authorities have to watch helplessly as traffic gridlock and congestion immobilize cities, while isolated illegal slum settlements mushroom at the outskirts.

### The Economic Cost of Political Distrust

The world is no longer dominated by a superpower. Instead, a multi-polar balance between influential regions has emerged. Each region is usually dominated by one or more powerful nation states. The European Union, however, had to return much of its power to its member states and has been reduced to coordinating the single market. The divisive atmosphere between the regions and trading blocs seems to have condemned the world to political deadlock. International organizations enjoy little relevance. Although most countries still maintain some sort of diplomatic mission in other nations, coordination between trading blocs is mostly organized through the bloc's trading companies, which barter inter-bloc exchanges of goods and raw materials. The blocs rarely engage in major clashes, but small proxy conflicts erupt frequently. In particular, resource deposits are conflict hot spots. The political climate in most countries is marked by populist rhetoric, thus some conflicts are also caused by former dreams of national grandeur and expansion.

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*Traditional international organizations have lost their influence, conflict levels have increased.*

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Political intervention in the economy is based on regulation rather than financial incentives. This development is, in part, due to tight public budgets, which are burdened with high expenditures on national security. Protectionism is a common practice but, naturally, more pronounced between rather than within the different trading blocs.

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*Protectionist walls separate trading blocs.*

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National transport and logistics regulations focus mostly on ensuring the safety and security of transported goods. To counter terrorist attacks and to fight organized crime, most governments

**SCENARIO 4**

have introduced legislation that aims at full physical control over the flow of goods into and, sometimes, even within the country. For both seaports and airports, numerous rules concerning

*Strict security regulations concerning the flow of goods and individuals.*

architectural design and operations have been introduced to maximize security and keep track of goods and persons entering the country. Clearing customs can take several weeks.

The regional blocs suspect each other of tolerating or even supporting certain piracy operations. Ocean freighters are usually well armed and armored to protect themselves against pirate assaults. Also, logistics companies rely on private security firms to protect their operations or offer such security services themselves.

**Carbon-Heavy Self-Reliance**

Only a few nations have implemented actions to fight climate change and the world is on course for global warming of 3.5°C in 2100. Although worldwide economic output has hardly risen compared to the previous decades, carbon emissions have grown as many countries increased the share of coal and lignite in their energy mix, seeking energy independence. Natural disasters are more frequent than in the past and hit poor regions the hardest. Disaster response is rarely internationally coordinated, reducing the capability to effectively provide aid and support.

Resource extraction has increased – more as a result of political influence than due to an increase in actual consumption. This development is degrading the environment in many regions, arable land is subject to pollution and, in particular in poorer regions, farmland is often destroyed by overuse and erosion.

**After Technological Convergence Comes Divergence**

Technological progress consisted mostly of incremental steps over the last four decades. Research and development has only slowly recovered from the neglect stemming from the decline in global scientific cooperation and the loss of R&D funding by large multinational companies.

The “Internet of Things” led to an immense amount of data used by both businesses and governments. Not only goods, but also vehicles, infrastructure, and even persons are equipped with



enhanced RFID tags and can be identified and located in realtime. In light of the aging societies, personal medical monitoring via implanted chips has become obligatory in some countries and, depending on their behavior, individuals may receive friendly advice on improving their lifestyle to maintain their health and productivity.

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*Technology has seen only minor improvements.*

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IT security is seen as tremendously important to safeguard the reliability of the national data and ICT infrastructure and protect it from cyber-attacks. In most countries, the Internet is under strict government control. Data streams are scanned to identify and prevent espionage or sabotage at an early stage. Additionally, there is also widespread censorship. Connections between regions have been throttled, making the Internet more a collection of regional nets with a few well-controlled links for data exchange. ICT standards differ widely between the major trading blocs. As foreign access to North American and European geo-positioning systems is strictly limited, several regions are working on launching their own systems.

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*The Internet has been separated into a number of regional nets. ICT-systems are only rarely compatible between blocs.*

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### *How It Came About – Looking Back on Four Decades of Developments*

At the beginning of the 21st century, most people thought that globalization – the international merging of economies and cultures – was inevitable. However, the outlook started to become bleak in the mid-2010s. On both sides of the Atlantic, the leading economies at the time faced massive debt crises and global imbalances still loomed over macro-economic developments. Deleveraging consumed most countries' resources and left little leeway to deal with dramatic challenges, such as mass unemployment, demographic change or climate protection. Austerity further hurt already sluggish growth so that, during this decade, most industrialized economies continuously fluctuated between slow growth and recession. The troubles of the developed economies also slowed down formerly rapid economic development in the non-OECD countries. Indeed, contemporaries came to call this period "The Decade of Crisis." Budget constraints meant entitlement cuts and many people had to cope with decreasing real incomes. More and more parts of the population became disenchanted with their political systems' problem-solving capacity.

SCENARIO 4

As one bad year followed another, the tone of political discourse grew harsher and politicians increasingly relied on populist rhetoric. By 2020, national mercantilism was rampant all over the world and slogans like “buy national” could be heard everywhere. The first waves of protectionism in the developed economies were rather moderate in nature. But once the WTO’s verdicts came to be routinely ignored, more and more countries implemented retaliatory protectionist measures. A vicious circle of action and backlash ensued. There were, of course, attempts at reconciliation. But the agitated political climate made a fair compromise impossible. In the process, the international atmosphere had turned poisonous and traditional international organizations like the UN and WTO lost much of their reputation and relevance for national decision-making.

A multi-polar structure of trading blocs began to emerge at the end of the 2020s. The re-regionalization of the economy continued well into the 2030s. Regional and local value chains and the security of supply became more important than a high degree of specialization or global trade. Some countries even nationalized their key industries. Regionalization was painful and led to stagnating or declining real incomes. After a while, most economies

*National egoism and populist policy decisions start vicious circle of protectionism.*

began to stabilize and employment rates rose above pre-crisis levels, but average incomes remained lower than before.

Realizing its own military weakness, Europe was the first to drop out of the race for Arctic resources. When both Russia and the North American bloc sent naval forces to control the area, the standoff made the whole world hold its breath. Only a year later, a similar sensitive situation emerged between the North American and Chinese trading blocs about resource deposits on the ocean floor of the Pacific. Both situations could be resolved before shots were fired, but neither party withdrew its claim to the region – renewed clashes are to be expected

*Multiple regional blocs arise out of the remains of the globalized economy.*

once the technologies for extraction have matured.

During the 2040s, the impact of climate change became more evident. Extreme weather conditions occurred frequently. Since humanitarian aid across regions was limited, famine and increased hardship were the results.

By the end of the 2040s, most people lived in regional “bubbles,” ignoring the problems in other blocs or of a global scale, as long



as the effects did not seem to directly concern them. The world appears to have entered a deadlock, characterized by the serious consequences of stagnant economic development, climate change and resource scarcity.

### *Key Take-Aways: Implications for the Logistics Industry*

- The decline and fragmentation of world trade and the resulting regionalization of supply chains are major challenges for logistics companies. Entering markets in foreign trading blocs is nearly impossible.
  - The average transport distance decreases. Ocean freight becomes less important. The significance of regional road and rail transport, on the other hand, increases.
  - The changing economic structures substantially reduce the business volume for global logistics companies. Shipping is slowed down by customs barriers and import restrictions. Accordingly, the international express and freight-forwarding segment undergoes massive downsizing and consolidation.
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- Strong consolidation process for global players.*
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- The remaining companies that operate globally are much smaller than they used to be. At the same time, domestic markets gain in importance, as do trade relations with other members of the same trading bloc. International business is mainly done in the different member states of a companies' home trading bloc.
  - Strong regional champions emerge, maintaining excellent relations with governments and public administrations. Governments view logistics as an industry of strategic importance. In many countries, these new regional champions are susceptible to nationalization.
  - As relations between some blocs and countries are extremely strained, logistics providers in bloc-free countries not only possess the knowledge and experience but also the credibility to be intermediaries in international trade brokerage.
  - The growing complexity and length of the customs clearing process increases the demand for specialized customs brokerage and opens up business opportunities for consulting services.

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#### SCENARIO 4

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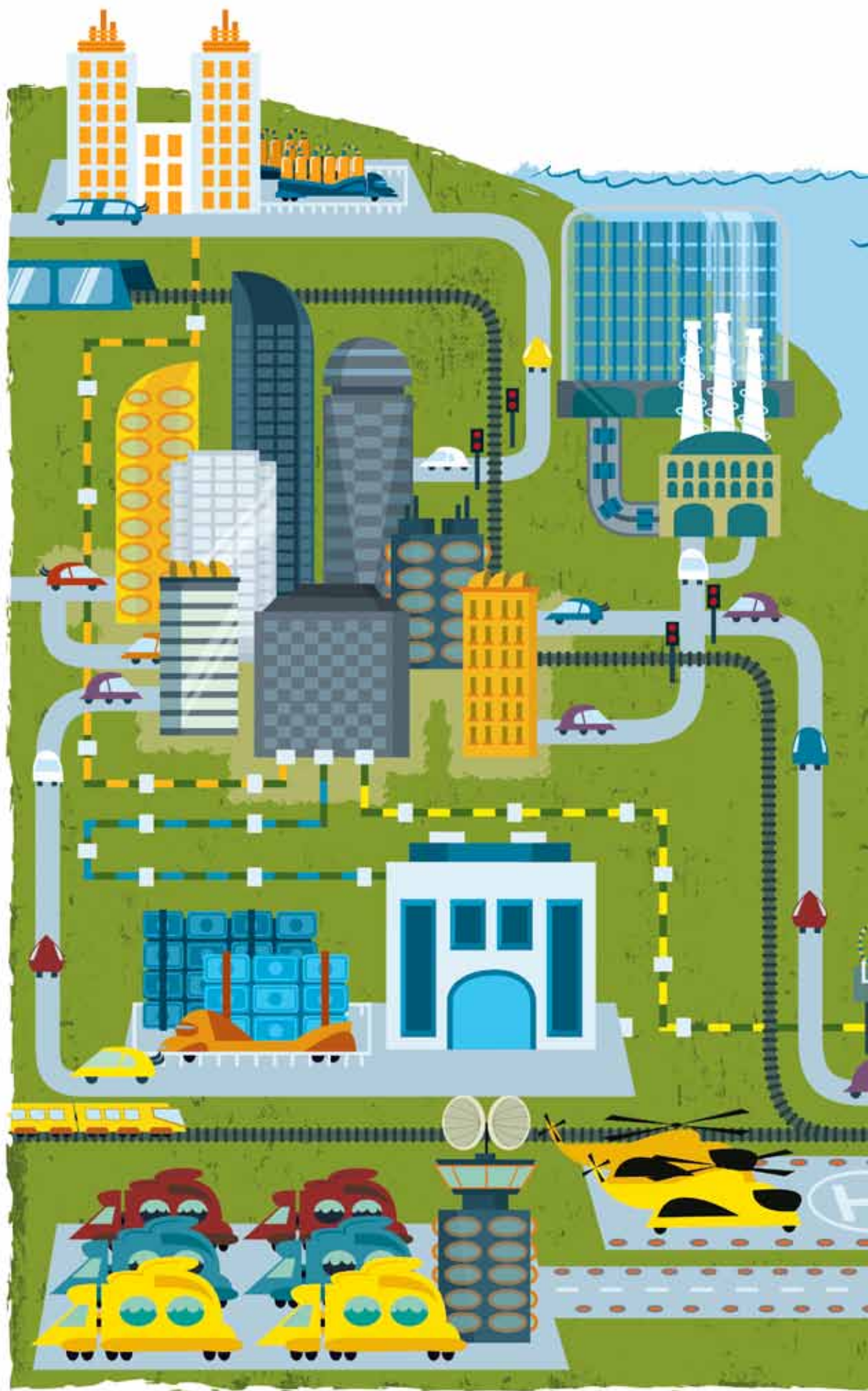
##### *Limited revival for classic mail.*

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- The shorter and less complex regional supply chains generally reduce the demand for elaborate and sophisticated logistics solutions. What many call a “devaluation of the logistics industry” results in fewer customized solutions and in services that become increasingly commoditized.
- The delivery of traditional letters becomes less frequent everywhere and is often combined with other deliveries to increase efficiency.
- Due to the high degree of restrictions on inter-bloc data streams, classic mail, however, experiences a limited revival for communication between world regions.
- Since resources are scarce and access to critical raw materials can be unstable, assuring high levels of recycling is critical for many countries. Implementing efficient reverse logistics processes is thus a viable strategic option for logistics companies.
- Declining income levels change purchasing behavior, leading to less consumption of short lifespan consumer goods and more reuse and repair of items. The increased demand for higher-durability and repairable goods benefits logistics companies offering repair and return services.
- As the exchange and reuse of goods becomes prevalent in some regions, organizing eBay-like local “swap meeting” networks while taking care of all transport activities represents another niche business opportunity in which some logistics companies engage.

EFFECTS OF SCENARIO 4

	Untamed Economy – Impending Collapse	Mega-Efficiency in Megacities	Customized Lifestyles	Paralyzing Protectionism	Global Resilience – Local Adaptation
World GDP development	↑	↗	↗	↘	→
Quantity of global flows	↑	↗	↘	↓	↘
Environmental quality	↓	↗	→	↘	→
Regulatory openness	↑	↗	→	↓	→
Classic logistics growth potential	↑	↗	↘	↘	→
New business perspectives for logistics	↘	↗	↗	↘	↗
Transformation intensity for logistics	→	↗	↑	↑	↑







**SCENARIO 5: GLOBAL RESILIENCE – LOCAL ADAPTATION***Core Idea*

In the first decades of the 21st century, stable energy prices and cheap, automated production led to a high level of consumption. Due to accelerated climate change, the number of extreme weather events increased, causing numerous disasters. The mighty automated supply chains on which the global economy was relying proved to be highly vulnerable. Frequent catastrophes disrupted lean production structures and oftentimes resulted in supply failures for all kinds of goods. In such an unstable world, cost-optimized global supply chains were no longer viable.

These events caused a change in thinking among political and business leaders. The new economic paradigm is characterized by a shift away from efficiency maximization to vulnerability mitigation and resilience. This radical move towards redundant systems of production and a change from global to regionalized supply chains allows the global economy to better weather troubling times.

Countries in the same economic region cooperate in their endeavor of safeguarding supplies by devising joint disaster relief schemes. Artificial intelligence has made technology more flexible; the interconnected machines' swarm intelligence enables quick reactions to surprising, sudden failures. Today, production sites and infrastructures may hibernate and be reactivated depending on emerging demand patterns. Efficient Materials, using little energy and recycling measures, all contribute to increased supply safety. Similarly, consumption focuses on highly material-efficient goods with long service lives.

*The World in 2050***Welcome to the Back-Up Economy**

The world is heading for a long-term warming of 3.5°C. Many areas are frequently or even constantly threatened by disasters. Some have even become all but uninhabitable. Water scarcity is an important issue that regularly sparks social unrest. The experience of the 2030s and '40s – when crises were increasingly regarded as normal – triggered a learning and even a transformation process across societies: What had to change to be better able to cope with the permanent natural and manmade risks?

The worldwide pattern of city development has changed in the past four decades – mainly because second and third-tier cities grew strongly in size and number.

High-density settlements have gradually shifted from risk areas to safer regions. Coastal strips, which are threatened by flooding, tsunamis,

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*Shift of urban areas to safe regions.*

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hurricanes and rising sea levels, as well as inland areas affected by earthquakes and floods, have been abandoned bit by bit, given the prohibitive sums consumed by risk prevention. The impact of this development is felt in regions like Florida, which is hit by hurricanes regularly, as well as in countries like Bangladesh and Japan, where many settlement areas are either affected by the rise in the sea level or situated in tsunami and earthquake regions.

Agricultural food production increasingly has to compete for land with other sectors, like biofuel production. As food and resource supply both have a high priority, a governance scheme clearly regulates the use of arable land.

