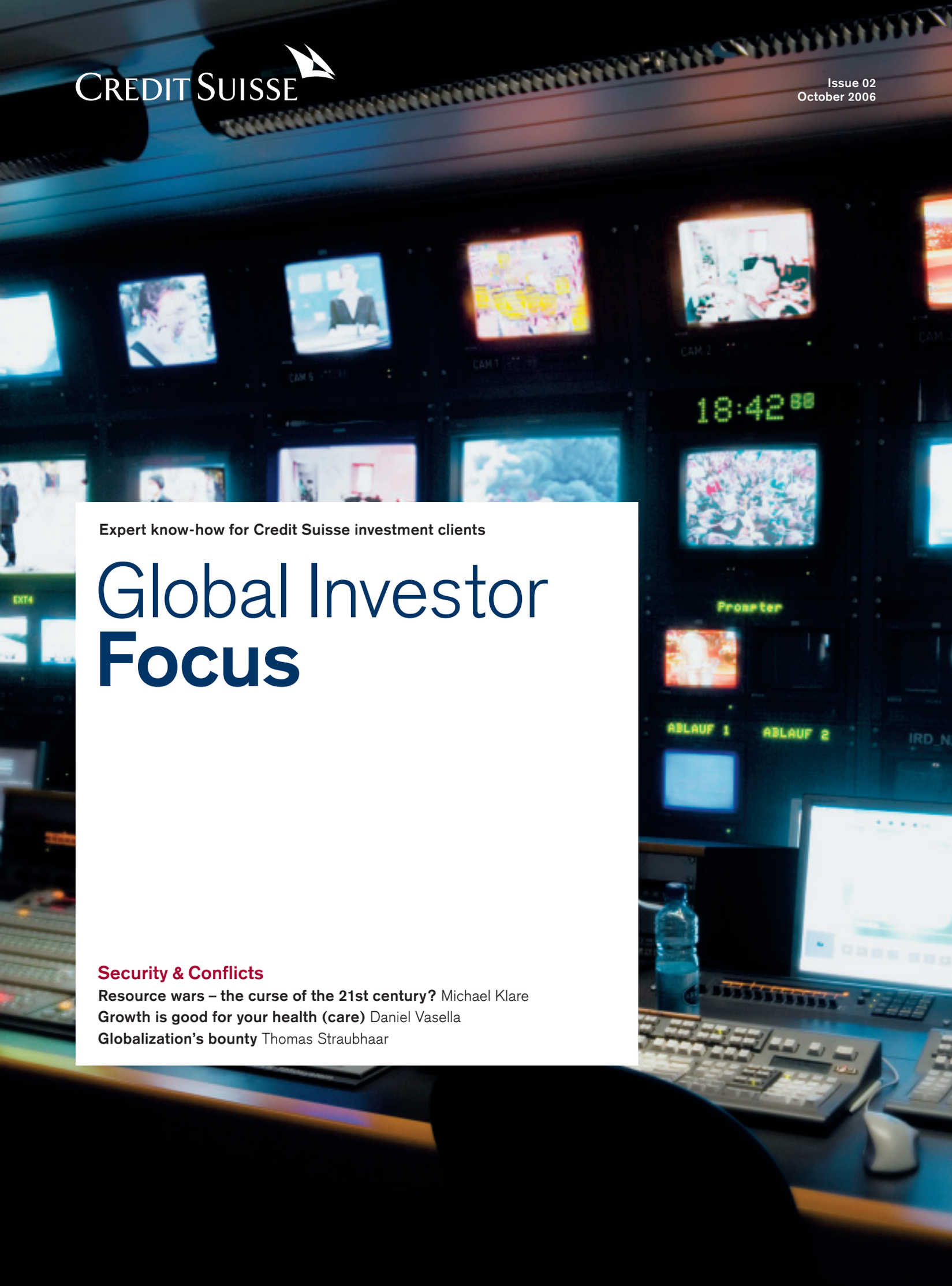

Expert know-how for Credit Suisse investment clients

Global Investor **Focus**

Security & Conflicts

Resource wars – the curse of the 21st century? Michael Klare
Growth is good for your health (care) Daniel Vasella
Globalization's bounty Thomas Straubhaar

Photo Cover: Gee Ly

Newshour

Good evening, ladies and gentlemen. Here is the news. The world is increasingly unpredictable. The Asian tsunami kills hundreds of thousands. Bird flu spreads across the globe in days. Conflicts break out over natural resources. Tensions escalate over water usage in the Middle East. Governments seize oil and gas fields. Migration is transforming Western societies. Personal protection is a growth industry. The message is clear: security is now so important that it is becoming a major investment theme.

Photo: Gee Ly

A war-torn world?

Newspaper headlines may tell a different story, but the figures prove it: the world has never been a safer place. The number of conflicts – whether between states or civil wars – has declined. Wars and violent confrontations are resulting in lower deathcounts than before. So why the feeling of insecurity? The answer is that the reporting of conflicts has been transformed by modern technology. Satellite communications and the Internet allow news and pictures of conflicts, even from the farthest corners of the world, to be transmitted in an instant.

Photo: Lynsey Addario/Corbis, Source: Human Security Report 2005

More security, quicker trade

After the terrorist attacks of 11 September 2001, the US government issued tough new regulations on airport and container terminal security. For developing countries in particular, this imposed a substantially bigger workload. Before containers could be loaded onto ships, they would have to open up every single container for inspection. But surprisingly, the heightened security procedures were more than offset by efficiency gains through innovations and new-technology systems. As a World Bank study discovered, the turnaround period in some ports was shortened, as many trading companies were forced to modernize their systems with the introduction of modern scanning equipment.

Photo: Royalty-Free/Corbis, Source: Bureau of Transportation Statistics

A global response to natural disasters

On 3 January 2005, the Sri Lankan authorities confirmed the extent of the catastrophe that had befallen them days earlier when a tsunami flooded the island's coastal regions and caused the deaths of 30,196 people. When news of the disaster reached Wai-Li Goh, an investment banker with Credit Suisse in London and born in Malaysia, she joined with a colleague to travel to Sri Lanka to help in the reconstruction effort. "It was important for me to lend a personal helping hand," recalls Ms. Goh.

Photo: Thomas Eugster

A disease without borders

Bird flu is a modern-day plague. Since the avian influenza A virus subtype H5N1 was discovered in chickens in Hong Kong in 1997, health officials worldwide have sounded the alarm. The H5N1 virus spread precipitously and infected large stocks of commercial poultry. The infected birds were quickly culled, thus hindering any further proliferation of the disease for some time. Then, at the turn of the year 2003/2004, there was a renewed outbreak of the virus throughout several regions in Southeast Asia. Furthermore, migrating birds transported the virus all the way to Europe, infecting more poultry.

Photo: Reuters/China Photos

The unknowable future

US Secretary of Defense Donald Rumsfeld once expressed it this way: "As we know, there are known knowns. There are things we know we know." One thing is certain: unknown risks to mankind are looming in the future. In the 1950s, smoking was hardly perceived as a health risk. Today, the consequences of radiation emitted by mobile telephones are uncertain. The World Health Organization (WHO) asserts that exposure to RF (radio frequency) radiation emitted by mobile phone handsets does not cause cancer. But of course, scientists will probably not be in a position to verify this assertion until the first mobile phone generation retires. Asbestos, also once described as a wonder fiber because of its heat-resistant qualities, turned out to pose a health risk and the European Union has had a ban in force since 2005.

Photo: TWPhoto/Corbis

Migrants and the law

In Aurora, Colorado, about 400 alleged illegal immigrants are sitting behind bars, most of whom migrated from Central America and Mexico. Hardly any have access to an attorney. Mekela Goehring works for the Rocky Mountain Immigrant Advocacy Network (RMIAN) and visits these immigrants in jail. RMIAN provides lawyers and legal advice to these noncitizens free of charge. These people are not even afforded a public defender at their deportation hearings, says Ms. Goehring. Most of her clients have worked illegally in the US for many years. Since they hold neither a visa nor a US passport, they are incarcerated in Aurora awaiting deportation. But a number of these detainees are effectively US citizens, she claims. One of her clients only realized he was entitled to US citizenship when he was languishing in jail.

Photo: Johannes Kroemer

Controlling the oil wells

To whom does the oil belong? It is the classic conflict between developing countries and the industrialized nations. Companies from the industrialized nations drill for oil or pump natural gas from the earth under impoverished lands. Oil constitutes the basic fuel that drives the economies of these industrialized nations. The President of Bolivia, Evo Morales, recently took control of oil and natural gas facilities belonging to the foreign companies operating there. In the future, President Morales aims to sell these natural resources in his own country. For the oil companies, this means a loss on their investments. But for Bolivia's president, it represents a gain in his country's sovereignty.

Photo: Roger Wood/Corbis

Water wars

Water covers more than 70% of the Earth's surface. However, most of it is saltwater and unfit for people to drink. A mere 2.6% of all the water on Earth is freshwater. But a large share of that small percentage is frozen in the polar icecaps, while part of the freshwater supply is buried so deep in the Earth's crust that it cannot be extracted. Hence, water ranks as one of the world's scarcest natural resources. Roughly 80 countries are unable to provide their populations with a sufficient supply of water without great difficulty. Hence, in many countries across the globe, violent conflicts have already erupted over access to water. And as this vital resource becomes more and more scarce, the number of emerging conflicts looks set to grow.

Photo: Chris Steele-Perkins/Magnum Photo

The protector

Even a boxer needs protection. When Muhammad Ali travels to Berlin as a guest, or when Kylie Minogue gives a television interview, there is one man with a shaven head and stout stature who is often nearby, monitoring the scene: Michael Kuhr, the five-time kickboxing world champion, who now runs a Berlin security agency. Mr. Kuhr does not look like the archetypal bodyguard. He is only 1.67 meters tall. But he was the first German to win a world championship kickboxing title. When he ended his professional career undefeated in 1993, he worked as an instructor, before being hired as a nightclub doorman. In 1994, he started his own business, a move that has paid off handsomely. Before his employees can become bodyguards, he first puts them to the test as doormen. As he explains, the street is still the best place to learn.

Photo: Thomas Eugster

Nanotechnology takes on cancer

The pioneers of nanotechnology – the creation of applications using materials at the molecular and atomic levels – are throwing up some stunning new practical uses. In one remarkable development, a technique originally conceived for use by the US military in welding composites is being adapted to fight cancer. Triton BioSystems is working on a product called Targeted Nano-Therapeutics (TNT) that can kill cancer and some other diseases by using heat to destroy infected cells without affecting the surrounding healthy cells. The key is the combination of precise targeting with the ability to heat up the material used to the exact temperature needed to eliminate cancer cells. If human trials, now under way, go well, TNT looks set to add to the growing number of uses for a technology that is rapidly coming of age.