To develop a backup system for the provision of food and energy, authorities foster urban farming and decentralized energy production. Parks and green areas in cities as well as roofs and the walls

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*Stable energy prices through a broad resource mix.*

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of buildings are used for small-scale farming. Renewables like solar and wind power are harvested not only in huge “energy parks” on the city’s periphery, but are also decentralized within the city proper. Plants used on farmland and in urban farming are optimized for the particular climate conditions and need little water, fertilizer or pesticides

SCENARIO 5

To reduce vulnerability, energy production takes place predominantly on a regional level. Renewables are complemented by domestic fossil fuels. Shale gas is being exploited as a new energy source in regions like North America and China, which have few conventional gas resources. Interconnected power plants and smart grids, in combination with demand reductions resulting from efficiency gains, allow for energy provision at stable costs in most regions.

Polymakers Focus on Fighting Crises Together

National policies provide strong frameworks for financial, goods and labor markets. Safety and resource efficiency standards are considered issues of national security. Most countries are collaborating

*Supply safety drives regional sourcing and international cooperation.*

intensely in common markets and in monetary and political unions. The latter aim at being big enough to source strategically important goods jointly. Neighboring countries are collaborating through

regional trade agreements to access rare resources. Disaster relief is based on global cooperative support, as all parts of the world are equally concerned by natural and manmade threats.

Efficiency measures are compulsory to reduce resource needs. The maximum material intensity of a product or service is politically defined, and a special tax imposed on the end consumer incentivizes the careful use of resources. However, the need for redundant systems and hibernating manufacturing sites offsets much of the efficiency efforts.

In addition to such regulatory measures, affluent countries in Asia and Latin America use their financial muscle to ensure supply security. They invest in redundant infrastructures and financially support the exploitation of national raw materials. National budgets are also used to subsidize corporations in providing over-

*Resilient infrastructures.*

capacity in manufacturing sites. Furthermore, nations invest in education to secure the skills needed for running a mostly autarkic economy.

The pursuit of resilience also affects transport and logistics: To ensure that a maximum range of transport modes remain functional even during catastrophic events, redundant infrastructures are put in place. Given the great political emphasis put on capable infrastructure in many countries, at least one infrastructural backbone is publicly owned.



## Technology to Reduce Vulnerabilities

Automated manufacturing facilities are specifically designed to be resilient. Artificial intelligence software analyzes the data streams from large groups of machines to autonomously find ways for optimizing production, as well as detect work-arounds for failures in parts of the system.

Worldwide, a huge variety of materials is used as every region tries to base production on endogenous resources. Product components usually contain a data chip that stores the respective part's entire lifecycle and its conditions of use. This allows for an optimal repair and maintenance routine, including the recycling of raw materials.

*Swarm intelligence supports autonomous risk detection and adaptation of machines.*

Particularly in the mature countries, urban legacy infrastructure is highly vulnerable due to its low capacity and exposure to recurring natural hazards. Decentralized solutions to provide drinking water, energy, etc. – originally developed as emergency measures – are being used for everyday supply. Small wastewater treatment devices for apartment houses clean the water to a degree sufficient for use in toilets, showers and for watering plants. Also, heat from warm wastewater is recovered. These technologies are included in almost all new buildings to increase cities' resilience.

## Abundance Was Then, Redundance Is Now

Almost everyone of working age is either in active employment or part of the backup workforce. Various models are used for financing and using this additional reservoir, ranging from job rotation with shared workplaces to temporary labor coupled with a basic income for the currently unemployed. A few regions in the world, however, are unable to afford such models and fall behind in terms of economic resilience.

Due to the erosion of world trade, prosperity hugely depends on regional production and consumption conditions. Most individuals' standard of living, both in the "old" industrialized world as well as in the BRIC countries, is on the level of the low middle class in Central Europe four decades ago. They live in relative comfort, but cannot afford luxury consumption. Still, the modular design of many products allows individualization through the specific assembly of standardized units to match personal customer preferences at affordable prices. This design is not only

SCENARIO 5

repair-friendly, but also allows product adaptations to follow changes in customer needs. Consumers try to retain their possessions for as long as possible and prefer to have private goods fixed rather than throwing them away. Renting services are available everywhere and allow the short-time use of all kinds of goods, such as power tools, bikes, zip cars, etc.

Most people live in urban regions or next to the main traffic routes. In many of the old industrialized countries – in particular Europe and Japan, and to a lesser degree North America – population decline leads to shrinking urban regions. Only some remain highly attractive tier-one cities. The shrinking process poses tremendous challenges for societies: On the one hand, they need

*Safety paradigm changes manufacturing paradigms and infrastructure setup.*

to cater to the needs of an aging population. On the other hand, infrastructure investments have to be made to build redundant backbones. Even rarely used quarters are kept in good shape, ensuring

emergency capacity to house evacuated people in case of disasters. Asian and Latin American cities, for their part, are growing dynamically. More than ever before, these cities offer a better life, jobs and education – supported by new urban infrastructure based on the most modern concepts and technologies available.

The need to create redundant production facilities leads to several adaptation measures in manufacturing. Some production facilities hibernate and are activated at very short notice. Permanent operation below capacity leaves headroom in case of unforeseen events. Industrial fabbing sites are able to switch production to other components almost immediately. Supply safety is further enhanced by dispersed warehousing of components and huge warehouse structures located close to the manufacturer. All these measures lower efficiency in production, but boost its resilience.

In transportation and logistics, a “100% scan” rule is applied to minimize the danger of manmade hazards. Even though this reduces the speed of handling, the safety-first mentality leads operators and customers to accept the lower efficiency of logistics.

**Reduced Margins, Increased Stability**

Thanks to the numerous resilience strategies of countries and corporations, the world is operating in a kind of “safety mode.” Increasing resilience drives economic decisions much more than the desire to maximize efficiency. The return-on-invest-cycles are

much longer now than they were a few decades ago, but reduced profit margins are outweighed by the increased stability of the economy.

However, the paradigm shift comes with a price: Economic development is stagnating. Hardest hit are the old industrialized countries. The formerly so-called emerging countries continued to enjoy dynamic economic development, but now also have to cope with much lower growth rates.

Companies are replacing their formerly lean production with redundant systems, fuelled by multiple regional supply sources. Some large companies resort to vertical supply chain integration: a renaissance for conglomerates.

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*Resilience aim leads to regionalization of trade.*

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Production takes place in dispersed production sites close to the markets. Global supply chains only exist for some resources that cannot be exploited at reasonable costs in domestic markets. As a consequence, intercontinental trade is more or less limited to raw materials and some goods with an unbeatable efficiency advantage when produced abroad.

While the economic world may be rather fragmented, the global community stands together and offers support where necessary when major disasters strike. The rapid reaction forces of neighboring countries collaborate with each other.

### *How It Came About – Looking Back on Four Decades of Developments*

In the early 21st century, the dominating business paradigm was strongly oriented towards process optimization and lean structures. This created an extremely fragmented global economy: companies as well as regions became highly specialized wherever competitive advantages could be gained.

Energy price development remained relatively constant in real terms. Cheap transport fostered economic growth and decentralized supply chains. Gradually, renewables also gained ground. Around 2020, they became cost competitive, which further stabilized energy prices.

Intense price competition resulted in cheap products consumed globally. Fads and fashions around the world further fuelled short product cycles. As a result, the global economy grew unhindered,

SCENARIO 5

while business and political actors did not take into account the negative impacts of this growth: carbon emissions driving climate change, resource problems getting more serious, waste disposal, to name but a few.

In the early 2030s, natural disasters started to seriously dent the world's growth curve. Climate change triggered floods, droughts and hurricanes. The affected areas were largely unprepared. Tsunamis and earthquakes devastated densely populated coastal regions. Global transport routes proved to be highly vulnerable as extreme weather events affected sea, air and ground transport. For example, after a destructive typhoon hit Chinese production sites, almost the entire automotive industry was brought to a standstill.

While piracy had been limited to the Horn of Africa in the first decade of the 21st century, it slowly spread to many other areas around the globe, with some of the groups even focusing on other

*Disasters lead to a severe breakdown of the world's supply chains.*

transport modes as well. What is more, radicalized social groups who had been left behind by economic development shocked the world with far-reaching attacks on infrastructure. The direct impact

of disasters, terrorism and piracy repeatedly paralyzed economic powerhouses and the lean supply chain system showed its soft underbelly: frailty and vulnerability.

As the first shortages appeared, businesses began to broaden their supplier base and increasingly explored near-shoring options. The value of all things local and national was rediscovered.

The political community fostered the process of rediscovering local resources and production facilities and, at the same time, passed legislation which made supply safety mandatory for businesses. The result was a duplication of similar manufacturing and production facilities in every market region or even in every country. What had previously been considered inefficient was now embraced for its high safety potential.

Everyday life is much less consumption-oriented than it used to be and products are much more expensive. However, society has learned to cope with risks and threats and is handling them as "normal," everyday events.

### Key Take-Aways: Implications for the Logistics Industry

- The resilient world in 2050, with regionalized trade, relies on a logistics sector that ensures the delivery of products in spite of unforeseen events. While timeliness no longer plays the key role it once did, supply security is a top priority.
- With the regionalization of economic activity, the hub-and-spokes architecture changes. Global hubs no longer enjoy their former flagship position. They are replaced by a number of regional hubs located in safe regions.
- How does the regionalization of supply chains affect the role of global logistics companies? One thing is clear: Shorter transport distances with lower volumes, due to multiple suppliers, favor logistics companies with regional or local roots.

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#### *Global players in a regional world?*

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- However, big international providers continue to play a major role. The capital capacity of large players is needed to provide a fragile supply chain with enough backup infrastructure and machinery and guarantee reliable transport in unstable and hazardous times.
- To ensure maximum resilience of the supply chain, logistics firms maintain largely dormant or redundant capacities at the ready, enabling them to quickly shift goods from one transport mode to another in case of emergency.
- With increasing natural and manmade risks, even pipelines for gas, oil or water are regarded as too vulnerable to be relied on. Trucks, trains and ships stand ready to replace them.
- However, such extensive backup systems are asset-heavy and conflict with the aim of carbon reduction. To counter this effect and balance energy efficiency and supply chain resilience, sophisticated logistics planning is used to achieve high capacity utilization.
- Owing to risk reduction efforts, complex just-in-time delivery processes no longer exist. Instead, huge warehouse structures located close to the manufacturer are seen as indispensable buffers.

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#### *Revival of warehousing to back up failures in logistics processes.*

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## SCENARIO 5

- In parallel, the relevance of express logistics has declined dramatically. Overnight and same-day delivery of spare parts is not very common, as producers aim to have all necessary parts in stock.
- At the same time, however, the quick delivery of emergency aid for disasters plays a highly important role. As disruptions and disasters have become a frequent challenge in many parts of the world, fast relief operations is regarded as a high-priority and profitable business.
- Emergency logistics providers support nations at risk by offering comprehensive disaster response services. This includes bringing in the relief equipment, evacuating people at risk, cleaning up damaged areas as well as re-establishing energy and water supply. The latter tasks involve the reconstruction of damaged buildings and infrastructure – either in the disaster area or in a new and safer region.

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*Emergency relief: A huge area of business for logistics.*

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- In addition, logistics companies also offer consulting services to quickly recondition manufacturing sites after destruction or failures.
- Given lower consumption levels and more focus on long-lasting products, the need for frequent household deliveries has declined. However, the need for service and maintenance of domestic technologies (such as water and energy generation facilities at home) is growing. Thus, logistics providers combine the operation of the last mile with offering technical services on the spot, including, for example, the collection of used products in order to recycle rare resources.
- In some parts of the world the last mile delivery network is also maintained as a backup service for communication in case online systems fail.

EFFECTS OF SCENARIO 5

	Untamed Economy – Impending Collapse	Mega-Efficiency in Megacities	Customized Lifestyles	Paralyzing Protectionism	Global Resilience – Local Adaptation
World GDP development	↑	↗	↗	↘	→
Quantity of global flows	↑	↗	↘	↓	↘
Environmental quality	↓	↗	→	↘	→
Regulatory openness	↑	↗	→	↓	→
Classic logistics growth potential	↑	↗	↘	↘	→
New business perspectives for logistics	↘	↗	↗	↘	↗
Transformation intensity for logistics	→	↗	↑	↑	↑

## **The Methodology**

### **Taking a Closer Look**

The study “Logistics 2050” developed explorative scenarios of the future for the logistics industry with a long-term and global perspective. The study aims to foster dialogue about the future of logistics by describing a number of different pictures of the world in 2050.

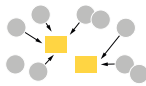
Scenario generation represents a method that is well-suited to systematically identify and describe complex and consistent visions of the future. In futures research, the scenario technique is a key tool used to create alternative images of the future, which can then be compared with each other. Generally, scenarios combine positive and negative aspects, thus providing food for thought on both risks and opportunities, as well as options and strategies. By extending alternative developments into the future, scenarios raise awareness of possible changes of the environment. They assist in identifying and clarifying strategic objectives and preparing knowledge for decision-makers. Since the focus rests not only on the possible future environment, but also on the implications taken from the scenarios, they are the method of choice for reflections on long-term oriented strategies and policy measures.

The Deutsche Post DHL “Logistics 2050” scenario process, which was designed and conducted by foresight experts of Z\_punkt The Foresight Company, is outlined in (see page 105) and described in the following section.



THE PROCESS

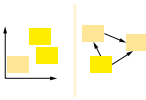
Influencing Factors



- Initial set of 62 factors
- Cluster and consolidate to 27 influencing factors



Key Factors



- Distill 14 key factors via expert input and a cross-impact analysis



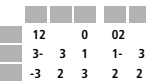
Projections



- Assess the possible future developments for each key factor through expert interviews and additional research



Raw Scenarios



- Apply consistency analysis to the projections
- Use analysis results to construct five raw scenarios



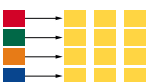
Final Scenarios



- Fine tune and finalize the five scenarios through an expert workshop



Implications



- Derive strategic implications of each scenario for the logistics industry based on top management input



Strategies



- Finalize impact analysis through an expert workshop



Publication



- Integrate the scenarios and implications into the final publication

A SHORT PROCESS DESCRIPTION

First, through an environmental analysis, all relevant **influencing factors** were compiled.

The next step was to estimate – with the help of internal and external experts – the **key factors**, or main drivers, and their further development (future **projections**).

This formed the basis for the construction of the **raw scenarios** using software-based **consistency analysis**. The purpose of this was to check which projections of a key factor “match” which projections of the other key factors.

This resulted in five internally consistent future **scenarios** that are substantially different from each other.

A final impact analysis then helped to determine the **strategic implications** of the various scenarios for logistics.

## **Environmental Scanning and Key Factor Analysis**

Scenario processes are based on key factors, i.e., factors which characterize or significantly determine a given subject and its future development. While all forecasts are uncertain, the degree of uncertainty about the possible future development of individual factors may differ. Demographic trends, for example, are characterized by comparatively low forecast uncertainties. Economic factors, such as consumer preferences, on the other hand, are often subject to considerable uncertainties. Therefore, key factors fall into two categories: factors with relatively low uncertainty, where only one parameter has to be considered for scenario construction, and factors with relatively high uncertainty, which require the consideration of several parameters in the scenario construction. The value of key factors lies in the reduction of complexity: selecting the most relevant influencing variables out of a very large number of parameters. This is done within so-called environmental scanning.

In the “Logistics 2050” process, numerous parameters – the so-called “influencing factors”, which determine trends in the environment of logistics – were identified, systematized, and classified. An initial long list, including more than 60 parameters, was reduced in a first step to 27 influencing factors by combining largely similar parameters.

In a survey, internal logistics experts of Deutsche Post DHL and external experts of Z\_punkt The Foresight Company assessed the shortened list of influencing factors, evaluating the degree of uncertainty and the impact strength of each influencing factor. Furthermore, as a next step, a cross-impact analysis of the 27 influencing factors was conducted in order to identify those factors which most actively drive future developments. The results of the survey and the cross-impact analysis served as the basis for determining the final list of 14 key factors (see page 107).

KEY FACTORS AND THEIR DEFINITIONS

	Key Factor	Short Definition
1	Level and Distribution of Income	Level and inequality of household incomes and wealth within and between countries.
2	Dominant Consumer Needs	The development of the most dominant consumer preferences and purchasing decision criteria for products and services (e.g., price, prestige, functionality, security, health, sustainability, education, entertainment).
3	Quality of Urban Development	The way in which urban areas will develop in the developed world and in the emerging countries in terms of infrastructure maintenance or expansion, the financial capacity of local authorities and the demographic change within cities' populations.
4	Distribution of Production and World Trade	Global dissemination of production facilities, the resulting trade flows of commodities and goods, and the organization of supply chains.
5	Energy Price and Energy Mix	Fuel and energy price level and the share of fossil and renewable fuels in the energy mix.
6	Availability and Price of Raw Materials and Resources	Companies' and peoples' access to (critical) materials (e.g., water, metals, rare earths) and the price level of resources.
7	Level of Climate Change	The level of global warming as well as the number and impact of natural disasters.
8	Regulatory and Spending Policies	The level of and balance between spending and regulatory policy, the former including social redistribution, subsidies and public investments, the latter referring to the general economic framework (property rights, competition policy, etc.).
9	Trade Regulation	The rules and the framework which apply to the international exchange of goods and services (e.g., WTO rules, import restrictions, or customs)
10	Logistics and Transport Regulation	The rules, norms, and standards applying to the transportation of goods, with a focus on security, environmental and monetary objectives.
11	Political Stability and Economic Security	Political stability with regard to the international institutional framework, political cooperation, (inter-) national conflicts, terrorism, and corruption. Economic security in terms of property rights, criminality, and piracy.
12	ICT Systems and Robotics	Precision, reach and general functionality of information, communication and knowledge management systems, including tracking and tracing, geo data and robotics.
13	Material Technology	Structure and functionalities of materials in regard to goods, vehicles, vessels, packaging, and 3D-fabrication.
14	Infrastructure for International Exchange	Density and quality of road, train, shipping, flight, energy, and information infrastructure (also ports and airports) including funding, maintenance, and operation.

## **Determining Possible Future Developments**

For each key factor, several future developments are possible. Identifying these so-called projections was part of the next project step, in which expert interviews rendered the input for the identification of possible and plausible projections. A total of 22 interviews with internationally renowned experts from diverse fields were conducted. Each expert provided information and opinions on possible future developments on three to five key factors associated with her or his field of expertise. As a result, for each key factor, three to four projections were synthesized out of the information gathered during the expert interviews.

## **Scenario Generation**

The next major step in the construction of scenarios was a consistency check to identify possible conflicts and synergies between the projections. Each set of consistent projections of different key factors forms the basic structure of a scenario (also called raw scenario or projection bundle). A consistency check is necessary because projections of different key factors can harmonize well, but may also lead to implausible combinations. The number of possible raw scenarios grows rapidly with the number of key factors and projections. In this case, more than 15 million projection bundles existed, which required another reduction of complexity. Two methodological approaches were used to analyze interdependencies between key factors, reduce complexity, and check the consistency of the raw scenarios.

The morphological box (see page 110) maps key factors and their respective projections and helps to identify consistent or even synergetic syntheses of them. As scenario building is designed as a team process, consistencies were discussed and determined in a workshop in which experts from Deutsche Post DHL and Z\_punkt The Foresight Company participated. Issues of dissent were discussed intensively, which induced several changes to the initial structure of the projections.

An additional step employed a software-based approach, the consistency matrix and clustering. In this process, all pairs of projections of different key factors are assigned “consistency values” describing their compatibility. Then, the software calculates a consistency score for each projection bundle, allowing inconsistent and low-consistency bundles to be dropped. As is usually the case, a fairly large number of projection bundles remained. Hence, the next step was a clustering of projection bundles based not only

on similarities, but also on the findings of the initial cross-impact analysis of the influencing factors. Thus, in the clustering process, the projections of the most actively influencing factors were considered as given. Five of the identified clusters were then chosen as raw scenarios. In choosing these specific raw scenarios, an emphasis was laid on having each projection appear at least once in one of the scenarios so that the entire space of possibilities of future developments would be mirrored in the scenario selection.

METHODOLOGY

MORPHOLOGICAL BOX - KEY FACTORS AND PROJECTIONS

	Projection 1	Projection 2	Projection 3	Projection 4
Level and Distribution of Income	Lower External Divide (Stagnation in OECD)	Lower External Divide (Rise of Emerging Countries)	External and Internal Divides Narrow	
Dominant Consumer Needs	Shift to Immaterial Consumption + Catching up	Personalized Consumption	Predominately Material Needs	
Quality of Urban Development	Saturated Cities + Uncontrolled Growth	Organic Development + Uncontrolled Growth	Saturated Cities + Dynamic Progress	Organic Development + Dynamic Progress
Distribution of Production and World Trade	Deep Freeze of World Trade	Frayed Out World Trade	Robust World Trade	Extended Economic Miracle
Energy Price and Energy Mix	Decreasing Energy Price	Constant Energy Price: US \$ 80-100	Energy Price: Factor 2	Energy Price: Factor 3
Availability and Price of Raw Materials and Resources	Dramatic Scarcities	Efficiency Transformation	Efficiency Transformation + New Resource Deposits	
Level of Climate Change	The 2°C Turn-Around	The 3.5°C Possibility	The 6°C Disaster	
Regulatory and Spending Policy	Worldwide Focus on Regulatory Policy	1 + Spending Policies (Emerging Countries)	New Period of Deregulation and Privatisation	
Trade Regulation	Incremental WTO Development, RTAs	Renaissance of Protectionism	Rise of WTO	
Logistics and Transport Regulation	Focus on Safety	Focus on Environment	Focus on Revenues	
Political Stability and Economic Security	Global Governance and Stability	Cooperative Muddling Through	Competitive Muddling Through	Low Stability
ICT Systems and Robotics	Implementation of the Outernet	1 + Absolute Automation	2 + Artificial Intelligence	
Material Technology	Strong Diffusion of Smart, Bio and Lightweight Materials	Smart Materials + 3D Printing	Lagging Development of Materials Technology	
Infrastructure for International Exchange	Accelerating Decentralization	Global Supergrid	Lack of Infrastructure Development	

## **Validation and Enrichment of the Scenarios and Identifying Implications for the Logistics Industry**

The raw scenarios were discussed during two expert workshops with a number of external experts who had previously participated in the expert interviews, as well as internal experts of Deutsche Post DHL. The workshop participants elaborated on assumptions about the causalities or underlying “logic” of a scenario, and discussed possible paths leading to each scenario. They also generated and enriched ideas on how these future developments could influence the logistics industry. While the first workshop emphasized scenario enrichment, the second workshop focused more on the implications for the logistics industry and on possible strategic options.

In addition to the findings of the expert interviews and the scenario enrichment workshops, six high-ranking managers of Deutsche Post DHL were extensively interviewed on their perspective about the scenarios. Moreover, the top executives of Deutsche Post DHL were invited to evaluate in an online survey central logistics implications for each scenario in the time before the second expert workshop.

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## 3 Issues



### **The Future of Secure Communications in the Age of the Internet**

*by Jürgen Gerdes*

**“Everything has to change in order for everything to stay the same”**

*From The Leopard, by Giuseppe Tomasi de Lampedusa*

Over the years, many futurists – at least those who are professional academics – have reliably identified a number of future trends. However, when asked when their predictions will become reality, things become more difficult. “Nearly all technical developments are expected earlier than they actually arrive,” says Matthias Horx, probably the most prominent of all German futurologists. He says the reason for this is that Delphi studies, for instance, are based on opinion and even include the opinions of those experts who play a large role in the scientific progress of the particular topic under study. They are not really able to distance themselves from their hope that their objectives will be achieved as quickly as possible.

So, it is all the more surprising that the same experts in the international Delphi study “Prospects and Opportunities of Information and Communication Technologies (ICT) and Media,” published by the non-profit communications research organization Münchner Kreis, apparently think one of the most important issues in this field cannot be resolved, at least not in the foreseeable future. That is the question of how we can make the Internet secure for all users. In the report, which was published in 2009

and forecasts through the year 2030, the authors say the following under “Core messages” in Chapter II of the Executive Summary: “A worldwide unified solution for identity management (authentication and integrity) between any number of communications will be available in the distant future,” followed by a very foreboding prognosis, “but not until 2020 at the earliest, and potentially at a much later date, or possibly not even at all.”

Conceivably, this conclusion may have even shocked the researchers themselves. That might explain why, in the following year, the authors of the study placed much higher value in terms of scope and content on the subject of “communications security on the Web.” In their third Delphi study (2010), the security issue is pushed to the forefront as one of the three focal points. The 2010 report indicates that, “secure, trustworthy and reliable conduct in an increasingly digitized world is the future key factor for successful societies and economies.”

Up to now, when thinking about the future of the Internet, we have focused on the technical side of things and, to some extent, this remains the case today. Progress is now gaining speed again, the Web is becoming faster, storage capacities are larger, and application options are growing more diverse. The volume of stored data will increase hundreds of times over in a very short time. Real time transmissions have been possible for some time now. At best, we talk about whether we want a two-speed Internet. But all of this is relatively less important than the issue of security. And that makes it even harder to come up with a reliable prognosis: “However, many users are still unaware of, and need to be taught, the value of protecting personal and sensitive data on the Internet” (Delphi Study 2010).

At first and even second glance, the overall situation is unclear:

1. Firstly, the Internet is rife with danger, even for the most technically capable users.
2. Secondly, most users dismiss or ignore such danger.
3. Thirdly, a new economic success story will only come about when use of the Web is free of fear and danger.

How does a company like Deutsche Post DHL deal with conclusions like this? What impact do these findings have on the company’s business models? How is our relationship to the customer changing? What will the company’s future look like in 20 years, or in 40 year?

The last question is the easiest to answer: No one can say with any degree of certainty what Deutsche Post DHL will look like in the year 2050. Just take a look back at the last 40 years and review the development of ICT since then. With the exception of world-renowned scientist Marshall McLuhan, who coined the expression “global village,” none of the futurologists in 1990 could have predicted which media would shape our communications today. This is essentially no different for the next 20 years.

Therefore, the value of the above-mentioned Delphi studies, when it comes to addressing the future of the Internet, is less in the description of future scenarios and more in the questions they raise: How do we create a secure Web? Whoever can answer this question can unlock new and potentially major business and possibly gain the all-important competitive edge in eBusiness.

For its part, Deutsche Post DHL is a company that one could say makes its money with a 500-year-old business idea: delivering the mail from A to B. This is a service, by the way, that sees ever-dwindling demand as the use of email continues to spread. How can you transfer such a business to the World Wide Web?

We will not find the answer in well-founded but bold predictions for the years 2030 to 2050. Instead, we have a better chance of answering this question by looking into our company's past – to the origins of Deutsche Post when Franz von Taxis built a modern mail system for the Habsburg dynasties in Germany. Von Taxis was a very clever and far-sighted businessman. He developed a business plan that to this day remains unparalleled. His unique selling point was not delivering letters. The Habsburg postmen were already doing this. The real innovation at the time was the logistics behind the mail operation that Taxis developed. This system guaranteed a mail service that was confidential, binding and reliable. For the first time, a recipient could be sure that the sender was really the one indicated on the letter. And, conversely, the sender knew that the message would reach the right recipient. This was an invaluable service during somewhat turbulent times.

The Internet today is really no different. Secure identification of the other party in online communications is exactly the current business model of Deutsche Post DHL. This includes the inviolability of the mail, which is one of the main pillars of our democratic society. Just as it was important and possibly even vital to one's survival during the Habsburg Empire, so it is also important for us today to be certain that the contents of our communications are not read by unauthorized persons. This is a service that Deutsche Post DHL offers and has brought to the Internet in the

form of the E-Postbrief, our digital letter. Taxis' "start-up" idea, therefore, not only fits today's digital world, it also forms the backbone of Deutsche Post DHL's future in the 21st century.

But this isn't the whole story. Deutsche Post DHL carries a responsibility toward its customers that goes beyond a standard business relationship, as the example of the mail's inviolability demonstrates. This is expressed in the extraordinarily high levels of satisfaction the company receives in customer surveys, which provide further proof of the trust that people have in the company.

This trust would be questioned if Deutsche Post DHL did not have an answer to the uncertainties of many users, who at best have an uneasy sense of the dangers on the Web, but cannot really put a finger on it. Consequently, our company began to think about what it could do to make the information highway more transparent and, above all, credible. Deutsche Post has established a chair at the Technical University of Munich that will focus on how the Internet can be made more secure. At the same time, the company has founded a non-profit organization aimed at drawing public attention to the dangers on the Internet. This is urgently required, according to the Delphi study.

We do not really know what the future holds for Deutsche Post DHL. And, when reviewing forecasts and predictions, we need to take care not to be tempted to extrapolate blindly into the future based on only one or two of the various criteria that impact our business. This will lead us astray. Nevertheless, we need to analyze individual trends and respond to them as a company.

One thing is clear when we step back and look at the question of "the Deutsche Post DHL of the future": The company will look completely different in 2030 than it does today – and, in 2050 even more so. Between now and then, a transformation will take place and very little of what we see today may remain. However, our core business idea is just as strong today as it was half a millennium ago. We owe this insight to a wide range of forward-looking studies. That is why we can look to the Italian writer Lampedusa as a guide for the future: "Everything has to change in order for everything to stay the same."



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## **Beyond Double-Digit Growth: Perspectives for Sustained Prosperity in Asia**

*by Jerry Hsu*

I recently met a distinguished historian who told me with great confidence that ‘Asia’ didn’t exist until Europeans invented it. Each of the many nations in the region, he explained, thought of itself as unique and apart from the others, a continent unto itself, so to speak, until European traders came along and gave the region a single unifying name.

He made an elaborate argument, but he was wrong. Asia has existed for millennia and the glue that holds this unique continent together is a set of core values that just about all Asians share – values that center on family, education and financial thrift.

While it is true that there is great cultural diversity across the continent, it is these core values, more than anything else, that define what it means to be Asian. They are at the heart of an identity that all Asians, from Turkey to Thailand, recognize and adhere to with pride.

These core values, more than anything else, have also helped propel Asian nations to the forefront of the global economy.



## **Asia Is Big**

Just about every aspect of Asia is impressive.

With about 30% of the planet's land area, it is the world's largest continent. Its lands stretch from the shores of the Black Sea in the west to the easternmost tip of Siberia, and from the Arctic Ocean in the north to the Torres Strait that separates New Guinea from Australia.

In addition to being big, Asia is also rich. It possesses vast mineral and agricultural resources. But, without a doubt, the continent's most valuable resource is its large and industrious population. Asia is home to just under 4 billion people, about 60% of the world's population.

Three of the four most populous countries in the world are located here. About 1.4 billion people live in China, about 1.1 billion live in India and about 230 million live in Indonesia.

Asia also supports an almost mind-boggling array of cultural diversity. More than 2,100 different languages are spoken in its 48 independent nations, and the world's four major religions were born here – Buddhism, Christianity, Hinduism and Islam.

While Asia can be proud of this rich heritage, history is still being made here today. Where once only the extremes of wrenching poverty and fabulous wealth existed, a huge and affluent middle class is now rising up and flexing its economic and political muscle.

Countries such as Singapore, Taiwan, Korea and Japan have almost completely eliminated poverty within their borders, and countries like India and China are catching up.

## **Asia's Economic Miracle**

Everyone who reads a newspaper, drives a car or shops at the local mall knows how successfully Asian nations compete in the world economy. Chinese electronics, Korean cars, Indian call centers, Japanese robots – the list of product categories that Asian nations dominate is almost endless, and it is continually growing longer. Looking at Asia's gleaming cities and powerhouse economies, it is hard to imagine that only 60 years ago Japan, China and the East Asian 'Tigers' were just beginning to recover from the devastation of the Second World War and its Cold War aftermath. Entire cities were in ruin, refugees roamed from country to country, and food was in short supply.