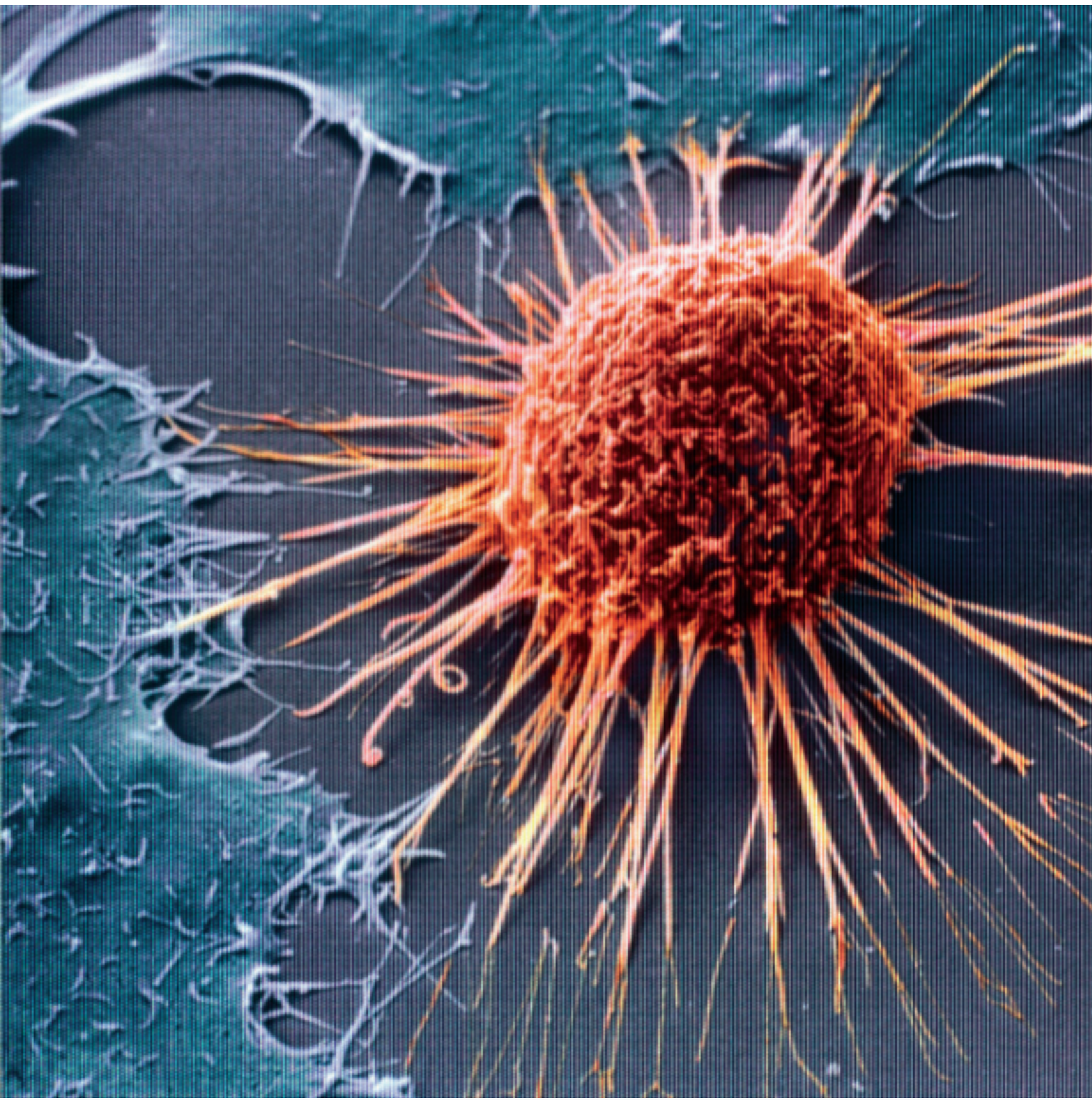

Photo: Steve Gschmeissner/Science Photo Library/Keystone

Fighting opportunist thieves

Burglary is a major source of crime around the world. In the US, for example, burglaries happen every 15.4 seconds on average, bagging a total of around USD 3.7 billion worth of goods a year, most of which will never be recovered. However, many burglars are opportunists, seeking easy access to properties. These casual thieves can be deterred by basic home security improvements. In the UK, 2004 – 2005 government figures show that, while 83% of all households have security locks fitted on windows, only 36% of burgled homes had window locks fitted. The good news is that more people are implementing such simple measures. In the UK, efforts aimed at improving home security, together with better-targeted policing, have led to the number of burglaries dropping by over half since 1995.

Photo: Defaix/mediacolors/Fotofinder

Photo: Thomas Eugster

Conflicts and catastrophes of various intensity and diversity are practically day-to-day subject matter for worldwide media coverage. They constitute threats to our planet, our prosperity, or our health. Some obvious examples of such events of global dimensions are escalating terrorist attacks, natural catastrophes, military clashes over appropriation of land and natural resources, the ever-widening gap between rich and poor, as well as the unpredictable pandemics of a new age. But there are also permanently looming risks – stemming from factors such as environmental pollution, traffic, alcohol and drugs, or severe illnesses – which are omnipresent and burden our everyday lives.

Nevertheless, we are not helplessly imperiled by all of these threats. Advances in science and the development of state-of-the-art technologies are making a significant contribution to meeting the growing, legitimate need for security at various levels of society. The analysts at Credit Suisse as well as international experts from a variety of scientific and academic disciplines shed light on numerous facets of these interrelated topics in this issue of Global Investor Focus.

Under the heading Earth, for example, we highlight industries that are developing methods to decelerate the pace of consumption of our natural resources, alternatives to conventional oil and natural gas excavation, and long-term preservation of the freshwater supply. On the topic of Wealth, the focal point is directed at the ever-widening social gaps and increasing demographical problems. Providing access to a banking system for the poor via microbanking can be an effective approach for upholding the social order in the long run. The section titled Health delves into preventative measures as well as the prevailing health risks and how these can be countered, for instance, through medical applications based on leading nanotechnology.

Accordingly, sectors and companies that are intensely striving to overcome these risks – with products and services designed to ensure global security, preserve prosperity and foster health care – offer significant potential for growth. Hence, they also present interesting investment opportunities for investors who wish to participate in the success of such firms. I hope you'll enjoy fascinating insights while reading. ■

Alois Bättig, Head of Private Banking Europe, Middle East, Africa

That's the news for now

The conflicts of the 21st century are multifaceted and complex. The world's problems are intricate and vary from region to region. Concerted efforts are necessary in order to solve, or at least alleviate, these problems. But this mission involves more than diplomacy. Science can also play a significant role here, for example, by developing innovative medicines and unearthing new discoveries. The task also necessitates economic measures. And that, ladies and gentlemen, was the news.

Photo: Gee Ly

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Health

Poverty is bad for your health

A healthy society is more productive, more provident, and more studious. Hence, public health policy in the developing countries, in particular, faces tremendous challenges.

Size matters

Nanotechnology harbors numerous opportunities as well as still-unknown dangers. In the realm of atomic science, the properties of matter are changing.

Health and markets

With or without patents, pharmaceutical companies profit from the field of health and strive to develop new therapies to treat old illnesses.

Promoting health solutions on a worldwide scale

The United Nations-backed Millennium Declaration put a spotlight on the urgent need for improvements in health protection and prevention worldwide. The link between health and poverty was put at the top of the agenda, given the weight of evidence that a healthier population is likely to result in a more productive workforce and to be more socially cohesive. Now, medical practitioners are searching for the solutions that will have the most benign impact on global health problems.

Prof. Dr. Ursula Ackermann-Liebrich, Academic Director, Swiss School of Public Health

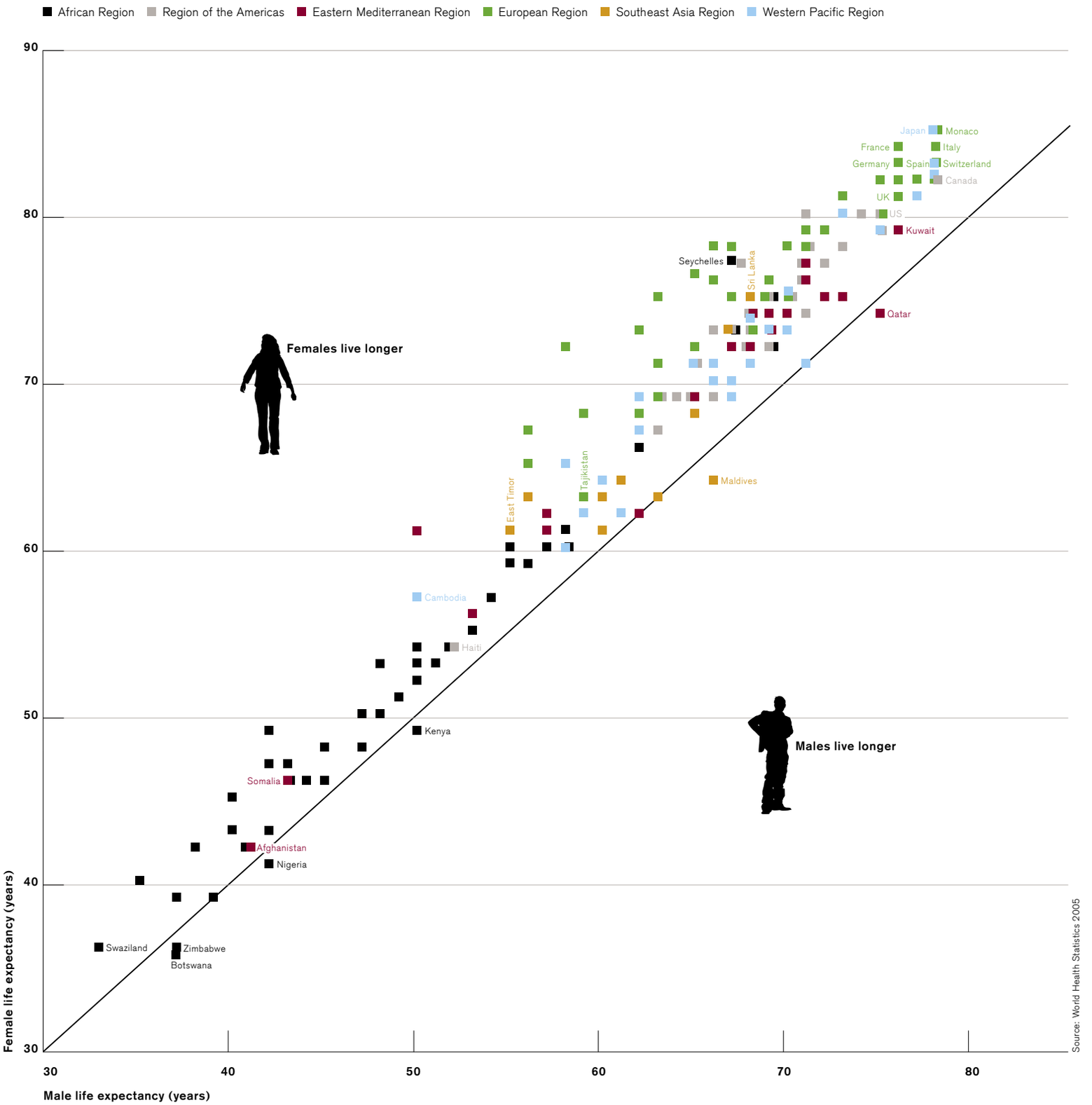
In September 2000, the largest-ever gathering of heads of state ushered in the millennium by adopting the Millennium Declaration. The Declaration, endorsed by 189 countries, was then translated into a roadmap setting out goals to be reached by 2015. The World Health Organization (WHO) has defined the prime goal for health in the third millennium as being that inequalities in health standards within and between countries should be drastically reduced. These inequalities have resulted from many factors, one of the biggest being discrepancies across the globe in distribution and access to economic resources and health care.

Seeking global health solutions

There is a German saying that health is not everything, but without health everything else is nothing. And without good health, access to resources becomes even more difficult. This is a vicious circle: ill health is perceived both as a cause of increased poverty and as an obstacle to escaping from it. According to the WHO, 2.1 billion people worldwide live on less than USD 1 a day, while food insecurity threatens 800 million people worldwide. Illness can slash household savings, reduce learning ability, lower productivity, and lead to a diminished quality of life, thereby creating or perpetuating poverty. Meanwhile, there is evidence showing that better health translates into greater and more equitably distributed wealth by building human and social capital and increasing productivity:

- A healthy workforce not only produces more, but also saves more.
- Healthy children are better able to learn.
- Healthy families tend to have fewer children, and better birth spacing.

Reducing poverty worldwide would probably be the most efficient way to increase health. This is something that is true not only for the developing world but also for the developed, industrialized countries. For example, the relative gap between the richest and the poorest when looking at the risk of child mortality is similar in industrialized and poorer countries, albeit at often radically different levels of both health and wealth. The top graphic on page 22, ↗



The life-span gap

Life expectancy is much lower in the world's poorest regions, as shown by the graphic above, based on WHO figures. The average life span in Africa, in particular, is much shorter than elsewhere due in part to poverty and the lethal effects of the HIV/AIDS epidemic that has swept that continent. Also evident is the almost ubiquitous tendency for women to live longer than men.

based on WHO statistics, illustrates this point and also shows that these differences have not decreased over the past ten years.

Many people not only suffer from poverty or from lack of access to health services but are also threatened by unhealthy jobs or an unhealthy environment. Environmental protection saves lives, produces fewer diseases, and gives more people a fair chance to achieve reasonable health. Today 1 billion people do not have access to sufficient safe drinking water, 2.4 billion people lack adequate sanitation, and 3.4 million mostly poor children die yearly due to insufficient and unsafe drinking water. Another 1.6 million deaths are due to indoor pollution. The WHO aims to ensure a safe and sustainable environment for all the people in this world. Environmental pollution and increasing natural disasters will threaten more lives every year. This is not confined to developing countries. The heat wave in summer 2003 and the floods of summer 2005 killed thousands throughout Europe, despite the prosperity to be found there. And these problems are increasing to the extent that insurance companies no longer insure houses in many parts of the world, while, in the southern Pacific, many islands are expected to disappear, leaving people homeless and in danger of drowning in the face of rising waters.