With Asia's traditional values to guide them, millions of entrepreneurs and small businessmen began the arduous task of rebuilding their lives and businesses. They succeeded beyond everyone's wildest expectations. Today, many East and Southeast Asian countries can be counted among the most economically advanced nations in the world, and India is not far behind.

China and Japan have significant aerospace and satellite capabilities and both are gearing up to produce commercial aircraft. Thailand is fast becoming one of the world's major automotive engineering and manufacturing centers. Indian firms are playing an ever more dominant role in computer software and systems development. Korean firms have taken the lead in television and computer display technology.

### **Will Growth Continue?**

The question is not whether Asian economies can compete successfully on a global scale – this has already been achieved – but whether they can sustain the current furious pace of growth over the long term. The answer, I believe, is yes... and no.

Can the huge trade imbalances that currently fuel the growth of Asian economies be sustained over the next 50 years? In my opinion, they cannot.

In one way or another, trade patterns between Asia and the rest of the world will eventually balance out. But that doesn't mean that the region's economies will slow down. In fact, I am sure they won't.

GDP (gross domestic product) is not purely a function of inbound or outbound trade. Investment and domestic consumption are also important factors.

When we look at countries like China, India, Korea, Thailand and Indonesia today, we see massive investments in sophisticated infrastructure, education and industrial productivity. This, I am sure, is the beginning of an important transformation.

Asian nations are taking the funds they are accumulating as a result of their export-driven trade policies and re-directing them into the domestic sector. The redeployment of capital in this way has many positive impacts, but, most significantly, it is creating an affluent middle-class. In just the last three years, for example, China has doubled the number of citizens earning US\$12,500 a year from 250 million to 500 million.

As international trade levels balance out – which they will – this redirection of capital reserves into the domestic economy will fuel the continued expansion of an affluent middle-class.

When Asians have money, they do two things with it – they save it and they spend it. As more Asians become affluent, there will be more spending and more saving. Both these activities stimulate and sustain economic growth.

The only danger I can see is Asians abandoning their traditional emphasis on fiscal prudence. Consumption is needed to stimulate the economy, but if consumers go overboard and over-consume, the economy can be damaged.

Striking the right balance won't be easy. But, hopefully, a proclivity towards traditional Asian thrift will help countries like China, India, Singapore and Korea to maintain growth without excessive debt.

## **Implications for DHL**

The growing depth and sophistication of Asia's economies, coupled with the fast-increasing number of consumers in the region, is good news for DHL.

Our relationship with Asia-based multinationals has always been excellent. As large Asian businesses grow and evolve in the future, DHL will continue to be there to meet their needs.

But, I see a real growth spurt coming from Small and Medium Enterprises (SMEs). This is the real opportunity for DHL.

The number of SMEs in Asia is growing by leaps and bounds and, as these businesses proliferate, they are increasingly reaching out to customers elsewhere in Asia and in other parts of the world.

However, generating loyalty in the SME market isn't easy. SMEs are very demanding. They want everything to be perfect. They want their courier pickups to be on time. They want their packages and envelopes to arrive on schedule and without damage. They want competitive pricing. And, they absolutely do not want to hear excuses if we fall short in any way. They know our competitors are just a phone call away and eager for their business.

Meeting the expectations of customers in this segment requires an efficient network, continuous training and, most importantly, the right business strategy.

Right now, I believe, DHL is way ahead of the competition. Our Asian network, hubs, air fleet, ground fleet and local facilities are all unmatched. And, we also have the best people in the industry working for us.

But, if we are going to maintain our position as 'No. 1,' our investments in hardware and people alone will not be enough. Another critical ingredient is necessary and that is an intimate knowledge of the local market.

### **The Local Touch**

We at DHL strongly believe in the importance of the local touch. We may be a big international company, but we understand that we are obligated to serve our customers in accordance with local customs and business practices. After all, we can't expect local markets to change the way they do business just for us.

Local expertise, however, is an elusive element that isn't easy for a big company to find and integrate into its corporate DNA.

In each market where we do business, we begin the process of 'localization' by listening very carefully to what our customers and employees tell us. Based on this knowledge, we then try to identify and forge close working relationships with successful local logistics companies.

These partnerships are a two-way street, genuinely beneficial to both sides. We leverage our partner's history and experience and their local customer 'touch.' In return, they gain access to our international network and our expertise in moving goods around the globe.

Our long-term relationship with Sinotrans in China is a good example. In fact, it is probably one of the best joint venture relationships I have seen in all the years I have worked in China. We have been working with them since 1986. They provide us with local knowledge, local contacts and local relationships, and we provide them with access to the world's best international logistics network and to our world-class business and management practices. Blue Dart Express is another good example. They are the No. 1 courier and integrated express package distribution company in

India, with more than 40% of the market. No outside company knows India like they do. We began working with them in 2002 and our alliance became so tight and so mutually beneficial that, in 2005, we took an 82% stake and brought them into the DHL family.

## **Building Trust**

One of the differences between Asia-based companies and their counterparts in Europe and North America is the tendency for Asia-based companies to keep logistics and supply chain operations in-house. This trend is driven, in part, by a lack of trust in outside service providers and, also, in part, by a lack of appreciation for how complex modern supply chain processes are becoming.

This is frustrating for us and, as the recent Japanese earthquake and tsunami demonstrated, it can create unexpected and costly problems for companies that manage their own logistics.

The area impacted by the double natural disaster in Japan in early 2011 is a major hi-tech and automotive manufacturing center. In the wake of the devastation, many companies experienced supply chain disruptions that sometimes took weeks to overcome. DHL, on the other hand, came through the crisis pretty well.

Our task is clear. We have to demonstrate to Asian businesses that we have the world's best logistics resources and an unrivaled expertise in transport and inventory management, and that we are 100% reliable, 24/7.

Given that Asian companies are notoriously conservative about outsourcing critical functions, such as supply chain management, building this kind of trust is a challenge that is going to take some time.

## What the Future Holds

Over the past 50 or 60 years, Asian businesses have learned a lot from the West about the importance of nimbleness and innovation. And, they have applied what they learned extremely well. But the tables have turned and the world is now learning something from Asia. The deeply rooted values that put family, education and financial thrift at the center of every Asian's life are now resonating around the world.

I believe that this two-way exchange of values between East and West bodes well for everyone everywhere.

As I write these concluding words, I find myself thinking about the grandchildren I hope my children will give me one day.

As they grow into productive adults, I don't want them to think of themselves as Asian or Western. I want them to think of themselves as international citizens who naturally combine the best values from both worlds.

I want them to cherish their family and value education as Asians do. But, I also want them to approach the tasks and problems they will encounter in their lives innovatively, like a Westerner, and to be able to react to opportunities with nimbleness.

In this sense, I believe that the future of Asia is the future of the world... and vice versa.



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## **Why I Believe in a Bright Future for Africa**

*by Amadou Diallo*

As I reflect on the future of Africa, I find my thoughts repeatedly drifting back to my own past.

My parents entered this world in a small village in Senegal, in the Northwest of Africa. It was a poor place, without running water or electricity. My ancestors were cow herders.

But, nonetheless, there was opportunity. Senegal's capital city, Dakar, where I was born and educated, is a cosmopolitan center with world-class schools and libraries. The education I received there as I came of age propelled me on to universities in France and Britain, and to an international career that eventually brought me to DHL.

My own experience as an African is a good illustration of both the formidable challenges that confront this vast continent and the tremendous opportunities that await it.

With an area of about 30 million square kilometers, Africa is the world's second largest continent – only Asia is bigger – and it is home to more than 1 billion people. The continent also possesses about 10% of the world's petroleum reserves, and it holds about 90% of the world's cobalt, 90% of the world's platinum, 50% of the world's gold, 98% of the world's chromium, and one-third of the world's uranium. Of course, there are also vast tracts of farmland under cultivation, producing everything from maize and wheat to asparagus and wine grapes.

There are 54 independent countries in Africa today. That may seem like a lot, but this number doesn't even begin to hint at the continent's incredible cultural diversity. More than 3,000 different languages are spoken across the savannas, forests and mountains, each one representing a unique cultural tradition. In addition to a broad spectrum of traditional belief systems, my continent also lays claim to the world's most ancient Christian communities and its oldest Islamic universities.

Sadly, Africa also possesses a history stained with colonialism and slavery.

This dark period, which lasted well into the 20th century, was traumatic for Africans in many profound ways, both emotional and economic. While countries in Europe, America and Asia focused on building modern global economies after the Second World War, Africa's best and brightest struggled to take control of their own destinies.

### **A New Beginning**

I am happy to say that in the 21st century the struggle for independence is well behind us. My kids will only know about it from their history books. Today, we are producing 700,000 university graduates every year who are concerned about the future – what they need to do for their kids – and transforming the continent and integrating it into the global economy.

Now that independence is a reality, Africa's nations are moving to the next level and coming together around their common linguistic, social and economic bonds.

Since 1975, 15 countries to the West of the continent have been working together in the Economic Community of West African States. The mission of ECOWAS is to promote economic integration in the region and to foster collective self-sufficiency.

In the South, the Southern African Development Community was established in 1980 to facilitate socio-economic cooperation and integration among that region's 15 member states.

And, on the Eastern side of the continent, the Common Market for Eastern and Southern Africa stretches from Libya to Zimbabwe. Formed in 1994, COMESA aims to create a fully integrated, internationally competitive regional economic community.



This kind of cooperation bodes well for the future.

Sure, progress is slow. There are huge diversities to contend with. There are different political and business interests that need to be addressed. But, we shouldn't forget that the European Community required more than 50 years to arrive at its present state of social and economic integration, and that ASEAN, founded in 1967, has only recently begun to deliver real economic benefits to its member states.

What is important is that momentum has been established, and I have faith that we will continue to see African states cooperating more and more closely for common benefit... and for the benefit of their citizens. I think 50 years from now we will see four or five well-integrated regional entities seamlessly engaged in trade with one another and with the rest of the world.

### **Investment Is Flowing**

The timing of this accelerating trend toward economic cooperation and integration could not be better. As the populations of Asia and Latin America become more affluent, there is an ever increasing demand for energy, food, housing and basic consumer goods such as clothing and shoes. As Africans continue to develop their economy, they will be in a good position to supply these commodities to the world, efficiently and at reasonable prices.

It seems they are off to a good start. Trade between Africa and China topped US\$100 billion in 2010. Trade with India was over US\$50 billion. In fact, the volume of trade between Africa and Asia was higher in 2010 than the trade between Africa and all the other regions of the world combined.

Of course, sustaining this growth for the long term will require tremendous investment in both infrastructure and production, especially if African businesses are going to emphasize value-added manufacturing over the export of energy and natural resources.

Again, I am optimistic. The global economy is really a simple system at heart. Money flows to areas that have the greatest potential to make a profit, and many areas in Africa are looking very attractive to both offshore and onshore investors right now.

Unfortunately, this success story is not well known outside of Africa. Although famines and civil wars generate spectacular images that are prominently reported on the front pages of newspapers

around the world, when someone like Nigerian-based billionaire Aliko Dangote invests a billion dollars in an African industrial project, it almost never makes headlines. I guess images of progress just do not sell newspapers.

It is estimated that Mr. Dangote is personally worth more than US\$13 billion and his company, Dangote Group, is the most capitalized company on the Nigeria Stock Exchange with a value of over US\$3 billion. His businesses include food processing, cement manufacturing and freight.

There are many investors like Mr. Dangote on the continent right now who are putting their 'smart' money behind crucial infrastructure and industrial projects. A recent study conducted by a respected African NGO reported that African countries collectively received about US\$50 billion in investment from outside the continent during the most recent year for which statistics are available. But this amount represents only about 30% of the total investment in Africa for that year. The other 70% was generated from sources inside Africa.

### **DHL's Role**

This is encouraging news, but money is not the only thing that the African economy needs. Once minerals are extracted and processed, once goods are manufactured, they need to be shipped to customers located elsewhere on the continent and in other parts of the world.

If you cannot move the goods efficiently once they are produced, they have no value. Companies will fail. Employees will be out of work.

We at DHL understand how important our services are to the competitiveness of the African economy.

Actually, we have understood this for a very long time. We are the only logistics company operating in every country on the continent – a milestone we reached more than 30 years ago.

The most important investment that DHL Global Forwarding has made in Africa, however, is in the development of our people. No other company can match the knowledge of local markets that our employees possess, and the capabilities of our African teammates are further enhanced by 24-hour connectivity to seasoned specialists located at DHL 'Centers of Excellence' in Asia, Europe and North America.

## Intangible Dividends

Africa is one of DHL's fastest growing markets. In the first quarter of 2011, revenue growth in Africa was up more than 25% year-on-year.

DHL operates in all African countries, offering end-to-end supply chain solutions with over 300,000 square meters of warehouse space in all Sub-Saharan Africa and operates a fleet of more than 2,000 owned and sub-contracted vehicles and 17 aircraft.

As DHL is equally present in all other geographies of the globe, we are therefore better placed than anyone else to connect Africa to the world and enable investors, importers, exporters and consumers to have and make better choices.

For me, personally, contributing to a bright future for my home continent is just about the sweetest reward I can earn as a professional. It is a reward I could not possibly have imagined when I first entered school as a cow herder's grandson.



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*Amadou Diallo is Chief Executive Officer of DHL Freight and a member of the DHL Global Forwarding, Freight Management Board. Previously, he was Chief Executive Officer of Africa and South Asia Pacific for DHL Global Forwarding. Mr. Diallo has more than 20 years of experience in the tourism, banking, express and logistics industries and has worked across all geographies in Europe, Africa and Asia. Since February 1, 2010, he has been a Board Member of the Singapore Economic Development Board. Mr. Diallo is also a member of the Universal Business School of Mumbai. He was born in Senegal and is fluent in several languages including English, German, French, Fulani, Wolof and Spanish.*

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## **Vulnerability and Security in the 21st Century**

*by Professor Herfried Münkler*

Ensuring security has always been one of the most important responsibilities of political systems and organizations. With the conception of the institutional territorial state in Europe, a specific security regime was established and, to this day, the functioning and effectiveness of this security regime forms the basis of our expectations for safety and security. But the established order of states is experiencing a dynamic transformation process. Today, non-territorial political players have assumed an increasing amount of power and influence. Most recently, the dividing line between war and criminality, one of the greatest achievements of the modern state, has been blurred. The security regime established in Europe in the 16th and 17th centuries, which survived the sometimes brutal test of time through to the end of the 20th century, now faces a fundamentally new landscape. And this raises the question: how will security be guaranteed in the 21st century? Who will provide security in the future, how will they do it, what will be their conditions for providing security and what will be the costs?

Security is a collective good and the problem with collective goods is that no one can be excluded from using them. And, in the case of security, no mechanism exists for cost sharing. There is no way to ensure that “consumers” of security each carry their share of the cost burden. Security regimes have a “freeloader” problem and the long term sustainability of these regimes depends in no small part on how they handle or solve this problem. Gated cities, residential

communities cordoned off and “secured” from their surroundings by fences and security guards, are an answer to this problem, but do not represent a satisfactory solution. For starters, there is the question of how to secure the connections between the gated areas. In addition, there is the fear that growing security threats outside the gates will lead to increased pressure on the gated communities and increased security costs. The privatization of security may solve the “freeloader” problem temporarily, but is not a satisfactory or sustainable solution to the problem of growing security costs.

To appreciate the magnitude of the challenge, it is useful to take another look at the typical security regime of the institutional territorial state. This is characterized by the territorialization of governance, i.e., governance based on more or less clearly defined geographic territories and no longer on individual population groups. The state assumed responsibility for security and order in the given territory and demanded in exchange the obedience and compliance of all the people living within the given boundaries. The English political theorist Thomas Hobbes, writing in the mid-17th century, summed up this exchange between citizens and the state with the phrase: *oboedientia pro protectione* or “obedience for protection”. This obedience also included the willingness to pay taxes, which were used to finance security services. The spatial boundaries made the collective security politically manageable and if some people paid more and others less (or nothing) for this, it could be justified by the different intensities of “use” of the security services. Because the wealthy were vulnerable to a greater degree than the poor, it was fair for them to contribute more for security services than poorer citizens who had “nothing to lose.”

Just as important as the fair distribution of the costs and benefits of security, was the distinction that territorialization created between the internal and the external. The security regime of the institutional territorial state is fundamentally based on this distinction – a distinction which creates not only two dimensions of security, but which also proportions the vulnerability of the secured area. In this way, the violence of war could be expelled from the interior of the state and relegated to the border areas. Within the territorial borders, the rule of law, order and peace prevailed, while the state assumed for itself the monopoly on legitimate physical violence. Accordingly, physical violence within the state became a crime. And since then, violence within a state’s boundaries could only be considered an economic resource, i.e., a source of revenue and profit, for “underground” members of a society.

Of course, these security regimes have not been invulnerable. They have been breached in the past in the form of civil wars

or revolutionary upheavals. And, later developments in military technology brought violence deep into the hinterland of states at war. But, more remarkable than these disruptions was the subsequent renewal and restoration of the security regimes. Today, it is the force of social and technological evolution – not war – that has weakened the conventional security regime. This, in turn, raises the question whether the security regime can continue to function as it has in the past. Even more importantly: which new kind of security regime can take the place of the territorial state?

First, it can be assumed that the old regime, even in its weaker form, will by no means disappear. It will continue to exist and most people will continue to see it as the main provider of security. But, for a number of strategic security requirements, in both economics and politics for example, the capacities of the old regime will no longer suffice. The conventional security regime will have to be complemented and/or augmented by new forms. This is due to the limited reach of individual states and the fact that a growing portion of the flow of goods, services, capital and information takes place outside the states' traditional sphere of influence. These highly relevant processes have been shifted outside the states' security regimes.

At the same time, the vulnerability of states has increased significantly. Today, one should spend less time contemplating clearly identified "external" threats and more time analyzing the general vulnerability of a society. However, identifying the antagonists, i.e., those looking to mount an attack on society and benefit from its vulnerability, is not a simple task. According to the classic model, the state acts as the hard outer core of a vulnerable society. Moreover, because there are many such states, each employing the same basic methods to protect its interior, an analogous "threat" regime evolved in parallel to the security regime. Governments each took precautionary measures that were equally suitable for both protecting their own states and attacking others. General vulnerability was transformed into specified threat, which made it politically manageable.

The costs of this arrangement – the interplay between security and threat – are well known. After astronomical costs were incurred in Europe in the first half of the 20th century, varying constellations of power managed to limit the costs in the second half of the century, so that the benefits of this arrangement became more apparent. In no way can one rule out the possibility that this system will become more costly in the future. The consequences of a confrontation between the U.S. and China, for example, could hardly be limited to the antagonists themselves. Incidentally, one of the main

effects of political territorialization in the form of the institutional territorial state was – and is – that a state can choose to stay out of a conflict and remain neutral. But the interwovenness of the global economy, the global impact of the use of modern weapon systems, and the discursive overlapping of states' interests in the area of humanitarian relief and human rights, have made this impossible. Today, neutrality is nothing more than a legal fiction; the theory of public goods considers it an example of the “freeloader” problem.

Of course, there have always been areas where the system of territorial security could not be applied in a reliable way. One example is the open sea, where security was achieved by way of convoys or the temporary presence of military ships. Time and again, the ocean became the realm of pirates, who preyed on the weak and defenseless out at sea. The world's maritime powers were constantly called upon to fight back against piracy, and others profited from their success. In this way, the naval powers increased their spheres of influence and paved the way for their rise to empire, providing protection to all who operated within their territory. These powers created, financed and made available a collective good – security – and expected in return recognition and respect, voluntary abstention from economic damage and willing support in the event of political conflict. In this way, they converted collective security into power and influence.

Today, the problem of transnational spaces has been expanded to other areas – including outer space. It also very much applies to the virtual space of the Internet, which features the rudiments of territoriality, but is otherwise largely de-territorialized. These spaces are used by non-governmental elements to reap material gain and/or to assert a political agenda, from the pirates in the Straits of Malacca and off the coast of Somalia, to the hijackers of September 11, 2001, to the computer hackers that engage in all manner of corporate espionage, Internet crime and attacks on administrative facilities. Whereas the state once had the capacity to lock away highway robbers, criminal gangs and marauding mercenaries, these newer criminal elements cannot be disabled in any permanent way; the only option is to push back against these threats to security. In doing so, powerful individual states as well as alliances can distinguish themselves and boost their reputations and prestige. But, the forces that resist such collective investments in security should not be underestimated. Alliances can disagree about fair distribution of costs. And then there's the critical voice of the citizens themselves, who might question the wisdom of investing in collective goods when funds could be directed towards basic domestic needs, such as maintaining infrastructure.

To be sure, long-term cooperation among the states and the achievement of lasting security outside their own sovereign territories requires a system of cost distribution that is fair and regarded by the citizens who pay for it as reasonable. It is unlikely that this can be achieved on the level of the United Nations; the discrepancy is simply too great between the interests and capabilities of the member nations. Instead, the burden will fall on alliances such as NATO, country associations such as the European Union, or powerful countries with regional/global security interests, such as the U.S. and, perhaps in the future, China. Because of the transnational nature of the security challenge, the functioning of the global political and economic order may indeed require the return of quasi imperial powers. A characteristic of successful empires of the past was that they abstained from plundering and depleting on the peripheries and instead provided collective goods, particularly security, to subjects who would otherwise have to fend for themselves.

Nevertheless, providing security in the future will involve difficult and time-consuming negotiation processes among the responsible powers. At the same time, these providers of security will be subject to increasing attacks on the part of de-territorialized aggressors. While the attacks might only rarely approach the scale of September 11, smaller attacks, kidnappings and hostage-takings will form a kind of continual background noise to the public order. Quasi imperial powers will help keep the peace, but this will be complemented by the further privatization or partial privatization of security in certain areas. The gated cities and personal bodyguards of the rich and famous are just the beginning. The reputation of the state as the classical guarantor of collective goods will be eroded, but it will continue to serve this function. New gray areas will emerge and the new providers of security as a privatized good will inevitably feel the need to expand their business models and find ways to spark unrest and foster instability.





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## **The Future Belongs to Renewable Energies**

*Interview with Professor Klaus Töpfer*

*For many years, you've played a leading role in international climate negotiations. When you look back now – for example, to the conference in Rio de Janeiro in 1992 or the summit in Kyoto in 1997 – and take stock of where we're at, what's your assessment?*

Töpfer: If you take the level of CO<sub>2</sub> emissions as an indicator, then the current status is sobering. These emissions are still rising significantly. And, we still can't foresee when we're really going to reach the point when they'll begin to fall again. So, based on this indicator, we have certainly not been able to make any great progress. Quite the contrary, we have not managed to meet the requirements needed to stabilize the climate.

*In the coming decades, will humanity be able to set a course, both politically and technologically, to enable a smooth transition into a climate-friendly world? Or are disruptive changes in store for us, because the right decisions weren't made at the right time?*

Töpfer: I am and remain an optimist at heart and assume that people don't always only take action when forced to by the conditions on the ground. But, we have to do everything, through intelligent, forward-thinking and decisive policies, to convince people. The technology exists. Enormous progress has been made in the field of renewable energies – meaning energies that do not harm the environment. Very substantial progress has also been made in energy efficiency – at least in highly developed countries like

Germany. Now, we have to transform the people's understanding that something needs to be done into action. It's absolutely necessary to take determined political action at the national, international and global levels. We can't leave this to chance or allow too much time to pass.

*Do you think that the 2° C scenario by the end of the century is still realistic?*

Töpfer: Yes, realistic in the sense that it needs to be adhered to. But, we won't be able to do this with the measures we've taken so far. To meet this target, significantly more far-reaching decisions have to be made, both internationally and by every single person around the globe. All countries are called upon to prove that they can create policy that will help us achieve the 2-degree target – this applies especially to highly developed countries, so Germany included.

Regardless of that, we have to increasingly face up to the need to move measures forward to adapt to climate change. We have an ethical obligation to ensure that countries that are not really responsible for climate change, but suffer as a result of it, are able to finance any adaptation measures. We must not burden the poorest of the poor with the costs of our prosperity.

The International Energy Agency recently published the latest data indicating that harmful emissions have dramatically increased. Are we even able to properly deal with such slowly progressing but profound transformation like climate change? Are we mentally and also organizationally and politically able? And, what do we have to work harder at in order to respond to these challenges? Töpfer: Let me put it this way: I'm not a naive optimist who believes, "it always works out in the end," as the saying goes in Cologne. That's not enough. And the figures that were published are extremely shocking. The 5% rise in CO<sub>2</sub> emissions in the past year is a dramatic, catastrophic fact. This is all proof that climate policy to date has been mainly influenced by economic cycles rather than by conscious, climate-driven actions by governments and consumers.

It's even more important that we see clear political action in the future. It's good that we've now begun tackling energy policy. But, the price for saying goodbye to nuclear energy must not be that our climate targets are taken less seriously. Quite the contrary, we have to link the two closely together. Because, only then can we show the world that you can achieve prosperity and economic stability without fossil fuels and through renewable energies and

energy efficiency. So, there is a huge amount of work to do and there are a lot of options to drive things through regulations – for example, with regard to the energy efficiency of our residential homes or the efficiency of heating units, or decentralized deployment of renewable energies.

*A number of political measures to reduce greenhouse gas emissions are being discussed. One involves market-based instruments that set a price for emissions. Another involves traditional regulatory measures. In your view, which approach should climate policy take?*

Töpfer: These two options are not mutually exclusive, but instead complement each other. If you want to regulate CO<sub>2</sub> emissions using market prices, you have to stipulate how much CO<sub>2</sub> is allowed. Prices cannot be set without setting a CO<sub>2</sub> limit and a market cannot exist without prices. So, what we first need is a state to set clear and legally binding targets and then let market forces work within this framework. When the legal basis is in place, the market functions superbly, stimulates changed behavior and drives technological advancement. We've already seen this when we implemented a recycling economy, and we created considerable benefits with regard to the use of scarce resources.

*The nuclear disaster in Fukushima shocked the entire world. But most countries are still holding on to nuclear energy. Germany is the only country to decide to phase out nuclear energy despite its ambitious climate targets. What do you think – which direction is right for future generations? Will Germany's decision send a signal to other countries?*

Töpfer: There was a broad consensus in Germany against nuclear energy even before Fukushima. People talked about it being a bridge technology, and there were a variety of viewpoints within Germany as to how long nuclear energy would be needed, so how long the “bridge” needed to be. Fukushima put the question of how quickly we can phase out nuclear energy into a different light and – across the entire social and political spectrum – transformed public opinion. And, I think that we are in a better position than others to phase it out. Nuclear energy makes up 22% of our energy needs in Germany, while in France it is 80%. On top of that, we are the world market leader in renewable energies – there is a lot of market opportunity for us. If we are able to maintain our prosperity without nuclear energy and with ever-decreasing amounts of fossil fuels, then we'll achieve an entirely different level of energy supply security. I struggle to believe that we would have only done this due to the recent uproar and that “German angst” led to the decision. No, it was also very rational thinking,

that the energy markets will be increasingly influenced by renewable energies and energy efficiency in the future. We have to make every effort – even from an economic perspective – to use energies that aren't limited.

*Do you think the transition to renewable energies will send a signal to other countries?*

Töpfer: I just returned from China. And I would recommend to anyone that they read through the Chinese five-year plan. One thing you will find is that they want to generate an additional 70 gigawatts of wind energy. Germany consumes a total of 90 gigawatts. The five-year plan also states that they want to generate 5 gigawatts of solar energy – that's five power plants for every 1000 megawatts. You see, the transition to renewable energies is simply taking place. What's more, the technology in these fields will improve drastically. The learning curve is quite clearly getting less and less steep.

By the way, I'm in no way saying that the transition doesn't require any political or human effort. And, it could break down at any time, in that people no longer take the time to support these developments. The process can also fail if politicians focus more on elections than on what is needed in the medium to long term.

*There are other serious global challenges in addition to climate change. In your view, what developments are going to shape our future most?*

Töpfer: Without a doubt, one factor will be global population growth. Although, you have to understand that the world is divided in this regard. The population will grow in Africa and on the Indian subcontinent. The trend is at best stable or even declining in all other regions, as is the case in Germany. These changes will have far-reaching consequences.

A second factor is doubtlessly the fact that there are huge wealth disparities in the world. And, that a trend toward convergence is associated with these disparities. In the Mediterranean region, we see the enormous consequences tied to this. On the south side of the Mediterranean Sea, the per-capita income is roughly US\$3,000 or US\$4,000. On the other side, this figure is over US\$30,000. A configuration like this often tends to converge, which sharply increases the probability of migratory movements. There are similar challenges in other regions – take, for example, the border between the United States and Mexico.

I see more major challenges in that we have to deal with the overuse of our ecosystems while, at the same time, advancing the associated production of food. Our increasing need for water and energy is making this difficult. We have to break these global trends, or at least tie them to the development issues we face.

*What is the role of international organizations with regard to dealing with this and other challenges in the future? Can they deliver what is expected of them?*

Töpfer: We're going to see progress in the institutional arena and we should play an active role. We're increasingly seeing that other types of organizations are already emerging. We're seeing organizations that are leading to a kind of "oligopoly" in the world. This is not only the situation in Europe, but is precipitating very strongly throughout Asia, as well. Problems are arising overall in regions where this oligopoly doesn't exist, such as in Africa.

*Doesn't the current growth paradigm also have to shift for it to remain suitable for the coming decades? And if so, in what direction should this shift go?*

Töpfer: It is very encouraging to see that, in the meantime, a lot of people are convinced that change is necessary in this area, especially in the so-called highly developed countries of the West. President Sarkozy set up a highly respected working group [on the Measurement of Economic Performance and Social Progress] – led by two prominent Nobel Prize winners: Joseph Stiglitz and Amartya Sen. Germany's lower house of parliament established an investigative committee with a very similar mandate – two examples of development with broad, public acceptance.

More and more people believe that what we calculate as growth today creates the problems that we will have to solve tomorrow and the day after. It appears that the growth calculated in the gross national product is no longer a sensible indicator for prosperity – for people's happiness. Many people are no longer interested in how much material goods we can buy, but how we utilize them and what non-material factors play a role in our lives. I think that this debate can't be stopped, even if someone wanted to.

Indeed, using economic growth as a central indicator for prosperity is very appealing. But, it is continuing to lose value because we see that many things find their way into this growth that are negative for the health and well-being of people. Kennedy put it rather nicely once, when he said that the gross national product measures everything, except that which makes life worthwhile – and he was

right about that. I also believe, by the way, that highly developed countries have a lot to learn from “developing countries” in this regard. I lived in Africa for eight years and know that happiness and contentment are determined by much more than material wealth.



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## 4 Implications



### Mapping a Decarbonization Path for Logistics

*by Professor Alan McKinnon*

The central objective of global climate change policy is to keep the increase in average global temperature, since pre-industrial times, to within 2° C by 2100. To achieve this, emissions of greenhouse gases (GHG) worldwide will have to drop by 50% by 2050 relative to a 1990 base year. This will entail an 80% to 90% reduction in emissions from developed countries, whose per capita emissions are currently well above the global average.

Within these countries it is unlikely that all economic sectors will be set the same GHG reduction target. After all, the potential for cutting GHG emissions and its cost effectiveness will vary from industry to industry and this will have to be reflected in sectoral targets. The European Commission, for example, has decided to set a 2050 GHG-reduction target for transport of 60% – substantially lower than the 80% to 95% target for the EU economy as a whole<sup>1</sup>.