The peace dividend

The challenges for health protection and health promotion are not only to help reduce poverty, make the environment safer, and create better access to key resources, but also to promote peace and thus make it possible to live a healthy and fulfilling life. There are huge differentials between life expectancies around the world. If you are a woman born, for example, in Japan or Sweden, you will very likely be able to celebrate your 80th birthday. In some African countries you may not even reach your 40th. The graphic on page 20 demonstrates this gap, with life expectancy ranging from 35 to 83 years in the countries shown. Given all these varying problems, the potential impact of health service improvements on health protection or promotion may seem limited. But analysis of the causes of mortality show that a large proportion of early deaths (that is, mortality under the age of 70) could be avoided: as the chart at the bottom of page 22 shows, 10% of all deaths in 2002 around the world were attributable to tuberculosis, HIV infection, and malaria. Another 22% were linked to other communicable diseases. In many parts of sub-Saharan Africa, directly or through increased vulnerability to malaria or tuberculosis, HIV infection takes the lives of adults at their most economically productive age and leaves children without parents to guide them toward productive citizenship.

On a positive note, trials have shown that appropriate treatment of HIV and accompanying infections markedly increases not only the health of the individuals but also the economic health, productivity, and stability of the populations where community-wide treatment is instituted. However, the long-term establishment of such treatment needs a level of political stability to begin with. The chart also shows that the majority of people worldwide die from noncommunicable diseases, mainly cardiovascular diseases and cancer.

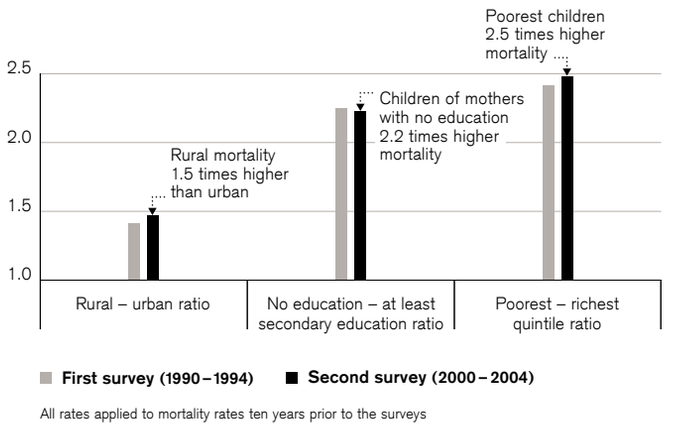
Changing contexts

At the other end of the scale, a new set of problems comes into play. As societies get wealthier, health can be affected by the so-called civilization diseases – those that are a consequence of unhealthy eating – a failure to engage in sufficient physical activity, smoking, and so on.

“The biggest enemy of health in the developing world is poverty.”
Kofi Annan

Equity and child mortality rates within countries

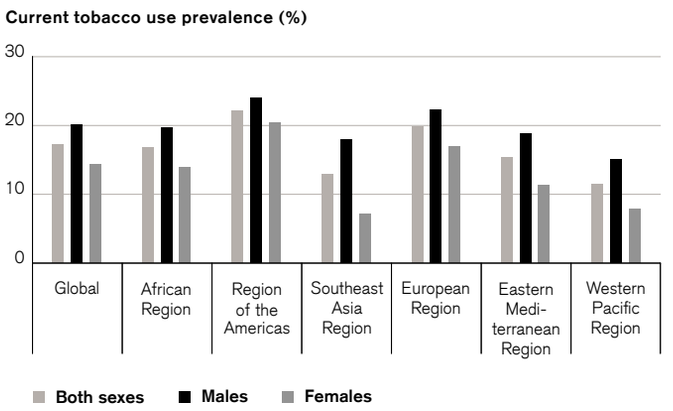
Based on WHO equity and child mortality rates within 29 countries. The chart shows groups from rural areas, with poor education or less money are likely to experience considerably higher levels of child mortality than their urban, better educated, or wealthy counterparts.



All rates applied to mortality rates ten years prior to the surveys

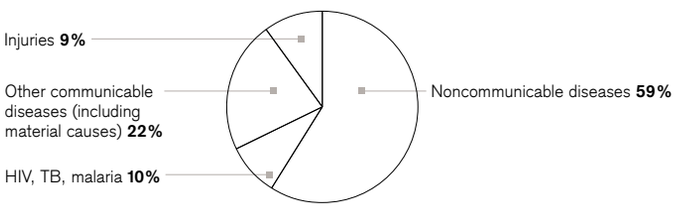
Current tobacco use among students aged 13 to 15 years

The fluctuating percentage of 13- to 15-year-olds that smoke in different global regions.



Causes of deaths in the world

Reveals what killed the 57 million people estimated to have died around the world in 2002.



The WHO World Health Report 2002 concludes:

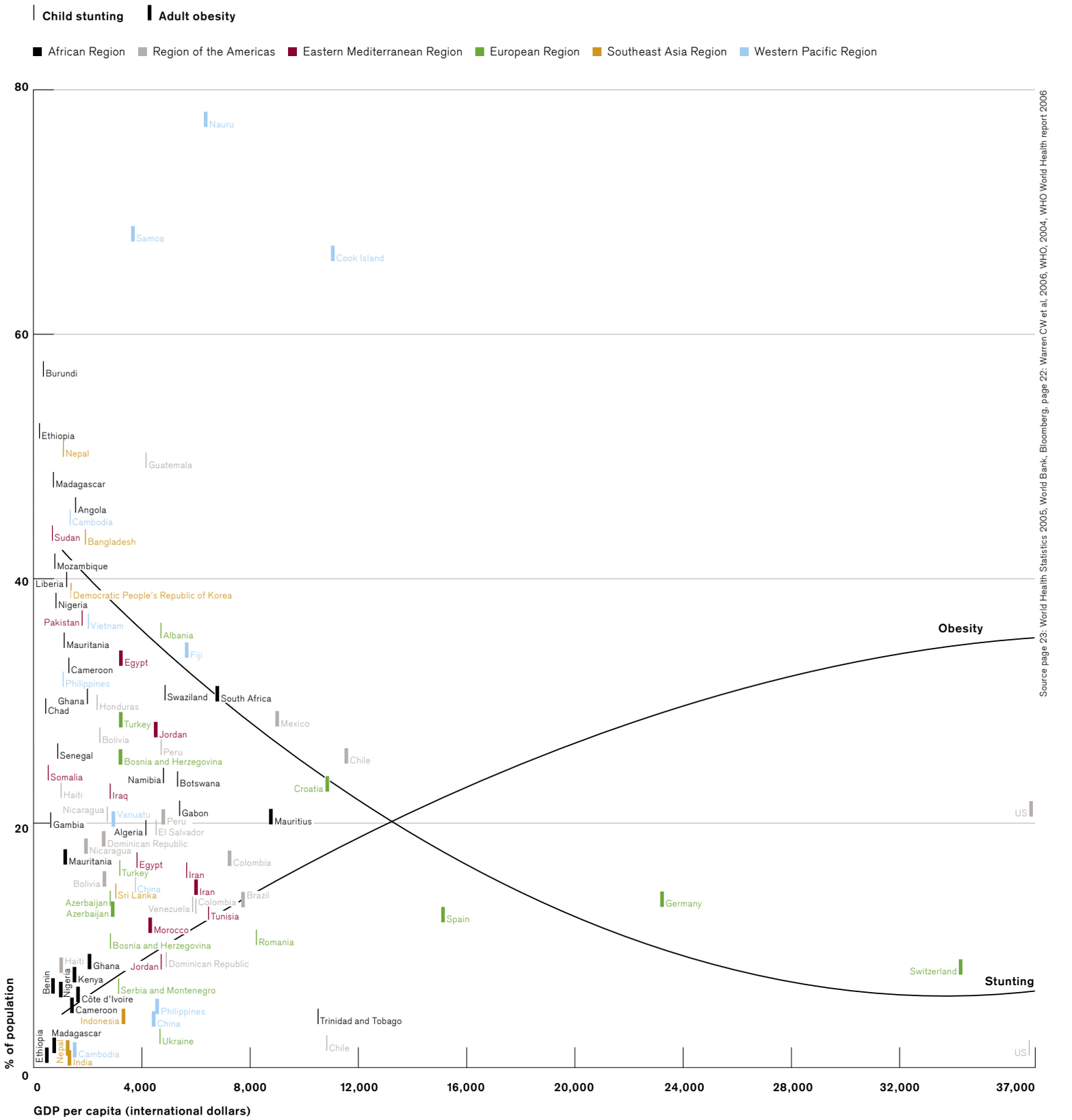
- Chronic disease risk factors such as raised blood pressure, obesity, high cholesterol, tobacco use, excessive alcohol consumption, and the diseases linked to them are now becoming prevalent in low- and middle-income countries.
- Low- and middle-income countries suffer from a double burden of disease, the combination of long-established infectious diseases and the rapidly growing epidemic of chronic diseases.

The graph on page 23 illustrates this point: as GDP per capita rises, children are better nourished, but obesity with all its health consequences (hypertension, diabetes, cardiovascular and respiratory problems) becomes very frequent. Chronic diseases can be attributed to different risk factors, of which smoking is the most obviously preventable. Smoking is still increasing in many countries, especially among young people – a factor highlighted in the middle graphic on the left. This rise in smoking has been a result not only of aggressive marketing by cigarette firms from industrialized societies, but also by shortsighted local and national promotion of home-grown, often less regulated, tobacco production.

The challenges of health promotion

The problems mentioned so far indicate the challenges for health protection and promotion – there is a need for activities at every level: political decisions and legislation, education, motivation, and personal interventions at a medical level. Protecting the environment by eliminating hazardous substances from it is probably the most efficient and effective way to protect and promote good health. This is true for the workplace and for the environment in general. It is estimated that around 40,000 people die yearly from exposure to air pollution in France, Switzerland, and Austria: this is more than twice the number killed in vehicle accidents. Yet the perception is different, as the effects of air pollution are much less dramatic and less visible. In traffic, a culprit is easily identified: someone, possibly drunk, driving too fast or irresponsibly, or perhaps an unseen object. Driving at night, after drinking alcohol, or driving on an icy road is recognized as “risky,” while breathing the air behind a truck or living on a busy road is seen merely as a normal activity to be tolerated.

Looking at risk factors for mortality leads us to think about personal choices and responsibilities. As the editor of the “New England Journal of Medicine” wrote, alluding to US health policy: “The concept of personal responsibility is that if we follow a healthy lifestyle and are good patients (keeping our appointments, heeding our physician’s advice, and using a hospital emergency department only for emergencies) we will be rewarded by feeling better and spending less money.” However, the primary goal of health services as well as of preventative measures and health protection cannot be to spend less money, but to facilitate a healthy life by spending funds in the most effective and efficient way. Health care is too often not based on solid scientific evidence, and thus ineffective treatments and interventions occur. In that case, efficiency becomes a secondary issue. This is especially true for prevention. Many primary prevention programs aimed at preventing the onset of disease, either through physician care/contact with the medical system or through education, are inadequately evaluated for their efficacy. Vaccination for smallpox and its consequent eradication is one example of successful primary prevention by the medical system. Another example of primary prevention through education is the reduction in the HIV epidemic through systematic sex educa-



The distinct health threats facing rich and poor

Health problems affecting the rich can be very different from those prevalent in poor communities, and they are not necessarily less problematic. This graph, based on a recent WHO survey, shows that children are far more likely to be stunted among poor populations, due to factors such as malnutrition. On the other hand, obesity and all its attendant problems are a much bigger health issue in the world's more developed and wealthy countries.

Photo: Thomas Eugster

Ursula Ackermann-Liebrich is Academic Director of the Swiss School of Public Health (SSPH) and Professor for Social and Preventive Medicine at the University of Basel. Her areas of specialist research include the relationship between health and the environment. → see full biography on page 70

tion in schools and among especially vulnerable groups in Europe and the US.

However, the success of these education programs has varied by culture and social circumstance, and secondary prevention/treatment has been more effective in some communities, becoming a necessary component of HIV control. In both industrialized and developing countries, the number of well-trained health educators and public health physicians is limited.