Superficially, this may seem good news for logistics managers and businesses. As freight transport accounts for around 90% of total GHG emissions from logistics<sup>2</sup>, they may feel blessed with a below average target. In practice, however, achieving even a modest absolute reduction in total GHG emissions from logistics by 2050

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1 European Commission (2011) 'Roadmap to a Single European Area – Towards a competitive and resource efficient transport system.' Brussels.

2 World Economic Forum / Accenture (2009) 'Supply Chain Decarbonization: the role of logistics and transport in reducing supply chain carbon emissions' Geneva.



will be hugely challenging<sup>3</sup>. This is partly because the demand for logistics services will rise steeply over the next 40 years.

On the basis of the past link between logistics and economic growth, it has been forecast that freight ton-kms by all modes will grow almost three-fold between 2010 and 2050<sup>4</sup>. This 'business-as-usual' trend is likely to be reinforced, rather perversely, by the effects on logistics of climate change adaptation and mitigation measures. Adapting our built environment to the climatic changes already 'in the pipeline' will entail the movement of vast quantities of materials for the construction of flood protection and realignment of infrastructure. The decarbonization of other sectors of the economy will also impose additional burdens on logistical systems. For example, mass programs of home insulation and the creation of renewable energy systems will be very logistics-intensive.

Logistics will also be relatively difficult to decarbonize because of its heavy reliance on fossil fuels. At the heart of most countries' climate change strategies lies the decarbonization of electricity generation, through a switch to renewable and, in some cases, nuclear energy. Most industrial sectors are powered by electricity and so will benefit indirectly from the predicted drop in GHG emissions per kilowatt-hour. Some logistical activities, such as urban van deliveries, electrified rail freight services, terminal handling and warehousing can operate directly or indirectly (via batteries or hydrogen) on low-carbon electricity. Most others, however, such as shipping, long haul trucks and aircraft, will have to continue running on liquid, carbon-based fuel for the foreseeable future. By 2050, the net carbon content of this fuel will, nevertheless, be much lower than it is today. Environmentally-sustainable forms of biofuel will have displaced fossil fuels from much of the freight transport system by then.

While the switch to lower carbon power sources will significantly reduce GHG emissions per ton-km of freight movement, the strong growth in ton-kms will largely, if not entirely, negate its effect. To achieve an absolute reduction in logistics-related emissions, it will be necessary to supplement 'repowering' with other measures. The International Energy Agency<sup>5</sup>, for example, sees the use of alternative power sources yielding only around half of the potential savings in carbon emissions from trucking by 2050.

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3 McKinnon, A.C. and Piecyk, M. (2009) 'Logistics 2050: moving freight by road in a very low carbon world' in Sweeney, E. (ed) *'Supply Chain Management in a Volatile World'* Blackrock Publishing, Dublin

4 World Business Council for Sustainable Transport (2004) *'Mobility 2030: meeting the challenges to sustainability'* Geneva.

5 International Energy Agency (2009) *'Transport, Energy and CO<sub>2</sub>: moving towards sustainability.'* Paris.

In its main scenario, the remaining savings would accrue from a transfer of freight to greener transport modes and efficiency improvements.

Increasing the proportion of freight carried by transport modes with relatively low carbon intensities (expressed as g CO<sub>2</sub> per ton-km) is likely to prove one of the most effective ways of decarbonizing logistics. A key element in the European Commission's carbon reduction plan for transport is its policy objective to have 50% of road freight travelling over distances greater than 300 kms move by rail or waterborne transport, instead, by 2050<sup>6</sup>.

To accommodate this enormous increase in rail ton-kms (and the accompanying growth in rail passenger volumes), the capacity of European railway infrastructure will have to at least double, even allowing for some lengthening of trains and reduction in empty running<sup>7</sup>. This infrastructural expansion will not only be very expensive; it will also carry a high carbon penalty. To date, comparisons of the GHG impact of different modes have been largely confined to vehicle emissions. Extending the boundary of the carbon calculation to include the development and maintenance of infrastructure alters the relative carbon intensity of the various modes.

Much more work needs to be done on the wider carbon implications of a major modal shift to rail and water. In assessing the modal split option, companies and policy-makers should also recognise that advances in transport technology over the next 40 years will decarbonize modes at different rates and by differing amounts. So, devising an optimal freight modal split for a tightly-carbon constrained world of 2050 is fraught with difficulty.

Less contentious are efficiency improvements within individual transport modes that cut fuel consumption and raise vehicle utilization. Several studies have forecast 20% to 40% improvements in the energy efficiency of new freight vehicles, vessels and aircraft by 2020-2030<sup>8</sup>. In interpreting these predictions, however, one must allow for the fact that the diffusion of new logistics technologies can be slow, particularly in the maritime, aviation and rail sectors, where replacement cycles span several decades. On the other hand, benchmarking surveys<sup>9</sup> reveal that many companies can operate,

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6 European Commission (2011): op.cit. p.9

7 CE Delft (2011) *'Potential of Modal Shift to Rail Transport: study on the projected effects on GHG emissions and transport volumes'* Delft.

8 McKinnon, A.C., Allen, J. and Woodburn, A. (2010) *'Development of Greener Vehicles, Aircraft and Ships'* in McKinnon, A.C. et al (eds) *'Green Logistics'* Kogan Page, London.

9 McKinnon, A.C. (2010) *'Benchmarking Road Freight Transport: review of a government-sponsored programme'* *Benchmarking: an International Journal*, vol. 16, no.5.

load and maintain their *existing* vehicles much more effectively to cut energy use and emissions per ton-km.

The prospects for improving vehicle utilization are also good. A Delphi survey of 100 logistics specialists in the UK indicated that, on a business-as-usual basis, it would be possible to cut the empty running of trucks by 19% and raise average payload weight by 12%, between 2006 and 2020<sup>10</sup>. Supplementing better capacity utilization with a relaxation of vehicle size and weight limits will permit much greater consolidation of loads, driving down CO<sub>2</sub> emissions per unit of freight movement<sup>11</sup>. The opportunities for consolidation are being greatly enhanced by the new spirit of logistical collaboration that is emerging in several industrial sectors. By closely coordinating their logistics activities and sharing more vehicle and warehouse capacity, companies can improve asset utilization at a supply chain level, yielding both cost and carbon savings.

Some commentators argue that the utilization of logistics assets could be further increased if companies were prepared to ease just-in-time (JIT) pressures in the interests of carbon reduction. As with freight modal shift, however, the overall effect of this proposal on carbon emissions is more complex than it seems. JIT is not simply an inventory reduction measure. It is a business paradigm designed to cut waste and raise productivity across a range of production and distribution processes. Although it often raises the carbon-intensity of delivery operations, this adverse effect can be more than offset by improvements in the carbon efficiency of other business activities. So, before reversing JIT trends, we need to conduct a more holistic analysis of their net carbon impact.

A similarly cautious approach must be taken to another much-quoted prescription for decarbonizing logistics, namely, the reversal of the globalization trend and return to localized sourcing. This would certainly reduce the transport-intensity of the global economy and freight-related emissions, but possibly at the expense of higher emissions from production, handling and storage operations. As the life-cycle GHG emissions of the average product are much more sensitive to the carbon-intensity of the production operation than to the distance it is transported, sourcing locally need not minimize total emissions. Indeed, by 2050, we may see pronounced clustering of manufacturing capacity in low carbon locations, where companies can exploit plentiful supplies of renewable and/or nuclear energy.

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10 Piecyk, M. and McKinnon, A.C. (2010) 'Forecasting the Carbon Footprint of Road Freight Transport in 2020.' *International Journal of Production Economics*, vol. 128, no.1.

11 OECD / International Transport Forum (2010) 'Moving Freight with Better Trucks' Paris.

Such fundamental changes in economic geography, and many of the other decarbonization initiatives outlined earlier, will only occur if carbon emissions are subject to much tighter regulations and stronger price mechanisms than today. Over the next decade or so, there is likely to be a diffusion of ‘cap and trade’ emission pricing schemes, both geographically and across economic sectors. Carbon restrictions and prices will be fully integrated into the management of supply chains well before 2050, with companies and their logistics providers skilled in the analysis and optimization of cost-carbon trade-offs.

All this assumes that companies and governments manage to get onto the right carbon trajectory to achieve the required emission reductions by 2050. It also assumes that, over the next 40 years, global warming will occur gradually, giving us time to adjust production systems, distribution networks and consumer behavior to the related ecological and geophysical changes. There is mounting concern in the scientific community, however, that climate change and its related environmental effects will be non-linear.

If climate change proves to be catastrophic rather than incremental, or if our carbon mitigation efforts fail, we may be forced to resort to so-called ‘geo-engineering’ options<sup>12</sup>. These fall into two categories: carbon dioxide removal, through, for example, fertilizing the oceans with nutrients to promote ‘algal blooms’ or ‘enhanced weathering’ of silicate rocks crushed and spread across wide areas; and solar radiation management, entailing the dispersal of aerosols, mainly of sulphur dioxide, into the stratosphere. To stand any chance of being effective, these geo-engineering measures would have to be applied on a planetary scale and involve the movement of vast amounts of material. So, in the bleakest of scenarios, logistics may ultimately play a critical role in keeping the planet habitable for human life.

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12 Royal Society (2009) *‘Geo-engineering the Climate: science, governance and uncertainty’* London.



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## **Towards a More Robust Global Trade Environment**

*by Roger Crook*

Over the last few decades, globalization, driven by sharply escalating levels of world trade, has reshaped the economic face of the planet and contributed to a rise in living standards around the world. Merchandise trade as a percentage of global GDP has grown from 22% in 1970 to 53% in 2008. This development has been fuelled by a dramatic decline in logistics and transportation costs. Standardization and, specifically, containerization, has resulted in a large-scale efficiency boost in the transport industry. While the cost of logistics accounted for an average of 15% of the value of exports in 1960, containerization and the use of standardized equipment has driven this down to less than a percentage point today.

However, in recent years, the pace of global trade growth seems to be slowing, with the efficiencies from containerization and optimization of transport modes reaching their peak. At the same time, new trends have the potential to drive up absolute trade volumes to much higher levels. Most importantly, the emergence of Asia, South America and Africa as new players is driving global trade and shifting its dynamics. These up-and-coming hotspots of consumption and trade are supported not only by population developments, but also by a middle class population that is growing by 11% annually. This is also contributing to the slow but definite transformation of a number of relatively unknown places of today into the megacities of tomorrow. According to estimates, 15 new cities with a population of more than 10 million will

emerge by 2030. India alone is expected to have three new megacities by 2030. This will redefine the logistics requirements of these regions, where the megacities will become the major inbound and outbound points of trade.

Although, on the face of it, it might seem that the emergence of new, consumption-driven economies and changing demographics would automatically provide a new boost to world trade. However, for this growth to take place, five crucial topics need to be addressed, which will enable us to move towards a more robust global trade environment:

1. Infrastructure development
2. Carbon efficiency in transport
3. Supply chain visibility and security
4. Customs regulations
5. International trade agreements and the reduction of red tape

## **1. Reducing Infrastructure Bottlenecks**

One of the main impediments to growth for emerging countries is the lack of necessary infrastructure. Ideally, infrastructure development should always be a step ahead of demand. Unfortunately, in many emerging countries, this is not the case. A study on transportation infrastructure has shown that government spending on infrastructure in growing economies is much lower than in developed economies. For example, the Indian transportation infrastructure spend over the last 10 years was US\$12.4 billion, which is about 2% of GDP. This is well below the global average among developed countries. Policymakers and industry need to recognize that investment in infrastructure, although capital intensive, will reap large returns in terms of economic growth as well as drive an increase in per capita income.

Nor is this just a problem for developing economies alone. In some developed countries, the flow of goods is greatly affected by infrastructure bottlenecks. To a certain extent, these bottlenecks can be overcome with the help of logistics providers through route optimization techniques, intermodal transport options and better use of technology. Such strategies, however, do not solve the underlying problem, but only provide a temporary workaround. The solution to these problems lies with adequate infrastructure development in terms of airports, seaports, roads, power stations, communication systems, etc. Such investments help transform infrastructure from being a barrier to a pillar for trade growth.

## **2. Improving Carbon Efficiency of Transport**

Improving carbon efficiency will be important for the logistics industry going forward, as the transport sector accounts for 14% of global greenhouse gas emissions and its share is projected to rise. To limit the implications of climate change, governments are increasingly putting a price tag not only on fuel, but also on carbon emissions. While the EU has the largest mandatory emissions trading system, countries such as Australia, New Zealand and the United Kingdom are ramping up similar schemes.

While carbon is becoming a global currency, the price of oil is ever-rising: 10 years ago, fuel costs for airlines accounted for 13% of their running costs; in 2011, this share is at 30%. This makes higher carbon efficiency not only important from a sustainability viewpoint, but also commercially attractive. Just look at the 24% of trucks in the EU that are currently driving empty, for example. In view of higher costs, scarce resources and climate change effects, green transport solutions are a key lever to foster global trade growth.

A global logistics group such as Deutsche Post DHL already provides its customers a broad variety of carbon transparency and green transport services. Capacity optimization through the consolidation of ocean freight shipments, improved routing to avoid unnecessary overland transport, and the highly efficient combination of different transport modes are only some examples how we are helping our customers to reduce the carbon footprint of their supply chain. Logistics of the future will not just be the transport of goods from point A to point B, but will be pulling the right strings based on comprehensive know-how and in-depth expertise.

## **3. Providing Supply Chain Visibility and Security**

Supply chain visibility and security will be a topic of keen interest in the years ahead. The success of any supply chain depends on its flexibility. In logistics, unexpected delays can occur in terms of port congestion, weather disruptions, etc. Although it is difficult to predict some of these delays, logistics managers can greatly benefit from the availability of realtime information on such delays. Sophisticated visibility solutions are vital for any supply chain that aims to be successful. Deutsche Post DHL already offers a range of advanced, realtime tracking solutions that provide customers with up-to-date information on the location of their cargo, along with proactive notifications on expected delays.



Security of the goods being transported is another major concern, especially when shipping high value goods through relatively risky regions. Realtime information on any security breaches during transport enables the customer or service provider to respond faster to such threats. The additional layer of security provided by such realtime solutions allays fears in the minds of logistics managers and promotes international trade to even the remotest areas.

#### **4. Simplifying Customs Regulations**

Customs regulations are a topic of great significance in any discussion on global trade. Trade regulations set by individual countries play a major role in determining the export and import trade levels of that country and the region. The European Union, for example, has a harmonized customs regime by which customs regulations are standardized across a wide geographic region. Were other regions to adopt this type of setup, it would vastly reduce the complexity of international trade.

Another area of simplification in recent years is the increasing trend towards electronic customs filing. This has brought huge improvements in terms of processing speed and has made the overall customs process much more efficient for those countries that have adopted this technology. With the implementation of e-customs, along with the support of efficient data mining tools, the need for physical inspection of goods at seaports and airports could be avoided in the future. This would minimize delays at ports, thereby significantly improving the overall speed of the supply chain.

It seems possible that, in future, more and more countries will align their customs laws and we will see a move towards a harmonized global system. Such a harmonized customs tariff along with the adoption of technology to improve the customs clearance process would bring about great benefits by facilitating the future growth of global trade.

#### **5. Eliminating Barriers to Trade**

Another major support pillar for the growth of global trade is the establishment and spread of trade agreements between key countries. The North American Free Trade Agreement (NAFTA) is a prime example of the success that free trade agreements (FTAs) and reduction of red tape can bring to participating countries. Such trade blocs eliminate barriers to trade and reduce

complexities; as a result, trade between the NAFTA signatories more than tripled between 1993 and 2008. It is estimated that NAFTA contributes as much as 0.5% towards overall U.S. GDP growth every year.