The secondary prevention approach

The most widespread preventative efforts focus on secondary prevention – the search for early signs of disease at a time when the individual concerned is not yet aware of it. However, the assumption that early treatment of disease must be the better approach has, at times, not been tested through appropriately designed and reproducible clinical trials of alternative approaches to treatment. Often, without objective data to support their assumptions, the public and medical practitioners assume that earlier treatment must be better and inevitably result in slowing down the progression of a disease. Yet early treatment may not be advisable if the history of the disease is uncertain or the benefits of treatment are limited. In the worst case, early treatment may be used in cases where the disease might have regressed of its own accord without this action. Treatment in such a case may trigger complications and extra costs which could have been avoided.

There are positive examples. For example, screening for breast cancer in a quality-controlled program and in a high-incidence community has been shown to reduce mortality. But these programs cannot easily be transferred to populations with lower risk or where the necessary quality control and follow-up cannot be guaranteed. Sometimes simple measures, such as medical advice to stop smoking, increase the probability of success. And legislation to create smoke-free workplaces and to reduce smoking in public spaces not only protects nonsmokers from inhaling tobacco fumes but may also prompt smokers themselves to quit.

Personal behavior and public responsibility

Secondary preventative activities, even those with proven effectiveness, will have a limited impact on a population's health. The same might be true for general medical advice on a healthy lifestyle. Creating a healthy environment is not restricted to cutting down pollution. It also includes social strategies and commercial aspects: healthy behavior should become the natural choice. As long as we build garages next to our houses and put public transport stops miles away from where people live, we cannot expect ready adoption of public transport and the benefits of a walk to the station. If the most available and cheapest food is unhealthy, then we are unlikely to eat healthily as a population. Personal responsibility for one's health is a nice concept, provided the option to choose a healthy lifestyle is readily and conveniently available.

Health promotion and protection need interdisciplinary approaches and collaboration. It has been said that health promotion is everybody's business and nobody's responsibility. This can be changed. Health is not just a responsibility for the individual, but also for society, employers, and market regulators. In short, we all need to act in order to achieve better health for all. ■

Note: Some parts of the introduction and all figures are taken from WHO World Health Statistics and WHO World Health Reports

Nanotech: Managing the health risks

Nanotechnology has opened up a host of possibilities for new consumer products, technological developments and medical techniques. But, as funds pour into this exciting area, we need to take precautions to minimize possible health dangers both for consumers and for those involved in manufacturing and developing nanotechnology.

Dr. Diane J. Mundt, Senior Science Manager, ENVIRON International Corporation

Anticoat Wound Dressing. Atomic Snow Izor Skis. Clarity Defender Automotive Windshield. Daewoo Refrigerator. Hydraflash Bronzer. LLBean Timberledge Pants. The iMac 65 Chip. These products have one thing in common: nanotechnology. They are among more than 200 nanotechnology-enhanced products currently available to consumers that are listed on the Woodrow Wilson Project for Emerging Nanotechnologies' website. The range of "nano" applications already in use is staggering, and these only hint at the variety of future possibilities envisioned and under development. Massive government and private financing has fueled the rapid spread of nanotech products. But there has been a tendency in some cases to lose sight of, or even ignore, the potential for human and environmental harm resulting from the mishandling of nanomaterials. Far fewer resources have been expended on improving understanding of possible health and environmental impacts from the manufacture and development of these materials, or the possible adverse effects of exposure to nanomaterials in their intended uses.

In its June 2005 issue, Global Investor Focus highlighted nanotechnology as being the key technology of the 21st century, paving the way for solutions to many of the most important problems facing the industrialized world, due to its inherent multidisciplinary nature. What makes this technology so special is that size matters – in this case, a very small size, on the order of less than 100 nanometers, where 1 nanometer is one-billionth of a meter. What makes the technology remarkable is that, in this size range, matter can be manipulated at the atomic level to take on novel properties that do not exist in a larger state. Bulk gold, for example, which is an inert, shiny material, can exhibit a rainbow of colors at nanoscale, and is also being developed for use in a variety of applications, such as a biological marker.

Differing techniques

Nanomaterials are generally produced using one of two methods. Reducing a bulk material to nanosize is known as "top-down" production – products developed in this way predominate in the market at present. But it is the "bottom-up" approach, where molecules are manipulated and positioned in such a way as to confer novel properties, wherein perhaps the greatest promise lies. In addition to consumer products, applications of nanotechnology in areas such as energy conservation, water remediation and medicine are making monumental strides. For example, nanomedicine will move healing technology to the cellular level. In the not-too-distant future, detecting and diagnosing cancer may occur before symptoms are evident, and allow treatments targeted at a few specific cells, rather than the healthy surrounding tissues, or the entire body, as happens in the case of conventional radiation and chemotherapy treatments.

Going even further than destroying diseased cells, some envision "nanosurgery," where "nanorobots" can be deployed to repair damaged cells. The use of dendrimers – molecules structured with branches like a tree – could deliver drugs directly to a target organ or tissue, identified by quantum dots – particles that change properties with addition or removal of electrons – which can be used as markers within the body. We have all been exposed to particles in the nanorange through ambient sources – for example, the by-products of combustion, volcanic ash and motor vehicle emissions. The possible health effects of these exposures have been studied in animals (toxicology) and in humans (epidemiology). However, the potential for exposure to engineered nanomaterials is unknown, and by extension, possible human health risks are unknown. Those who may be at highest risk of exposure to nanomaterials are people in the workplaces and laboratories where this technology is being developed, rather than consumers of goods containing nanomaterials. It is too early to know whether risks face those who may benefit from nanomedical applications.

Assessing the risks

At this point, what do we know about the possible health risks of nanoparticle exposure? To date, a few studies of possible health risks, conducted in animals or cell cultures (cytotoxicology), seem to indicate there may be some risk from exposure to nanoparticles.[2] Studies in rats have shown increased inflammatory responses and tumors in the lung, which may be a response to placing large quan-

Photo: Johannes Kroemer

Diane J. Mundt leads a team of experts at US-based ENVIRON International Corporation. She is a member of a number of advisory panels engaged in the search for safe applications and handling of nanotechnology.

→ see full biography on page 70

tities of nanoparticles in the lung. Other studies have reported that nanoparticles may be able to translocate or move to other parts of the body after inhalation, but results are conflicting.

Additionally, little is known about whether nanoparticles can penetrate the skin and move through the body, although this is also under investigation. Extending the interpretation of these toxicological results from animals and cells to humans must be done cautiously. We are not aware of any epidemiological studies of human health risks or reported illnesses from the use of engineered nanoparticles. Currently, the available science has not been developed to the point that we can accurately characterize and measure exposures to engineered nanoparticles in humans. Therefore, one scientific dilemma is the extent to which we are able to use what is reported in the scientific literature – both regarding health effects from exposure to ambient nanosized particles and the toxicology of engineered nanomaterials – and apply these findings to suggest possible human effects from engineered nanomaterial exposures. The chemical and physical properties of engineered nanomaterials are, by definition, altered to meet the particular needs of faster computers, smoother lotions, stain-free trousers and so forth; so drawing comparisons between what is known about the possible risks of exposure to naturally occurring nanomaterials and engineered nanomaterials may be incorrect.

Workplace exposure

In considering exposure to nanoparticles and the possible health risks, one needs to consider not only the characteristics of the particles, but also the actual potential for human exposure. For the average consumer, the potential for exposure to "free" or unbound nanomaterials is relatively low, because few products currently use nanoparticles in this state. When nanomaterials are used in electronics, clothing, and sports equipment, for example, the nanoparticles are bound up as part of the structure of the product and do not exist as individual particles. Of somewhat greater interest, and possible concern, is the occupational or research and development setting, where individuals may have far greater potential for exposure to unbound particles. Although the potential for exposure to unbound nanomaterials in some occupational or research settings may also be low, there are a significant number of individuals working with nanomaterials in ways that could increase the risk of exposure. Such risks include not using protection when working with nanoparticles in solutions or handling nanopowders, generating nanoparticles in areas that are not enclosed and maintaining equipment or managing spills in the workplace. Do these unresolved health-related issues mean that we should not proceed? Absolutely not. In the "traditional" workplace, for example, we already manage risks from possible exposure to hazardous substances. For example, manufacturers of "potent compounds" – drugs that only need to be used in very small quantities to have a very big effect – need to take certain safety precautions to protect employees at risk of high exposure to these materials.[3] Even if the specific toxicity of high exposure to potent compounds may be unknown, information gathered through experiences with drugs that act in similar ways can be used to protect the workers and the environment. Similarly, with nanomaterials, steps can be taken to manage occupational and environmental risks using techniques and approaches extrapolated from knowledge about other, traditional products.[4]

Corporate strategies

Some companies have risen to the challenge, choosing to tackle the uncertainties of health risks from nanotechnology by implementing procedures, protection and engineering controls in the workplace; some companies ignore past experience, denying any potential risk; and other companies admit they don't know what to do, or what steps to take. In the 21st century, however, neither ignoring past experience nor becoming immobilized by uncertainties regarding appropriate steps is an acceptable route. The area is not yet regulated, but government agencies around the globe are monitoring the situation and considering whether action specific to these materials is needed. Work must continue to develop nonburdensome and cost-effective techniques to measure and monitor exposure and develop optimal protective equipment for workers.

Although workers are on the front line in terms of exposure risks, these can be managed. Even if workers are fully protected from potential exposure, it will be necessary to devote a similar degree of attention to understanding the fate of these materials in consumer products – and the environment – and to be on the lookout for unintended adverse effects that may be a consequence of their use. ■

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[1] http://www.nanotechproject.org/44

[2] Borm DJA, Robbins D., Haubold S. et al., The Potential Risks of Nanomaterials: A Review Carried Out for ECETOC. Particle and Fibre Toxicology. August 2006.

[3] Naumann BD, Sargent EV, Stakman BS et al., Performance-based Exposure Control Limits for Pharmaceutical Active Ingredients. American Industrial Hygiene Association Journal. 57:33–42, 1996.

[4] From the US National Institute of Occupational Safety and Health: http://www.cdc.gov/niosh/topics/nanotech/safenano

Interview with Dr. Daniel Vasella, Chairman and CEO of Novartis

→ Interview Dr. Maria Custer Sigrist, Credit Suisse Research Team

"Fast-growing economies such as China and India are set to gain in importance as health care markets."

Dr. Maria Custer Sigrist: As we move into the 21st century, we are experiencing changes in the environment, lifestyle, and science. All these changes will in some way influence health. What is your vision for health care over the next 20 years?

Dr. Vasella: It is obviously difficult to make predictions such a long time in advance, but what we can predict – which has already had an impact and will have an even deeper impact in the future – is demographic change, with a dramatic increase in the aging segment of society worldwide. If you consider Italy, for example, more than 19% of the population is currently over 65. That has an influence not only on the economy but also on health care, because with aging you have a higher incidence of chronic diseases. For example, with cancer the biggest risk factor is age, so one can quickly see that diseases such as Alzheimer's will become more prevalent.

Second, we can anticipate technological breakthroughs. Up to now there is relatively little that has emerged from the genome revolution as it relates to applied medical therapies. There is, however, no doubt that, after a gestation period, we will see an array of products emanating from the insights we have gained from research into the human genome and its functions. To give you an example, we now have a technology using RNAi [RNA interference], which can modulate DNA activity.

But it takes a long time for these technologies to be applied. When do you think that they might be available?

Dr. Vasella: In this particular case, if it works, we can look at between 5 and 10 years. But in general, I would say that gestation periods are more like 10 to 20 years; so it takes a long time from discovery to application. Generally, the market enthusiastically embraces a certain technology but then is rapidly discouraged because nothing comes out of it immediately. Then, once almost everybody is discouraged, the technology becomes a reality and people pick up on it again. This has, for example, been the case for monoclonal antibodies. And in the area of tools, information technology and nanotechnology, it will play an even greater role than they do today. Inevitably, cost pressures will increase with demand and higher R&D costs. Eighty percent of costs are attributable to hospitals and secondary health care services, where there are a lot of inefficiencies in the system that need to be fixed. For example, we have duplication of lab tests in countries such as the US, partly due to litigation, second opinions on diagnosis and treatment, and a lack of sharing of medical data because of privacy concerns and corresponding laws.

Geographically, I anticipate that large, fast-growing countries, such as China and India, will gain in importance not only industrially but also as health care markets. Russia will expand too. Economic growth always has a disproportionately high effect on health care costs. When GDP grows by 1%, one tends to see health care expenditure rise by approximately 1.4%.

In countries such as China, health care infrastructure is still not quite there, is it?

Dr. Vasella: It depends. If you are looking at the coast, that is, at the big cities, such as Shanghai, you see that the use of Western medicine is growing. When you go to rural areas, there is a lot of catching up to do. But there is no doubt that there have been tremendous improvements. If you look at India, 38% of its 1 billion people have access to essential drugs, and the Indian government plans to increase access to 80% of the population by 2020. This implies very dynamic growth.