In recent times, FTAs signed by ASEAN states have largely been seen to promote trade growth within this region. The elimination of tariffs and quotas boosts trade and, as the economic benefits become more obvious to other countries, more multilateral trade agreements will be set up, promoting regional and global trade. However, governments should not only cut tariffs and other trade barriers, but should also work on reducing unnecessary bureaucracy and red tape.

The topics outlined above highlight how much remains to be done to make global trade growth more robust. The pace of infrastructure development will need to increase to accommodate surging demand. Green logistics solutions will need to ensure, on a broad scale, that the increase in trade does not come at the cost of environmental damage. Full supply chain visibility helps companies minimize the risks associated with long supply chains and optimally plan their logistics processes. Finally, customs harmonization, tariff simplification and free trade agreements are the keys to reducing complexity and fostering trade. Only if governments, businesses and society work together and focus on these tasks, can we be confident that global trade will overcome its current obstacles to growth and accelerate again, enabling us to unlock its huge economic benefits.



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## **Catering to Our Customers' Future Needs**

*by Rob Siegers*

"I never think about the future. It comes soon enough." As a scientist, Albert Einstein, who famously coined this phrase, had to focus on the present. However, for an organization that looks after Deutsche Post DHL's top customers, with some of the biggest names in business, planning for the future is also essential.

Customers are at the heart of DHL. While our teams work with our customers in realtime to ensure the efficient operation of their supply chains, we also keep a close eye on how customers are preparing for the next decade and beyond.

From the outset, one thing is clear when we consider the future – change is the only constant.

## **From Humble Beginnings to Leading Edge**

Businesses today have to move fast and adapt continuously to keep their competitive edge and meet their customers' demands. New products and innovations emerge almost daily. Companies nobody has ever heard of are now hailed as the emerging new champions. Some of our current customers did not exist 40 years ago. In fact, it wasn't until 1969, shortly after the world witnessed Neil Armstrong's first steps on the moon, that DHL founders Adrian Dalsey, Larry Hillblom and Robert Lynn began personally delivering documents by airplane from San Francisco to Honolulu and

created an entirely new industry: international air express services, the rapid delivery of parcels and shipments by air.

Other companies have radically adapted their product portfolio throughout the decades, such as Nokia. From its humble start as a paper mill in 1872, Nokia became one of the pioneers of mobile phone technology, building the first international mobile phone network in 1981 and launching the first digital mobile phone, the Nokia DX200, in 1982.

Today, our Technology Sector looks after our mobile phone clients and many other high tech customers almost in the way we look after customers in the fashion or film industries – our entire supply chain solutions are geared to support the launch of the latest mobile phone, notebook model or other high tech gadget – from components’ movement right through to the precisely timed delivery even to the world’s most far-flung locations, where an audience of aficionados eagerly awaits the arrival of the next big thing in high tech.

### **Listening to the Customer**

We support our customers first and foremost by listening, then advising, before we jump to action. At customer logistics boards, where our teams meet our customers’ teams, and at customer conferences, where we bring together many of our key customers and external experts from different sectors, we discuss future trends, challenges and solutions throughout the year. Our aim is to provide consultancy and deliver services that support our customers’ objectives, and help them meet their future challenges. Our supply chain solutions endeavor to simplify and make it easier for businesses to do business with us, but also with their customers and suppliers.

Our engagement with customers helps us to understand the major trends that play a role for them going forward. Current discussions in the Life Sciences and Healthcare sector, for example, center around topics such as entry into the big new markets, Brazil, Russia, India and China (BRIC); major demographic shifts in the Western world, with low birth rates and ageing populations, and the pressure on governments to supply healthcare to support the needs of future populations.

To be prepared for our customers’ future needs, we constantly monitor and evaluate trends to forecast how we need to organize ourselves and our processes, and to determine where we need to make investments.

## **Moving Beyond BRIC-M**

At present, our company is investing substantially in the infrastructure in the BRIC-M states (BRICs plus Mexico), but we are also engaged in and keeping a close eye on Africa and other countries and regions we feel have tremendous potential. These include the UAE, and some of the Baltic states, where we see an increasing level of near-shoring, as companies move their manufacturing for West European consumption to Eastern Europe to allaying the risk of rising oil prices and escalating labor costs in Asia.

## **Mitigating Risk in the ‘New Normal’**

Indeed, risk is also part of our future planning process. In a volatile world that some have called “the new normal,” risk has moved from being the exception to the expected. Our supply chain consultants can model a number of scenarios to help businesses plan their logistics. Modelling allows us to create a range of seamless, end-to-end supply chain scenarios that take into account a broad spectrum of variables, from the oil price to the sourcing of raw materials or components in different countries, and from using varying suppliers, manufacturing bases, transport modes and delivery speeds. Thus, we are able to help customers prepare for many future scenarios, while saving cost and CO<sub>2</sub> emissions, and mitigating risk.

Theft and counterfeiting of high value components or high tech gadgets are on the increase too, and demand a secure supply chain. Here, we have developed products such as Ocean Secure and Agheera Real Time for full visibility of goods at every stage, as they move from origin to destination.

But it doesn’t stop there. Our customer management teams, together with our Innovation and Solutions experts and our customers, are constantly engaged in looking at product development and innovations that will cater to future needs.

## **Flexibility Is Key**

Being agile, flexible and very quick to respond are certainly some of the core requirements all businesses need to succeed in the “new normal.” Already, through our extensive networks, expert planners and on-the-ground teams, we can react rapidly to changing situations – be they requests for near-shoring, changing suppliers, or keeping our customers’ goods moving during natural disasters.

Last year's volcanic ash cloud outbreak in Iceland is a prime example, when air traffic over Europe came to a virtual standstill. In record time, DHL created an extensive road network and kept customers' deliveries flowing. When air space opened up again, the combined power of our own fleet and our negotiating advantage on air cargo meant our customers' goods were often the first that went out. This meant their goods could be delivered and their factories had critical components and materials to keep production going. As natural disasters are on the increase, our teams continually hone their skills and finetune the network to be able to support our customers through any troubles they may face in future.

### **Collaborate to Compete**

Another major trend we now see emerging, with the potential to alter the way we all do business, is in collaborative logistics. Businesses are increasingly developing new ways of working together and collaborating to compete. We are active in several areas, such as e-tailing, where we are teaming up with partner companies to provide cross-border shopping services for consumers.

Collaboration is also something we engage in to safeguard the environment, as climate change is a present and future topic that none of us can afford to ignore. With one customer, Volvo, and a number of other companies and institutions, we currently partner in an innovative new mobility concept that will deliver a significant reduction in unnecessary pollution caused by suboptimal engine operation and vehicle breakdowns. This is achieved through the development of advanced vehicle telematics and a highly responsive aftermarket supply chain.

To support an environmental future, we brought to market a new solution for battery logistics in electric vehicles, assisting Renault, the first car manufacturer to mass market electric vehicles.

At the other end of the scale, we are increasingly engaged as Lead Logistics Suppliers, managing and working in tandem with other logistics companies to provide business with one strategic, cost-efficient and simplified logistics solution globally.

## Moving Ahead

Can we fully predict what the next 40 years will hold, or even the current decade? Certainly not. In the new normal, everything and anything is possible. We have come to expect natural disasters and we are used to constant and ever faster change. We are already working in the midst of megatrends – globalization, urbanization, shifting economic powers, scarcity of natural resources, next-generation technologies and climate change.

How will our world change once cloud computing has become the norm and fabbing turns from the new buzzword to a new way of manufacturing goods? Will life in the new megacities make consumers turn to cocooning and increase their yearning for a simple life or more local goods? Will they even be visiting shops anymore, or will the virtual mall cater to all of their shopping needs? Will the demand for democracy dramatically alter landscapes in the Arab world or even in some of the new global powerhouses in the Far East?

There is only one thing I know for sure: We will be right by our customers' side, developing with them and for them, and helping to find solutions for their future strategies, to "boldly go where no man has gone before," to that bright, challenging and fascinating place that is the future.



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## **The Logistics of the Future: Revolutionary Changes or the Development of Trusted Solutions?**

*by Petra Kiwitt and Steffen Frankenberg*

It all starts with an idea – an idea that triggers a transformation that simplifies customers’ lives. In order to create an environment ripe for ideas – for visions, for creation and for innovation – you have to actively push for progress. You have to live for innovation. That’s where visions are developed, tested and marketed. A place for free thinkers with a keen eye on strong focus areas.

It is absolutely vital for logistics service providers to test alternative transport solutions aimed at protecting both our planet’s resources and climate. Working permanently to improve supply chain efficiency is also essential. Yet, revolutionary changes that play out over a longer period have to be set in motion far in advance and they need to be more comprehensive. Clear visions and a holistic approach to complex relationships are necessary for this – visions that have inherent potential to become reality in the future.

One of the visions that will see ever-expanding use in the coming years is *realtime tracking*. Logistics is more and more permeated by telematics. In addition, economies of scale on the hardware side, as well as the increasing ubiquity of local networks (GSM/GPRS/UMTS/EDGE, etc.), mean that telematics systems have very low operating costs. People are increasingly “always on” – they are permanently online and connected to the digital world. It’s similar for logistics. The movements of everything we ship are being followed in realtime and this at very little cost.



The use of standard data transmission systems will certainly spread across the world (on every container, in every vehicle and in a high number of valuable individual shipments). But that's not all. The sensors we use will become more powerful and more intelligent than they are today.

For instance, containers will be able to monitor their own contents for explosives or radioactive material, and even move independently through a logistics network. This will take place by intelligently linking the containers to each other as well as by defining the critical path in the supply chain. Automatic prioritization and giving precedence to certain shipments ahead of others in the supply chain will also be part of the mix.

Tracking systems will have considerably higher service lives and it will be possible to build end-to-end networks simply because of the extensive expansion of devices together with ever more efficient "energy harvesting" solutions and energy-saving processors. This is how the "Internet of things" is slowly being realized, and end users are receiving the capability not only to track their shipments, but also to check whether the temperature is being maintained, as well as the shipment's carbon footprint, in realtime.

Logistics will also be shaped into a new dimension by *dematerialization and 3D printing*. "Fabbing" will have a significant impact on the market as a future fulfillment technology: spare parts made by a 3D printer or "fabber" (short for "digital fabricator"), technologies for additives, and the layer-by-layer manufacture of three-dimensional objects. Fabbers have been available for over 20 years, albeit so far primarily for models and prototypes.

In the coming years, we'll see intelligent materials and high-performance synthetics like polyetheretherketone (PEEK) help fabbing technology expand into other commercial applications. The growth in this industry will, at first, not be driven by new design possibilities, but, instead, by pressure to reduce costs. Given the exploding range of products and very short product lifecycles, "on demand" manufacturing of products using fabbing technology will become an attractive option for the spare parts market (automotive, household appliances, consumer electronics, etc.) and for manufacturing high-quality, customized products.

These innovations have interesting implications for logistics. If a significant share of products are no longer traded on the global marketplace, but, instead, are manufactured through an intelligent, decentralized production system with locally circulating raw materials and regional operations, the global flow of goods

will change dramatically. If fabbing services are positioned as an extension to the fulfillment business, operating a fabbing center to produce spare parts for a customer could develop into an interesting market with significant growth potential for innovative logistics companies.

*Urbanization* will also have a fundamental impact on the world of logistics. The proliferation of an urban culture and lifestyle and the accompanying increase in the share of the population living in urban areas (approximately 75% in 2050), as well as the birth of new megacities, will enter a new dimension.

Megacities are developing into powerful actors, which play a dynamic role in global change as economic hubs, political control centers and attractions for millions of people. They are at the forefront in many areas, such as fighting poverty, housing, environmental protection, transport and traffic. At the same time, the dynamic of the development process requires farsighted decisions; cities have to take preventative actions.

The goal must be to adapt the resource usage patterns of cities to the evolving social, economic and environmental conditions. Today, cities cover 2% of the earth's surface but consume 75% of its resources. So, cities have a huge impact on the global ecosystem. That's why cities are focusing more and more on a green future. Environmentally hazardous emissions are no longer tolerated. Cities are, in many cases, moving almost completely away from fossil fuels to renewable energies and both intelligently and systematically controlling energy consumption. Energy-regenerating buildings in both the private and industrial sectors are becoming the norm.

If you look at the situation in today's megacities, the issue of transport and traffic becomes clear, in addition to questions of living space and general infrastructure issues. And, it's not only about people, but most especially about inner-city logistics. Efficient urban logistics is gaining a leading role because more and more people are not only transporting things themselves, but also increasing the demand for goods transport.

Despite the fact that the trends listed above will relieve the system to a certain extent, alternative transport routes will still be required. Perhaps an underground transport infrastructure in combination with distribution centers near or on the city outskirts could be a solution to manage the flow of goods to and from the various districts in an urban area. These alternative transport routes and warehousing systems could even be used to store private property.

In very densely populated areas – especially in developing countries – millions of people will live in very tight quarters. This will limit the size of available storage room in living spaces. Private customers could store seasonal items (i.e., clothes and household appliances) in central warehouses and exchange them or have them delivered when needed. A comprehensive information system will guarantee that goods flow smoothly.

In this way, cities will make an important contribution to the fight against climate change and meet their responsibility to society. However, environmentally conscious traffic routing is not only necessary to protect the environment, but also to tackle the general supply and quality of life issues within a city. For example, megacities are hugely dependent on on-time supply from the outside due to the fact that they have very little land for agricultural purposes. The pollution that results from individual, non-consolidated transportation reduces the quality of life in urban areas.

Cities can turn these processes into “innovation engines” if they apply and support intelligent and efficient solutions. “City logistics” will therefore be part of the solution in the future for essential problems in megacities.

These three cutting-edge fields show how important vision, innovation and creativity are in order to actively shape trends in development on a global scale. And, the world’s leading logistics company should strive for nothing less. Through the DHL Innovation Initiative, we are also working closely with many world class companies and research institutes, which, together with DHL, are developing and testing game-changing innovations and making them successful on the market.



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## 5 Intelligence



### **Recrafting Scenario Practice to Achieve Robust Long-Term Decisions**

*by Robert Lempert and Johanna Zmud*

Freight transport is a rapidly expanding and changing economic sector. Its efficiency has a direct impact on product prices and security of supply. Globalization and the concomitant intensification of competition have created longer and more complex (i.e., inefficient) supply chains at a time when heavier demand on the system (both passenger and freight) increases the risks of congestion. Such congestion comes with an economic price tag, such as higher product prices, as well as social and environmental manifestations, such as energy supply and emissions repercussions.

Thus, industry and policy leaders face one big challenge: keeping freight moving today while, at the same time, reducing or even totally avoiding its negative manifestations or repercussions for the future. Long-term decisions in this area are multi-layered and complex. They also depend to a large degree on expectations about the future: How might changing customer expectations impact transport modes or supply chains of the future? How might bottlenecks in supply chains be overcome? How might the future of sustainable transport look if oil prices keep rising; or if they decline? Current information to support strategic decision-making for optimizing the system may be uncertain, incomplete, evolving or conflicting; thus, leading to alternative versions of the future.

In this essay, we are concerned with the question: How does what might happen in 2050 affect decisions about the freight transport

sector today? How do we make near-term choices that last over the long term? In other words, how do we make decisions today that are robust over a wide range of alternative futures?

### **Scenarios Can Illuminate Vulnerabilities of Proposed Plans, Making the Long-Term Future Actionable Today**

RAND's futures work focuses on informing what we call "long-term decisions." Long-term decisions occur when the process of reflecting on potential events decades or more in the future causes decision-makers to choose near-term actions that are different from those they would otherwise have pursued. Rather than asking what the future will bring, RAND's work asks: What can be done today to better shape the future?

For example, to support climate related decisions, RAND's approach would be to generate a wide range of plausible climate projections relevant to a specific organization's plans, including potentially unlikely "worst cases" that might significantly stress the plans. These ensembles of climate projections would be provided in a form that, when combined with relevant socio-economic, biophysical, and other projections, allows the organization to identify scenarios summarizing the future states of the world where their plans fail to meet their goals. Then, to support choice tasks, we would ask, how likely would these scenarios have to be in order to justify a change in plan?