In the West, we are witnessing a striking change in lifestyle. On the one hand, there is less physical exercise, with adults doing sedentary work or children spending a lot more time at the computer instead of playing soccer. On the other hand, as regards nutrition, people consume more convenience foods, and in addition, there is an impact from overindulgence. These changes in lifestyle have led to a rise in obesity not only in children but in adults as well. The problem has taken on truly dramatic proportions. There is also a concomitant increase in secondary diseases such as hypertension, diabetes, and degenerative joint diseases. This trend has not yet reversed, and that is very worrisome.

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That is a task for preventative medicine, surely?

Dr. Vasella: Yes, preventative medicine has a bigger role to play. The first priority is a healthy lifestyle with better nutrition and normal weight, so people will not get sick as often or succumb to chronic diseases. Significant costs are also caused by smoking and alcohol abuse, and efforts to educate the population and reduce these poor habits must be sustained. We also need to increase our investment in vaccines, a classical form of prevention, which is projected to grow between 15% and 20% in the next five years in order to fulfill the needs of the population and health care systems.

Several food manufacturers have moved into the nutrition business. Do you expect the links between the pharmaceuticals industry and food manufacturing to become closer in future?

Dr. Vasella: In the past, I believed this would be more realistic than I think today. One has to reflect on a few things.

One approach is to modify plants genetically so they produce drugs, and efforts are under way to do this. This is a long way from becoming reality, but it is absolutely feasible to develop plants to a point where they produce therapeutic proteins, rather than just plant proteins. Doing this in a broader, systematic way is still far-fetched. For example, the modification of plants so that they produce drugs or compounds to treat HIV – imagine a food that could basically treat HIV – is still a long way from becoming a reality.

More effort has gone into modifying so-called functional foods to make them healthier, or to identify ingredients, for example, in red wine or in chocolate, that may bring health benefits. There is still no major breakthrough in this area. The reason is that the consumer mostly makes decisions based on taste, texture, or convenience and not really on therapeutic health benefits. We want to enjoy food, rather than feel that we are taking medicine. There is a psychological barrier.

However, there is a significant effort focused on making food healthier, and eventually we can expect to see some results from this trend.

What are the long-term priorities of the pharmaceuticals industry?

Dr. Vasella: Well, different companies have taken different routes. There are some that are highly focused on branded and patented pharmaceuticals, and then there are those that are more diversified, that have a health care portfolio with a broader range. We are, I think, the only pharmaceutical company that is building its business portfolio according to the megatrends taking place in health care across the world. First, there is a need and desire for innovation, for better medicines to treat diseases that cannot be treated properly today – that's the branded pharmaceutical innovation business.

Second, there are cost pressures and the imperative for volume growth due to increased demand, which generics addresses. There is prevention by vaccines, and finally there is consumer empowerment through self-medication. We believe that we have strategically shaped our business portfolio to address all of these trends and also to provide less risk exposure.

Your company has both patented drugs, which need protection, and generics. Do you see any conflict in dealing with both types?

Dr. Vasella: The first question is, Why not have both? They are managed separately, sharing some common platforms such as production or selling to key accounts. The customer, whether a doctor or patient, doesn't distinguish between generics and innovative drugs. Each searches for the optimal health care solution for a certain condition. A physician prescribes both novel medicines and generics, and a patient takes both medications. There is no inherent conflict between the two products or with the customers.

The next question is, What does a company stand for in terms of policy? We take the position that medicine has progressed dramatically through innovation. No reasonable company, however, will invest in innovation unless it can produce a return, and the return is dependent on effective patent protection. Patents provide equally a reward and an incentive. So if a society wants continuous innovation, if we want better medical treatments for our children, then we must have proper patent protection.

Patent protection is a monopoly that is given to a company as a reward for performance. But this is a time-limited monopoly that has an expiry date; after that point in time, we believe that generics are legitimate alternatives. Companies have had time to recover their investment and make a fair profit. Furthermore, knowing that a product will lose its patent and that it will face competition generates a sense of urgency for companies to perpetuate the innovation cycle, because they need to find new patented products. If there were no innovation, there would be no new generics. There is an interdependent relationship.

"Growth always has a high effect on health care. When GDP rises by 1%, health care costs rise 1.4%."

We already operate in the world-class league in both businesses, and we have the ambition to remain competitive in both.

What do you think about the prospects for tailored medicines?

Dr. Vasella: I think tailored medicine will become increasingly feasible. Most likely it will not be individualized to the point where each patient gets his or her exactly personalized drug. But today, we know how to design drugs for certain diseases, once the genetic defect is known and we have identified the proteins that can lead to the misbehavior of the cell.

One example is chronic myeloid leukemia, where we know exactly the genetic defect, the molecular biology, the pathway, and the protein that is responsible for making the cell behave like a cancer cell. Our drug, Gleevec, was designed exactly to target that protein and to suppress it. Now that a small proportion of patients are becoming resistant or intolerant to Gleevec, we have a second drug called Tasigna that successfully tackles the disease in those patients. As you start to understand the molecular biology, the genetic makeup of a patient, and the disease, you can design drugs that address it in a much more specific way.

In summary, we will better understand diseases, their pathophysiology, and their pathways, so we will also be able to address the needs of smaller, more specific patient segments in an effective way. ■

Photo: Markus Bertschi

Earth

Possessions beneath the earth

Supplies of many commodities are drying up. At the same time, they are urgently in demand. Hence, conflicts arising between producers and consumers are inevitable.

New conflicts, new wars

In the aftermath of the Cold War, the world has not become a more peaceful place. New conflicts have emerged – and they are more complex than the clashes of old.

Is the future bright?

Oil and natural gas supplies are finite. Has the time come for nuclear energy?

Time to act on resource wars

The coming century could witness an endless succession of resource-based conflicts as a growing world population consumes ever more commodities in pursuit of higher living standards. In order to alleviate fundamental dangers for consumers and investors alike, we must turn to international legislation rather than arms to settle our differences. Robust laws allied to greater conservation of natural resources and the technological development of alternatives can help reduce the risk of resource wars.

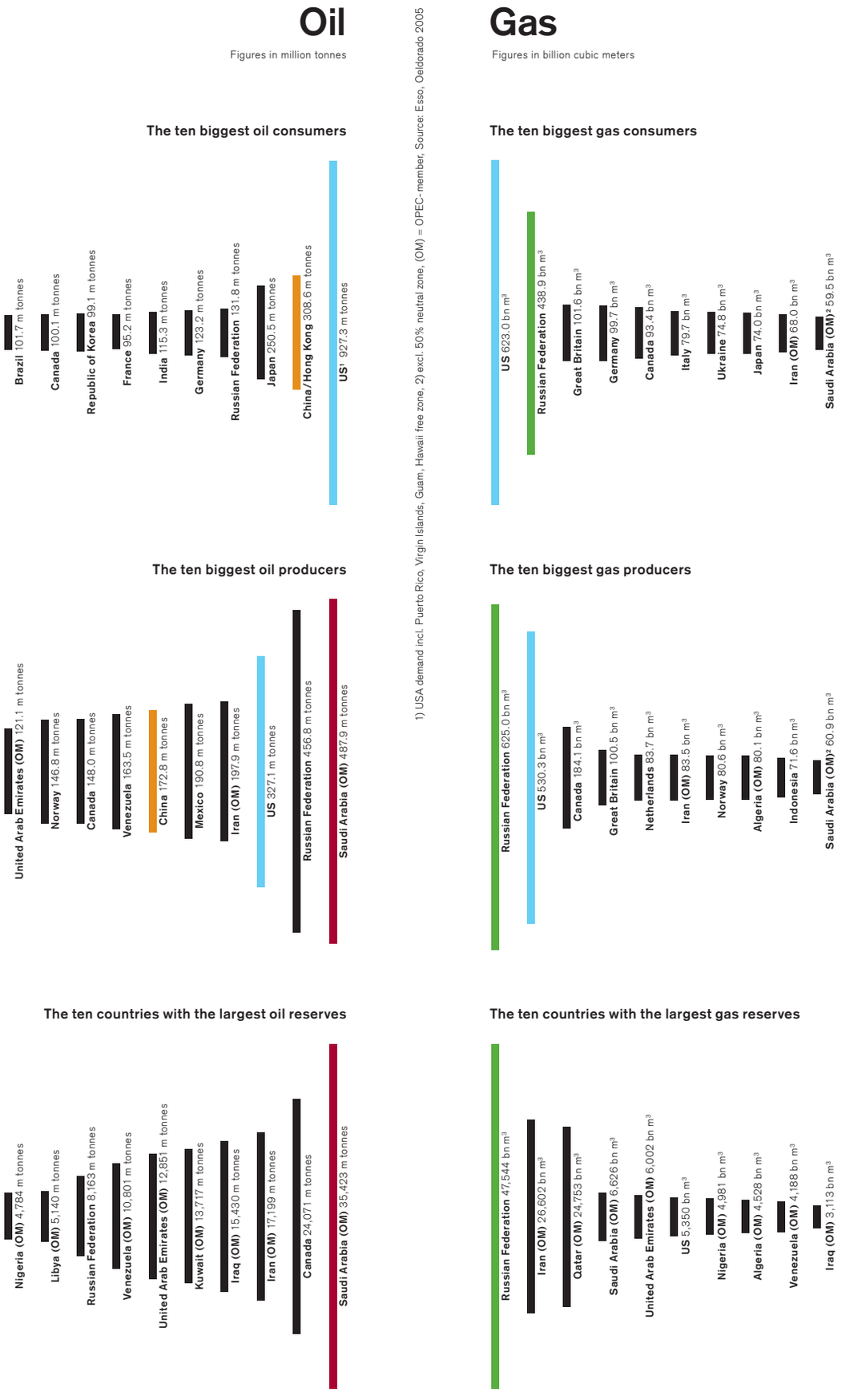
Prof. Dr. Michael T. Klare, Professor of Peace and World Security Studies, Hampshire College, Massachusetts

As anyone who reads the business pages of the newspapers will be aware, soaring world demand for energy and industrial minerals, such as copper and nickel, has produced a powerful surge in the price of basic commodities. This has been good news for oil and mining companies, many of which have posted record-breaking profits. With demand for such commodities expected to remain strong, moreover, these companies are scouring the world in the search for promising new sources of oil, natural gas, copper, and other critical materials. These efforts have obvious economic implications for both consuming and producing nations, as well as for investors and shareholders around the world. But they are also affecting the international security environment. With the worldwide demand for vital commodities rising and supplies becoming increasingly scarce, the risk of conflict over these materials is growing. The 21st century could, in fact, prove to be a century of incessant resource wars.

Resource-driven conflict is not, of course, a recent phenomenon. The earliest recorded wars, in ancient Mesopotamia and the Jordan River valley, involved brutal struggles over river-fed arable land. The outward expansion of the Roman Empire can largely be attributed to a predatory quest for extractable resources, including precious metals and human slaves. A similar impulse can be discerned in the global expansion of the great European empires of the 16th, 17th, 18th, and 19th centuries. This epic quest led to frequent wars of subjugation in colonial territories as well as to periodic conflicts among the imperial powers themselves; a long, drawn-out struggle that culminated in World War I. For most of the 20th century, however, ideological and political rivalries rather than resource competition were the principal engines of war. Only now, in the post-Cold War era, has such competition regained its pivotal role as a cause of armed conflict.

Certainly, it is not difficult to perceive the role of resource competition in many current conflicts. In the Congo, for example, various warlords and militias are fighting for control over the trade in coltan, a rare mineral used in the manufacture of cell phones and other lightweight electronic devices. In Sudan, fighting has raged over the control of oil fields in the south and over water and cropland in the arid west (especially Darfur). Control over valuable diamond fields was a major factor in the wars in Angola and Sierra Leone, and control over valuable forestland has been a key factor in periodic struggles in Central Africa, Amazonia, and Borneo. Even the major powers have been caught up in this sort of conflict: the protection of Saudi Arabian oil fields was a critical factor in the 1991 US decision to drive Iraqi forces out of Kuwait, and many analysts believe that the pursuit of oil was also a factor in the 2003 US invasion of Iraq.

One could conclude from all of this that what we are seeing is little more than a return to the status quo ante; to the resource-driven competitive struggles that took place before World War I. And, of course, there is much truth in this observation. With ideological struggle a much diminished factor in world affairs, it is easier to detect the material interests that often inspire states, tribes, and ethnic factions to fight over valuable oil fields, copper mines, diamond fields, and water resources. But rigorous analysis would suggest that we are seeing more than just a return to earlier patterns of behavior: with global stockpiles of many vital resources ↗



1) USA demand incl. Puerto Rico, Virgin Islands, Guam, Hawaii free zone, 2) excl. 50% neutral zone, (OM) = OPEC-member, Source: Esso, Oeldorado 2005

Middle East dominates a mismatched world

There is a stark imbalance between the world's major owners of natural energy resources and the main consumers. The Asian economies are the most obvious examples. Japan is the third largest consumer of oil, at 250.5 million tonnes per year, but does not figure as an oil or gas producer of any note.
On the other side, the Middle East is the richest region for stocks. Five of the six biggest holders of crude reserves, including Iran and Iraq, are situated here.

beginning to contract and the demand for them showing no signs of diminishing, the worldwide competition for access to critical materials is growing more fierce, as is the risk that such competition will erupt in armed violence. Several factors distinguish the current epoch from those of the past. One of these is globalization, which is facilitating the spread of industrialization to more and more parts of the world and fueling the worldwide demand for raw materials. Of particular significance is the rapid industrialization of China, India, South Korea, and the Southeast Asian "tigers" – a process that inevitably produces a huge increase in demand for energy, minerals, timber, and other basic commodities. The annual demand for energy in developing Asia, for example, is expected to jump from 78 quadrillion British Thermal Units (BTUs) in 2002 to 224 quadrillion BTUs in 2020, an increase of 187%. China alone is expected to see its energy demand climb by 230%, from 42 to 139 quadrillion BTUs. To provide all of this additional energy, these countries will have to produce or import vast quantities of energy.

Population boom stretches resources

The global demand for resources is also being driven by an unprecedented increase in human population and per capita income. The world's population is expected to grow from 6.5 billion people today to 8.2 billion in 2030, an increase of 2 billion people. The world's combined GDP is projected to expand by an even bigger percentage over this period, from an estimated USD 49 trillion to USD 140 trillion (in constant prices at purchasing power of the year 2000). All of these additional humans will have to be fed, clothed, housed, and otherwise provided with vital materials – a gargantuan task that will impose enormous pressures on the planet's carrying capacity. The fact that so many of the world's peoples are experiencing an increase in personal income is also placing enormous pressure on global resource stocks. To give just one example: with the world's population of automobiles projected to double over the next few decades, the global demand for motor fuel, steel, aluminum, chromium, rubber, and related materials will experience enormous growth.

With all this going on, many of the world's stocks of basic materials are being depleted at unsustainable rates, producing a growing risk of shortages and scarcity. The demand for fresh water, for example, now exceeds the available supply in many parts of the world, a condition that can only grow worse as population expands, industrialization reaches more countries, and greater reliance is placed on irrigation to grow crops. The UN predicts that as many as 3 billion people will be living in water-scarce areas by the middle of this century, generating increased competition for access to water supplies. Throughout history, such competition has been a major source of conflict, and there is every reason to believe that this will prove to be the case in the future. Arable land and timber will also become more scarce, producing a similar risk of conflict.

It is scarcity of oil and natural gas, however, that is most likely to generate armed conflict in the decades to come. This is so because these two materials provide approximately two-thirds of the world's total energy supply and are absolutely essential for the effective functioning of the world's highly industrialized, transportation-dependent economy. Without adequate oil and gas, entire industries – automobile manufacturing, petrochemicals, airlines, highway construction, tourism, and mechanized agriculture – could grind to a halt. Oil is also essential for the conduct of modern mechanized warfare. For all of these reasons, oil has long been viewed by several countries as a "strategic" commodity: something they are prepared to fight over. At present, there appears to be sufficient oil and gas buried in the earth to satisfy immediate world requirements. Many existing fields still harbor large reserves, and these will remain accessible for global use in the years ahead. But there are deeply worrying signs on the horizon: many older fields, including some major oil reservoirs in the US, Mexico, and Saudi Arabia, are declining at a faster rate than anticipated, while the rate of discovery of new fields has been dropping steadily since the 1970s. Furthermore, many of the newest fields to be discovered lie in deep offshore areas where storms are frequent (such as the hurricane-prone waters of the Gulf of Mexico) or in areas exposed to recurring disorder and strife. Unless many large, easy-to-develop fields are located soon, we will eventually reach the limits of existing reservoirs, and the global supply of oil and gas will begin to contract.

When, exactly, such a contraction might commence is a matter of considerable debate. Some experts believe that it could be in 2010 or so, others much later. But few doubt that such a crisis is forthcoming. "One thing is clear: the era of easy oil is over," the chief executive of Chevron, David O'Reilly, declared in a widely placed advertisement. "Demand is soaring like never before…At the same time, many of the world's oil and gas fields are maturing. And new energy discoveries are mainly occurring in places where resources are difficult to extract, physically, economically, and even politically. When growing demand meets tighter supplies, the result is more competition for the same resources."

Increased competition of this sort will result in increased prices, as is already evident across the globe. But it is also likely to result in increased military action, especially where competing nations or groups are struggling for control over oil and gas reservoirs or where internal disorder threatens the free flow of petroleum.

Resource competition spreads

In the East China Sea, for example, China and Japan have nearly come to blows on several occasions over their conflicting claims to an undersea natural gas field. At present, the maritime boundary between these two countries is undetermined, and both have laid claim to the body of water that sits atop the Xihu Trough, an underwater depression that is believed to house a number of large gas fields. Several rounds of negotiation have been held to resolve this matter, but neither side has shown any inclination to compromise, and both have sent planes and warships into the disputed area in a mutual dance of intimidation. With relations between Beijing and Tokyo unusually tense at this time, there is a very real risk that this dance could escalate into something much more serious.

A similar dispute pits Azerbaijan against Iran for control over contested oil and gas fields in the southern Caspian Sea. While the maritime borders in the north Caucasus have now been determined, no such boundaries have been established in the south. Despite this, Azerbaijan has laid claim to a number of oil and gas fields in waters off its southern coastline, claims that have been repudiated by Iran. In 2001, an Iranian gunboat entered the area claimed by Azerbaijan and harassed foreign oil survey ships operating in the area. Since then, Azerbaijan has turned to the US for help and, with Washington's assistance, is constructing a small navy to deter and repel future intrusions of this sort.

Iran is also involved in a dispute with the United Arab Emirates over undersea oil and gas fields that lie between the two countries in the eastern Persian Gulf. Any of these disputes, and others like

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Photo: Johannes Kroemer

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them involving energy reserves in the Red Sea, the South China Sea, and the Gulf of Guinea, could ignite significant armed conflict in years to come. Conflict could also arise over efforts to transport oil and gas supplies in the face of internal or regional conflict. In Iraq, for example, American forces are deeply involved in efforts to protect pipelines, pumping stations, and refineries against insurgent and criminal violence. Recurring attacks on these facilities have severely hampered the nascent Iraqi government's efforts to use oil exports to finance economic reconstruction – an absolute necessity if the government is to attract any popular legitimacy – and so US officials have made protection of oil installations a high military priority.

Conflict could also arise in the case of threats to the safe passage of oil tankers through key maritime "choke points," such as the Strait of Hormuz near the Persian Gulf and the Strait of Malacca near the Indian Ocean. Every day millions of barrels of oil travel by tanker through these narrow passageways, carrying Persian Gulf oil to markets around the world.

For some considerable time the US has made it clear that it will not tolerate any effort by a hostile power to close these corridors and thus impede the global flow of oil. In the most famous expression of this policy, then President Jimmy Carter declared in January 1980 that any move to block oil traffic in the Persian Gulf would be regarded "as an assault on the vital interests of the United States of America" to be repelled "by any means necessary, including military force."

Escorting oil around the world

More recently, American officials have expressed their determination to prevent Iran from blocking the Strait of Hormuz, an action that Tehran has threatened to take in retaliation for any US military strikes on Iranian nuclear facilities. The United States has also stepped up its naval patrols in waters off Nigeria, where ethnic militias and criminal gangs have seized offshore oil facilities and coastal oil tankers. These are by no means the only places or situations in which the competitive pursuit of oil and natural gas could lead to armed conflict between competing nations, factions and groups. And while oil and gas are the commodities most likely to spark resource conflict in the years ahead, they are not the only materials that could trigger armed violence. The risk of such conflict can only grow, moreover, as soaring worldwide demand encounters ever-shrinking supply, and as more and more states (and other actors) turn to armed combat to deal with the specter of scarcity. Unless something meaningful is done to address this predicament, we can expect an increasingly dangerous epidemic of resource wars.

To reduce this danger, the international community must address both sides of the equation: it must seek to reduce demand through vigorous conservation, while increasing supply through technological innovation and the development of substitutes for scarce materials. At the same time, however, we must repudiate the ideas put forward in the "Carter Doctrine" and other precepts that legitimize the use of military force to address resource-scarcity problems. In particular, the international community needs to rise to the challenge of developing a more robust system of law and adjudication for resolving territorial disputes such as those described above. The greater the progress we make in these areas, the smaller the risk that the 21st century will be a time of endless resource wars. ■

The new era of global conflict

Civil wars in politically fragile, ethnically fragmented, and economically weak societies are the focal point of international security policy at the outset of the 21st century. At the same time, global risks are increasingly superseding local and regional conflict hotspots. Asymmetric patterns of conflict are emerging from the concurrence of these two trends, ensuring that violent political conflicts in coming years are likely to be characterized by a high degree of complexity.

Prof. Dr. Andreas Wenger, Center for Security Studies

In retrospect, the 20th century was an era characterized by political and ideological rivalry among the superpowers. In the aftermath of two world wars, the Cold War epoch emerged – in which the dominant antagonism was between East and West, under the leadership of the two superpowers. Security policy concepts and actions were oriented toward symmetrical structures of conflict. The focal point of the doomsday scenarios at the time was the feasibility of a war between nations, involving the conventional and nuclear weapons systems of the two military blocs. This predominating backdrop of danger was marked by national players and military resources and, as such, by factors that could more or less be tangibly determined.

In contrast, the current environment with respect to the prevailing risks and threats is characterized by a high degree of uncertainty. Complex and dynamic risks, dispersed players, and asymmetrical structures of conflict permeate the challenges to security policy of the 21st century. Traditional militarily threatening factors have generally lost significance at the global level. The probability of a war between superpowers in the foreseeable future is slim. In terms of military and technology, the US still remains the dominant power. But the European Union (EU) is also developing into a decisive player in terms of initiating security policy on the European continent. And in Asia, China and India are increasingly becoming the driving forces of the globalization process due to their rampant economic growth. Wars among nations still remain conceivable, but primarily in the form of territorial conflicts between regional opponents, or in the shape of intervention by a superpower (together with a loose coalition) in authoritarian states.

Today, nations pursue their own interests in an international system, in which the centers of power are globally dispersed and regional powers have gained significance. Although the US dominates the military playing field, new forces are emerging on the economic front. Moreover, the transnational playing field is becoming increasingly important: the system of nation-states is being superseded by multilateral structures, multinational corporations, and nongovernment organizations (NGOs) – albeit amid a very disparate, regional density.[1] Overall, that gives rise to a spectrum of risks and threats that has expanded markedly with regard to substantive as well as geographical aspects. Countries within a region are increasingly exposed to risks that cannot be described as military in a traditional sense and whose origins can be found much farther away in geographical terms.

Crises and wars are characterized by two opposing trends in a networked world. First, the danger of regional destabilization is tied to the growing importance of national conflicts. The downfall of nations and badly governed regimes plays just as significant a role

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Source: Dan Smith, "State of the World Atlas".

Brothers in arms

The Far East dominates the global picture in terms of the numbers of regular and reserve government forces, the legacy of conflict dating back to the start of the Cold War. North Korea and South Korea – both countries that remain on a war footing – have the largest percentages of their populations in active military service.

as ethnicity and religion in understanding the origins of the prevailing conflicts. Second, the potential for power and destruction arising from stateless players and networks grows in parallel to the course of globalization. Further proliferation of weapons of mass destruction and long-range weapons systems, organized crime as well as global terrorism, all play a multifarious, interactive part in the downfall of nations in destabilized regions.