Likewise, transport planning must address not just today's issues, but also those of the future. For transport infrastructure, future generations will experience the effects of today's decisions. But, trying to predict the future so that today's decisions will meet future needs, particularly in a dynamic and rapidly changing environment such as transport demand, is at best challenging. To ensure today's decisions about freight transport are robust over a wide range of alternative futures, we need to make long-term decisions; thus, directing near-term research, investments, policies, and designs in ways that will help shape a beneficial evolution of the freight transport system and help it to function effectively, no matter what surprises the future brings.

Making near-term choices robust over the long-term is hard for two overarching and deeply linked reasons. First, people generally prefer gratification in the present, leading them to avoid near-term costs that might yield long-term gains. Second, deep uncertainty about the future often severs any clear connection between near-term actions and long-term consequences. Because people cannot

be sure any near-term action will yield the desired long-term result, they often discount the significance of potential long-term consequences as a justification for their near-term choices.

These overarching concerns are compounded when placed in the context of freight transport. The freight transport future rarely moves in predictable ways. Seemingly small shifts in demographics, regulations, economics, technology or a myriad of other factors can have dramatic and unintended consequences on how organizations source, manufacture, distribute, and operate. Non-linear impacts are very difficult to predict using traditional forecasting methods since they, by definition, do not follow any historical patterns.

While any attempt at forecasting in this environment is difficult, planning for freight transportation infrastructure investments is especially hard. Infrastructure projects of any magnitude typically take decades from planning to actual use. Planners must satisfy and accommodate diverse interests, vocal constituents, and conflicting priorities. Most importantly, as a derived demand, freight patterns (and the resulting infrastructure) are subject to numerous exogenous and uncontrollable factors, ranging from political actions to fuel costs to trade agreements to changing consumer preferences.

Scenarios can help decision-making in this difficult context by making potential long-term consequences more vivid, and thus more likely to motivate action. Two scenario features prove particularly important. First, scenarios have narrative storylines that engage imaginations, helping people envision what the future might bring. Such engagement serves to motivate near-term actions that might avoid deleterious futures and help bring about desired ones. Second, scenarios suggest plausibility, not probability. This attribute makes them psychologically less threatening to those holding different worldviews and, therefore, people are willing to participate in open discussions about plausible futures.

But traditional scenarios can have significant shortcomings when it comes to informing and motivating action. The best scenarios are few in number, because more than a handful will prove confusing. But summarizing the vast array of plausible futures with three or four scenarios can prove problematic. The choice can seem arbitrary, particularly to those whose interests are threatened by the scenarios' implications. In addition, a constrained number of scenarios could neglect what may turn out to be the most important surprises. Surveys of previous scenario exercises suggest that they have often missed the discontinuities that, in retrospect,



seem most important, as captured in the succinct statement often attributed to the futurist Herman Kahn – “the most likely scenario isn’t.”

RAND’s Robust Decision Making (RDM) approach addresses these challenges by defining scenarios as vulnerabilities of proposed policies, that is, as groups of future states of the world in which a proposed policy would fail to meet its goals. For instance, a nation’s proposed infrastructure investments and related policies might implicitly or explicitly assume a particular mix of future demand and particular future transportation technologies. A useful scenario would suggest sets of conditions where this plan would fail to perform as desired.

Organizations can implement the RDM approach analytically by running their planning models for each of thousands of different combinations of assumptions about future trends, specifying those outcomes that would represent future success or failure for their plans. Then, they would use statistical algorithms on the resulting database of model runs to identify the clusters of cases where current policies do not meet their goals. These clusters become the foundations for actionable scenarios.

But, even without the analytics, the concept of scenarios as vulnerabilities of proposed policies proves useful, because such scenarios link back to specific actions. In this way, they can help decision-makers identify and make more robust near-term choices. For instance, by sequencing investments in a way that they might respond to changing future conditions or targeting research on ‘game-changers’ that might open up the most dramatic future possibilities.

Such scenarios can also seem less arbitrary and less likely to miss surprises. The first, because most everyone, regardless of their expectations or values, will acknowledge the importance of describing vulnerabilities of current plans; the second, because specifically searching for futures that will stress seemingly robust plans provides guidance for seeking out those surprises that, in retrospect, would seem most important to today’s choices.

## **Implications for Sustainable Logistics**

How then can freight transport scenarios be crafted to most usefully support sustainable logistics-related decisions? This essay suggests that users might consider scenarios as succinct summaries of the vulnerabilities of proposed policies or plans – as sets of

future states of the world in which a proposed policy or plan may fail to meet its goals.

As one important example, consider decisions about Information and Communication Technologies (ICT). As one key objective, logistics aims to reduce costs by optimizing the total system. Many experts see ICT as a potential enabler of this goal. Traffic congestion is a large and growing burden on national economies. Traditional traffic control systems cannot keep pace with this growing problem, but future motor vehicle systems using advanced electronic controls offer potentially significant advances in drivability and safety, as well as reductions in congestion, emissions, and the high costs of wasted time and fuel.

Already, early examples of such systems are beginning to appear, with escalating use of information technology in motor vehicles to enhance basic and secondary vehicle functions, as well as wireless connectivity to in-vehicle systems, between vehicles and external information networks. The use of ICTs and the integration of Internet-based solutions may make the control of complex logistics chains a competitive advantage for forward-thinking firms, urban areas, and nations.

But, as with many new technologies, the future capabilities and impact of ICT is shrouded in uncertainty. How well will these systems work? To what extent will they be accepted by the public and governments? How will today's policy decisions regarding social, legal, economic, and technological issues influence the rate and character of the transition to greater automation? What is the likelihood of cyber security threats and what safeguards need to be in place to assure the reliability and safety of such systems? Many experts believe that transition to semi-autonomous vehicle systems will take place within the next decade but the implications of today's decisions regarding ICTs are long-term.

The potential for ICT thus offers a range of opportunities along with a wider range of uncertainties. In particular, how can planners seek to take full advantage of ICT's potential while prudently avoiding policies and infrastructure plans that fail to function as intended if the new technology fails to meet its full promise? Scenarios chosen to illuminate the vulnerabilities of proposed policies could help policymakers and planners meet this challenge.

An RDM approach to developing such scenarios might begin with one or more schemes for using ICT to optimize freight logistics and/or supply chains. It would then use a wide range of relevant and plausible technology projections, a wide range of assumptions

about businesses', the public's, and governments' responses to this technology, along with a wide range of assumptions about future demand and other key trends, of possible future outcomes, including potential unlikely "worst cases" that might significantly stress the freight transport system.

The analysis would then extract from these ensembles of projections scenarios that would help decision-makers and stakeholders to understand the key combinations of trends and factors most important in determining whether or not today's policies and plans would lead to a well-functioning future freight transportation system. Such scenarios would then help decision-makers and the communities they serve to adjust today's plans to make them more robust over a wide range of futures.

ICT is only one example of the opportunities and uncertainties facing transportation policymakers and planners and the freight logistics sector. RDM-based scenarios could help decision-makers more confidently craft policies and plans that can take advantage of future opportunities, avoid potential risks, and engage diverse stakeholders in the planning process. Implementing such a vulnerability-and-robust-response approach can help identify scenarios that help people to envision the future of logistics, and to connect these visions to the near-term choices they face today.



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## Corporate Strategy in the Face of Volatility

*by Jan Thido Karlshaus and Markus Reckling*

In recent years the business climate has become increasingly more volatile and complex. Nearly all companies constantly feel the impact of significant changes in the customer and competitive landscape. This includes companies in all industry sectors – especially the logistics industry, where the volatility of many relevant factor prices has risen sharply in recent years. This is demonstrated by the Baltic Dry Index, which tracks freight rates on selected ocean freight routes, or by oil prices, which in recent years have also been marked by increasing volatility. The consequences of unforeseeable events, such as the eruption of the Eyjafjallajökull volcano in Iceland in early 2010 or the tsunami in Japan at the beginning of 2011, are even more dramatic. These catastrophes in some cases had a major impact on international supply chains in the global economy and on the economic situation of many companies.

Volatility and the uncertainty and reduced forecast quality that comes along with it have become commonplace. It is apparent that for this reason the shelf life of corporate strategies and competitive advantage is ever declining. A look back at the history of Fortune 500 companies is quite telling: The vast majority of companies that were on the inaugural list of the world's largest companies in 1955 are not found on the list today. By contrast, many of today's leading companies, such as Apple, Amazon or Dell, did not even exist when the list made its first appearance (*Jim Collins, 2008*). This is no different in the logistics industry when looking at the rankings of the largest contract logistics or freight forwarding

companies. Many companies that led the market just ten years ago don't exist today due to the ongoing consolidation in the logistics industry. Likewise, it is certainly conceivable that Asian or Middle Eastern logistics companies, which are largely unknown today, could attain leading positions in the future. These observations make it clear that a company's strategic position – especially in an increasingly volatile environment – can change very rapidly. With this in mind, companies must respond with increased, strategic agility. This essay provides an overview of the implications that arise from this corporate strategy requirement. We will first address the impact on portfolio management, after which we will discuss three central action areas that can help achieve higher agility: simplification, flexibility and innovation.

## **Portfolio Management**

To achieve a competitive edge and maintain it in the long term it is absolutely necessary to effectively manage the company's portfolio and answer the "where to play?" question. In a volatile world, this portfolio must be continuously reviewed and optimized based on the changing market requirements, for example, new customer requirements or the actions of competitors. Internally, a company must review the compatibility of its various business activities, for example, with a view to internal synergies or core competencies. Areas found lacking or superfluous must be expanded or divested through organic or inorganic means. It's safe to assume that the frequency and intensity of such a portfolio review must be increased in a volatile business environment.

The question of what is the optimal scope of a portfolio in times of increased volatility is not as clearly answered. The basic principle must be to create a coherent and consistent portfolio that is both controllable and stable if the business environment changes significantly. Here a number of different perspectives can be drawn upon for managing the portfolio.

- From a regional perspective, a company can hedge against local uncertainties by positioning itself globally and especially by strengthening its position in markets where above-average growth is anticipated. With this in mind, it is not surprising that all the leading logistics companies do business in nearly all the countries on the planet and continue to build on their positions in the growth regions. On the other hand it is safe to assume that smaller logistics companies will continue to stay in business based on excellent local knowledge and customer relationships.

- In contrast, companies that offer their customers a comparatively broad range of products and services have an advantage with regard to portfolio management. For instance, the fact that the portfolio includes several modes of transport (i.e. air, ocean or overland) makes a company more flexible to switch to alternative modes or a combination thereof (intermodal transport). Two of the aforementioned examples from recent history clearly show the advantages of how flexible this makes a company: increasing oil prices have triggered a move toward lower-cost – and also slower – modes of transport, and the sudden eruption of the volcano in Iceland caused companies to shift transports to road or rail in the short term, benefiting those companies who already had these services in their portfolio.

## **Increasing Strategic Agility**

There are without a doubt countless ways to respond to a volatile market environment. Below we explain some approaches that are part of three major action areas that can help a company increase its “strategic agility” and thereby become masters of volatility:

1. Systematic simplification and reduction of complexity
2. Flexibility of internal structures and processes
3. Innovation and continuous orientation to the changing market requirements

## **Reduction of Complexity**

Endless complexity – of structures, processes or systems – slows down the response to volatile changes in the market. Targeted simplification is the only reasonable answer to non-value-adding complexity. The logistics industry has produced some revolutionary simplifications in the past few decades, such as the container or the euro pallet, which have dramatically simplified core logistics processes. However, there is presumably still an exceptionally high level of complexity in many sectors of the logistics industry. In many areas – especially outside of the network business – we find inconsistent, non-standardized processes and systems as well as complex structures. This is often the result of acquisitions of other companies or adaptation to the specific needs of individual customers, sectors or local circumstances. It’s not always possible to systematically and permanently remove complexity. However,

the general rule is to simplify, where possible, structures (e.g. by reducing levels of hierarchy, increasing spans of control or decentralization and increased delegation) and processes (e.g. streamlining, standardization or modularization).

From a strategic point of view, it is not possible to formulate a concrete policy or derive one immediately from the corporate strategy for every conceivable situation. In most cases the corporate strategy can act as a roadmap to guide employees rather than detailed instructions for dealing with the situation. Details are added to the map based on divisional and regional strategies and finally by employees as a result of increasing delegation of decision-making autonomy. The reduced complexity that results from this should also be reflected in the company's strategic planning. Here the rule of thumb is to minimize depth of detail, introduce shorter planning cycles and focus on strategic projects that are agile enough to respond to changing priorities in a volatile climate.

### **Flexibility**

In a world marked by continuous change and volatility, being flexible enough to adapt the company's strategy is essential. Obviously this creates new challenges for the strategy and for strategic planning: Scenarios, stress tests and rolling forecasts gain importance, while the relevance of traditional long-term planning and fixed budgets fades. Rather than precisely understanding a fixed scenario, it is important to test the stress level of the company's strategy or strategic alternatives against alternative scenarios. The best strategy is not the one that delivers the best results in the base model, but the one that is the most robust across a number of different scenarios. In volatile times, in which even the next three months may prove difficult to predict, fixed budgets lead to misallocation of resources. By contrast, rolling forecasts allow a company to constantly realign its resource allocation.

In addition to purely cost-driven optimization, flexibility is also gaining importance from a strategic perspective in the design of global supply chains (*see also Gattorna 2009*). A substantial competitive edge is to be had through fast and flexible supply chains. The fashion industry presents a good example: Companies like Zara or H&M are able to respond flexibly to short-term fashion trends and ever-shorter product life cycles and have high-fashion articles on the shelves within weeks after the new product is designed. The flip side to that coin shows countless examples in every industry imaginable of how a slow reaction or even a failure to react to unforeseen circumstances can lead to critical delivery bottlenecks for spare parts, production components



or missed sales opportunities because the product didn't reach the point of sale. There are so many areas that can be optimized and are worth looking into. One centrally important question is finding the right combination of onshoring, offshoring or nearshoring. Postponement strategies also present opportunities for improvement. Postponement refers to postponing the time when a product is produced or configured for an end customer, which can ensure the elimination of excess inventory and can improve flexibility in a volatile environment.

## **Innovation**

Substantial competitive edge can be initially generated through rapid and flexible supply chains. The idea is to adapt quickly to changing market requirements. Potential risks and opportunities from the relevant trends have to be identified early and confronted actively (*see also the essay on the "Logistics of the Future" by Petra Kiwitt and Steffen Frankenberg*). The rapid rise of Facebook or the way in which the iPod and the iPhone have changed the face of the music and telecommunications industry are just two examples of how it is simply not enough for a company to concentrate on the direct impact these trends have on the conceived core business. A company has to question its own strategic assumptions time and again and understand what is happening beyond the confines of its own business model.

The faster and more frequently change takes place in the business environment, the more difficult it is to anticipate it in time and have a well-directed response. In order to always be ready for changing market requirements, the ability to innovate is necessary so that signals and ideas are picked up across corporate divisions and from outside the company and can be converted into novel solutions and business ideas. In the logistics industry, it is essential to have close partnerships with customers as well as with suppliers, research organizations and – in certain circumstances – competitors. Often this is the only way to find better or more efficient solutions (in terms of costs or CO<sub>2</sub> efficiency). This way new solutions can also be developed that are tailored precisely to the needs of specific customer groups (e.g., industry sectors or regions). It's best not to put all the eggs in one basket, but instead to steer a broad range of innovations using systematic innovation management and to bring mature product ideas quickly and consistently to market.

## Conclusion

In a volatile environment only one thing is certain: the certainty of continuous change. This type of an environment presents a stark challenge for a company's strategy and requires the highest possible degree of strategic agility. Only those who systematically prepare for this environment can be certain that the future will not only hold challenges and risks, but also opportunities.



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#### A WORD ON THE ILLUSTRATIONS

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