Regional conflict zones: local origins of violent conflicts

Even in this age of globalization, violent political conflicts continue to be predominantly attributable to regional and local factors. A breakdown of the number of armed conflicts in the 1990s reveals two different patterns: first, national conflicts accounted for more than 90% of these violent clashes. And second, the flashpoints were concentrated geographically in regional conflict zones. Parallel to the fall of the communist multinational states, there were outbreaks of ethnic conflict in the Balkans, in central Asia, and in the Caucasus region. These new, virulent national conflicts had their origins in the transformation of the old-world order and the accentuation of regional imbalances resulting from the process of globalization. The economic gap between and within the regions widened during the 1990s. In Africa, the marginalization process accelerated and erupted into humanitarian catastrophes in Rwanda, Somalia, and Sudan. Furthermore, in the Middle East, globalization is often perceived as a form of Western hegemony.

The regional conflict zones show a high degree of overlap with zones of badly governed regimes and zones with merely very limited regional trading integration. This indicates that the origins of civil wars are connected to the buildup of alternative systems of profit and power as well as to the context of ethnopolitical nationalism. Political economists point out that countries whose populations are growing at an unimpeded rate, nations that are in a state of economic decline and dependent on export of resources, are the most prone to the risk of civil war.[2] Today, roughly 1 billion people live in countries where the risk of outbreak of civil war is 15 to 20 times greater than in the OECD countries. Water shortages, subsistence economies, poverty, and famines provide an ideal breeding ground for future processes of political destabilization. Political scientists repeatedly emphasize that the outbreak and prevalence of civil wars can be traced to the role of corrupt leaders and weak political institutions. These conflicts revolve around ethnicity and identity, which is why they are usually marked by a high level of violence, emotion, and irrationality.[3]

Global risks: the denationalization of war

A few years ago, there was still widespread hope that growing economic interrelationships among nations would lead to a reduction of violent conflicts. However, globalization has brought with it not just the riches of the earth, but also the dangers of the world right to our doorsteps. The new porousness of national borders opens up more room for maneuver for organized crime networks and international terrorism. Dual-use technologies currently circulate more easily against a worldwide backdrop. The (theoretical) potential for destruction arising from stateless players will likely continue to grow in tandem with technological developments in the fields of biotechnology, nanotechnology, and information technology. The complex risks that emerge from such a scenario are no longer particularly directed toward the territory of an individual nation, but instead increasingly aimed at the social fabric of an entire region. Serious threats to international stability and security will arise primarily from the concurrence of the downfall of nations and civil wars with global security risks. Terrorist networks, such as Al Qaeda, benefit from weak nations and lawless regions; they try to legitimize terrorism as a means of pitting the weak against the strong in the context of the widening economic gap between rich and poor, as well as the military dominance of the US. Through exploiting the vulnerability of the infrastructures of modern nations and global markets, the battle is waged in regions that are geographically distant. Similar downsizing of the geographical structure in terms of its function as a protective shield is also apparent in the realm of organized crime as well as the trafficking of both people and drugs. In many countries, active migration and integration policies are gaining significance in terms of strategic security, and the challenges to the instruments of homeland security are mounting against the backdrop of an aging population and overburdened social welfare system.

Focus on the Middle East: region of instability

For the countries trying to pinpoint the territorial origins of these global risks, the focal point shifts from the Balkans, to central Asia and across the Caucasus region toward Asia, and for the foreseeable future focuses on the greater Middle East. There is no other region of the world in which the newly emerging risks interchange, from the downfall of nations, proliferation of NBC (nuclear, biological, and chemical) weapons, global terrorism, and political Islam, to a comparable potential for instability. Three trends underscore the ongoing relevance of this zone in terms of security policy. First, the political, economic, and social problems in the region are

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Photo: Thomas Eugster

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enormous. This situation was clearly revealed in the "Arab Human Development Report."[4] These three factors set the backdrop for inter-Arab modernization conflicts, which, in turn, form the basis for the rise of political Islam. Only in the eyes of these radical forces is the rest of the world seen as the direct target in this conflict. Nevertheless, the world cannot evade the global effects therefrom – whether as the plane of projection for fundamentalist ideologies, as a destination for Muslim immigration, or as the consumer of Arab oil.

The second trend is the threat of another round of nuclear armament in the Middle East in the wake of the arms buildup in Asia. The prelude was the shock of the revelation that Iraq and North Korea – both signatories of the Nuclear Nonproliferation Treaty (NPT) from the year 1970 – had been pursuing a clandestine military nuclear program going back many years. In the late 1990s, nuclear tests carried out by India and Pakistan – neither countries are NPT signatories – changed the picture with respect to the realities of nuclear arms in Asia. The discovery of the smuggling network operated by Dr. Abdul Qadeer Khan – the father of Pakistan's nuclear bomb – ultimately proved that nations are not compelled to cooperate with other countries when realizing their own nuclear ambitions. Indeed, the important new role that India plays as a reliable major power in Asia has garnered broad acceptance. On the other hand, Iran's insistence on building its own fully fledged nuclear-enrichment facility – a classic example of dual-use technology – triggered widespread uncertainty. The majority of elites in the region view Tehran's claim to the role of the predominant power in the Middle East with scepticism. However, much of the international community may come to regard Iran as a source of instability as it continues to support the leaders of radical Islamic forces, such as Hamas, Hezbollah, or Shia militias in Iraq, in the use of armed violence. Should Iran actually exercise the military option, the NPT regime would probably no longer be salvageable. In addition, fears would arise that other countries in the region, such as Saudi Arabia, Turkey, or Egypt, could follow in Iran's footsteps.

Third, there is one other noteworthy factor that "Global Investor Focus" highlights elsewhere in this issue: 71% of the world's oil reserves and 69% of its natural gas reserves are concentrated in the wider Middle East and Russia. For these countries, it means that their development model will continue to be dominated by a small group of elites. For the West, and increasingly for China and India as well, this means that their security with regard to energy needs, and thus their economic productivity, will continue to be largely dependent on developments in these regions. Political instability in hydrocarbon-exporting countries can lead to disruptions in the energy supply, though all the major powers would be affected by the economic repercussions – albeit to varying degrees. This leaves one question hanging in the air for the time being: whether the shortage of crude-oil and natural gas resources is tied to the escalation of military conflicts among nations, or whether the shortage of resources – as exemplified by water[5] – can also serve to strengthen cooperative international efforts that should pave the way for equitable and sustainable utilization of natural resources.

The new complexity of asymmetrical conflicts

Violent political conflicts in the 21st century will likely be characterized, to a growing extent, by asymmetrical structures and, as such, will become increasingly complex. On the military playing field, the gap between the US and all the other nations of the world will

Source: International Institute for Strategic Studies (IISS), Military Balance 2002–2003, London, 2002.

Big spenders

After the end of the Cold War, global defense expenditure declined. But by 1999, governments were expanding military budgets again, with a marked acceleration in the wake of the 11 September 2001 attacks. Throughout, the US has enjoyed a technological advantage over the rest of the world.

likely continue to widen. America's potential enemies have therefore drawn the conclusion that they can only outmaneuver the US by means of asymmetrical warfare. In this context, the escalation of the privatization of violence is discernable – and certainly on both sides of the spectrum of conflict. In weak countries, warlords, extremist groups, and terrorist networks control the ways and means of inflicting violence. On the other hand, the industrialized nations are delegating an ever-increasing share of state security tasks to private security and paramilitary firms. As a consequence, the civilian domain can hardly be distinguished from the military domain any longer. So on the broad canvas of the globalized media environment, even the human conscience increasingly becomes a battle zone. Terrorist groups use hospitals, mosques, video communiqués, and the Internet to their advantage as effective instruments of an orchestrated communications strategy. In turn, national players respond by means of information warfare – and the voices of moderation, the deliberations, and the long-term view fall by the way side.

Order and stability in a fragile international system

The events surrounding the war in Lebanon in recent months revealed just how geographical and transitory borders seem to disintegrate amid asymmetrical conflicts. Today, the origins of local, regional, and global conflicts are hardly distinguishable from one another. Against this background, the central dilemma of the US acting as the global police force re-emerges: in the long term, Washington cannot single-handedly overcome the asymmetrical challenges posed by terrorist networks and authoritarian states. A successful battle against global terrorism is predicated on the condition that the origins of the regional conflicts in the greater Middle East increasingly draw renewed attention, and that the living standards of the Arab population improve. Although the military superiority of the US led to swift victories in Afghanistan and Iraq, the uncertain future of both these countries confirms the realization that winning the war is not enough. The key challenge lies in the construction of functional national structures and in the creation of economic opportunities aimed at stabilizing and pacifying countries and regions that have spun out of control. This is a feat that requires the combined endeavors of public, civilian, and private players.[6]

The neoconservative project aimed at a swift democratic transformation of the Arab world – spurred on by outside forces and set in motion through a policy of military-induced regime change – should be regarded as a failed strategy. A policy perceived in the region as being dictated by the West plays into the hands of those forces that strive to incite intra-Arab clashes to escalate into a "war of civilizations." President George W. Bush managed to achieve regime change in Iraq within the framework of a loose coalition. However, the related issues involving public order – reconstituting sustainable political structures in Iraq, resolving the Palestinian problem, and reshaping regional authority – can only be successfully accomplished within a broadly defined international framework, reaching beyond the traditional West and including close cooperation with the moderate powers in the region.

Furthermore, any resolution of the crisis surrounding Iran's nuclear program can only be possible if all the members of the UN Security Council choose to fight the same battle. Eliminating Iran's nuclear option without military escalation still necessitates the closing of ranks between Europe and the US. Nevertheless, the West is no longer able to single-handedly guarantee enforcement of the NPT in the Middle East and in Asia. One decisive factor for the success of any eventual set of sanctions imposed by the UN Security Council against Iran would be if Russia discontinued its nuclear and aerospace development programs with the Islamic Republic. China would also have to shut down its arms trade with Tehran, albeit taking into account that Iran would hike its oil and natural gas prices, as it has warned. Indeed, linking power with cooperation is increasingly becoming a virtue of necessity, not just in Washington, but also for all the other major players on the field of global policy. World order and stability in an increasingly fragile international system can no longer be upheld by merely a few national players, dominated by the US. ■

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Interview with Adrian Collings, Director of Policy Development at the World Nuclear Association → Interview Lars Kalbreier, Credit Suisse Research Team

"The newest nuclear plants would be capable of surviving the total failure of all their safety systems."

Lars Kalbreier: Do you believe there has been an improvement in the safety of nuclear power plants in recent years?

Adrian Collings: Improving safety is always the top priority for nuclear operators. Operators know they simply can't afford to have a problem with a plant that needs to work around the clock for the business – they've learnt that the safest procedures are also the most profitable.

Why do you think there is a discrepancy between how power plant operators and the public perceive safety?

Adrian Collings: I don't really know that there is a discrepancy – safety is crucial to both groups' benefit from nuclear power. Perhaps the discrepancy comes because the public don't always realize that plant operators share the same basic concerns about safety and make them central to all their activities.

Do you believe that incidents like the recent scare in Sweden or the accident in Chernobyl 20 years ago can be fully avoided with modern technology?

Adrian Collings: Well, no scientist could ever truthfully say there could never ever be a problem at a nuclear plant, but reactors built today have multiple fail-safe systems which don't require any action from operators. In fact, the newest plants would be capable of surviving the total failure of all their safety systems because the reactor would be protected by the passive safety of its own basic design rather than relying on the activation of any secondary systems.

What are the major differences between modern nuclear technology and first-generation nuclear power plants that are still operating today?

Adrian Collings: First-generation plants varied in their designs quite widely, being the results of national research programs, whereas now the global industry has largely settled on just a few basic designs which are incrementally improved and are becoming increasingly standardized. That's because modern nuclear power plants are industrial facilities built by one business for another according to their demands: safe, secure, reliable, standardized systems that are as simple for a utility to operate as possible. Modern plants are also designed to be simple to build, maintain and eventually

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dismantle, which also helps to support the economics.

To what extent is it possible to upgrade first-generation nuclear power plants to the current standards?

Adrian Collings: It wouldn't really be possible to upgrade the fundamental systems at those plants, but that's not really necessary because they were built to very high standards in the first place. However, during their 45-year lives a large amount of equipment – sensors, control systems, fire protection and so on – would have had to be replaced again and again, bringing improvements in standards and safety each time. Operational procedures and safety standards will be absolutely modern even at an older plant.

What are the economic advantages of using nuclear power instead of other sources of energy, whether fossil fuelbased or renewable?

Adrian Collings: All sources of energy have their advantages and disadvantages but for nuclear energy the main advantages come from the sheer reliability of the plants and the relative cheapness of the fuel, which makes up only 5% of the running costs. That means that your electricity price is very stable, especially compared to power generated by a fuel like gas where the price can vary a lot over a short period of time. And if CO_2 emissions have a price in your market, nuclear energy will totally avoid that.

How can one bridge the conflict of interest between the growing need for electricity and the population's reluctance to use nuclear power?

Adrian Collings: People are much more accepting of nuclear power when they're familiar with it. Communities resident near

"In the past the nuclear industry has kept its head down. Nuclear companies are now becoming more outgoing."

to power stations always show very strong support for them because they know and trust the people that work there, or they've visited the plant and actually seen for themselves what it's like. In the past, though, the nuclear industry has tried to avoid problems with the public by keeping its head down and that has partly led to the situation where a large number of people don't appreciate the contribution nuclear power makes to their lives. Nowadays that's changing as nuclear companies develop a more outgoing approach, and as the public become more aware of energy and climate issues, this should ensure a better understanding.

To what extent could future technology enhance nuclear waste treatment?

Adrian Collings: In future we could use fast reactors to get energy from what we now think of as waste, and at the same time literally destroy the most toxic materials inside. The result would be a lot more energy from the same amount of mined uranium and much, much less real waste that needs long-term management. The US is pushing hard in that direction right now but besides that, there's a lot of research into partitioning the different materials in wastes so you can deal with the ones that last a long time separately from those that last shorter times.

Can we really commit to future generations the environmental and security burden of nuclear waste, however well we deal with it?

Adrian Collings: While I don't want to diminish the significance of radioactive waste, it's good to have some perspective. Radioactive wastes are one of the smallest burdens we're passing on to future generations. For example, in Europe, 30% of electricity comes from nuclear plants, but the toxic waste from that makes up only 1% of the total from all activities which need long-term management. Another thing to remember is that although nuclear waste may be toxic for a long time, it's far more carefully managed than arsenic and lead which remain toxic forever.

Why won't the private sector finance nuclear power, despite the improvements in processes?

Adrian Collings: The private sector does actually fund a lot of the world's nuclear power and does so profitably. In the US and the UK a lot of interest is being taken in the prospect of new nuclear plant construction. The only requirement is a policy framework from government that allows firms the confidence to make long-term investments – the technology itself isn't an issue. ■

Photo: Thomas Eugster

Wealth

Global migration The promise of a better life faraway from their homeland lures people to migrate to foreign countries – ultimately bringing change to those destined societies.

Investing and saving National savings in the US has to rise. Just as the US needs to get its house in order in terms of savings.

New horizons Asian countries are striving to close ranks – and Singapore, in particular, is yearning to attract talent.

The bounty of globalization

The world's population is expected to grow by 40% by 2050, triggering greater levels of migration from poorer continents to richer. Demand for natural resources will be fiercer while tension between new immigrants and indigenous groups may start local conflicts alongside the national confrontations over commodities. There is, amid this gloom, reason to be optimistic. Man creates or discovers answers to his problems when they are most urgent. Over the past 30 years, for example, the quantity of proven, extractable resources from the Earth has risen in spite of greater consumption by more people. This experience can be repeated in our time. See also article on page 31 for more detailed analysis.

Prof. Dr. Thomas Straubhaar, Director of the Hamburg Institute of International Economics (HWWI)

Today's vividly apparent megatrends reveal the potential for economic conflict in the 21st century:

1. The global population is growing. Consequently, the demand for resources will continue to increase as well. If the expanding supply cannot keep pace with rising demand, shortages and bottlenecks will become apparent. Sudden price shocks, in particular, heighten the danger of resource allocation conflicts.[1]

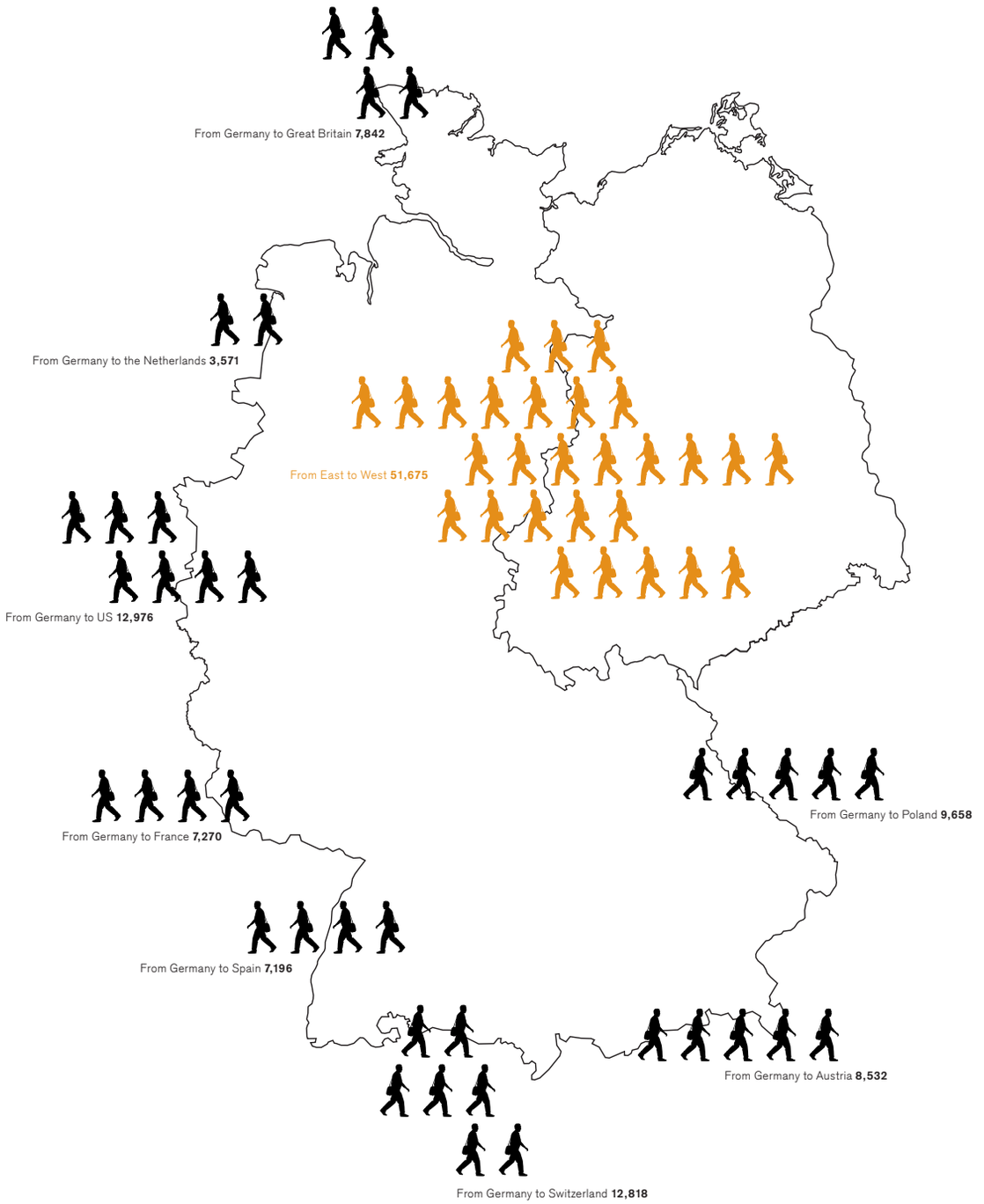
2. A wealthy, but shrinking, population in the Western hemisphere stands in contrast to a poor, but growing, population in the South and East. On the one hand, this will lead to new dimensions in international migration between the less prosperous economies of the world and those with better standards of living. On the other, a clear conflict of interest arises between the countries of origin and destination. Both societies will compete for the pool of well-qualified, dynamic talent; both will strive to keep their quota of unqualified, displaced workers to a minimum. As a result, the country of emigration attempts to retain the strongest among the labor force while inciting the weakest to migrate elsewhere. The host nation only wants to open its doors to the brightest, motivated workers, not the problem cases.

3. Nevertheless, these societies which import people have to form coherent policies in the face of sometimes contradictory impulses: how to react to mass migration? Who should be allowed to enter, and who should remain outside? What rights and obligations should these new arrivals have? Should they be awarded residency or citizenship? Countries develop a more pluralistic society through immigration because a variety of cultures, practices and languages have to coexist. But the change from homogeneous to heterogeneous is not certain to be harmonious. Coexistence does not, sadly, always bring peace. Violent conflicts between the indigenous populace and newcomers can erupt. These clashes are particularly prevalent when immigrants are forced to compete with local nationals for scarce public resources and social benefits, such as healthcare, housing and welfare.

4. Within individual countries, the regional flight from rural to urban areas will continue. The glimmering lights of the metropolises lure with promise. This holds true for huge cities on the continents of the South and the East, with their vast suburbs, slums and zones of squalor, each conurbation inhabited by more than ten million people. But it also holds true for the West. This urbanization process has become a global phenomenon, with society's weight coming to rest on slums and suburbs while the countryside empties. What is already known as the "Mezzogiorno phenomenon" in Italy, or "East-West flight" in Germany, will likely spread, leading to greater disparities in the regional development of all European nations.

5. The population of Europe is shrinking, but it is also aging. And indeed, it is the aging of the population, and not the shrinking, that constitutes the actual demographic challenge for the affluent societies who live here. In this regard, public social policies are ↗

Source: Federal Statistical Office, Germany



Net exports from the East in 2004

Even within Germany's borders, migration patterns are being felt. Since the fall of the Berlin Wall in 1989, more people have moved from East Germany to West Germany than the other way round. Increasing numbers of Germans are emigrating. The best educated are taking up jobs in other European countries or settling overseas.

anachronistic. They presume greater numbers of the young than the old. This was the case 60 years ago but the ratio is in the process of decline. Fewer and fewer young people have to shoulder the burden of provision for the older populace. The former sacrifice income in the form of tax to pay the latter's pensions, stunting their savings capital. Thus it will become increasingly difficult for future generations to be able to fulfill the expectations of their predecessors. A social contract between generations could rapidly dissolve into a battle of ages.

6. Globalization is only in its first stage. And of course there will be setbacks. But from the long-term perspective, more and more aspects of our professional, social and private lives will look beyond the national realm to global dimensions. Consequently, economic structural change will continue to progress – albeit at an accelerated rather than slower pace. In the OECD countries, more and more people will earn their living using their minds, rather than their hands. Many of these people will enjoy rewards from this trend. Not everyone, however, will be able to meet the new challenges. Some may be swept away by the wave of globalization. How will those on the losing end react to overwhelming economic changes?

Of course, these various megatrends are not independent of one another. In fact, they are rather closely correlated and interactively garner mutual strength from each other. These megatrends become more consolidated in the battle over resources, amid the fears surrounding mass migration and against the backdrop of the tensions between winners and losers in the globalization process – the dominant potential economic and demographic conflicts of the 21st century.

The growing global population and battle for resources

The world's population continues to grow and grow. Demographic growth represents an enormous challenge because 2–3 billion more people, in addition to the 6.5 billion today, will only amplify demand for the world's water, food, energy and resources.[2] It would be an interesting computation to calculate the basic natural materials that will one day – perhaps a time in the not-too-distant future – be required to satisfy the per capita consumption of energy, water and housing space in China and India, should consumption reach the same level as in the US or Europe today. The fast-growing economies in China and India are already buying up extraordinary quantities of commodities in the global market place. Consequently, commodity and energy prices have climbed from one record high to another in the first decade of this century and there seems to be no end in sight to the upwardly spiraling prices. Political conflicts are often closely correlated with accessibility to the production sites and storage facilities of strategic resources. Does the growing global population and its mounting hunger for commodities exacerbate the potential for conflict?

The concern over tighter supplies of commodities and the resulting higher prices is a dilemma as old as mankind. Ever since his expulsion from paradise, man has sought to take control of nature's resources. And over the many millenniums, people have reacted quite rationally to rising commodity prices, bravely overcoming the fundamental challenges presented by land, water and weather. As the supply of certain resources became tighter, people became more daring, more venturesome and more determined in the search for other sources, deposits, mines and pits. Alternative solutions, recycling processes and conservation measures also became even more pronounced. Of course, there have still been famines and resource supply crises as well as bottlenecks and surging prices. Conflicts and wars erupted over resources. But amid the deficiency and scarcity of resources, tinkerers and inventors emerged who have been the driving forces behind the search for new sources, new technologies and innovative solutions to expand the supply and optimize the consumption of resources. People sought new horizons and uncovered faraway lands. Manufacturing processes tapped the potential for energy conservation. Automobiles were built to run on much lower quantities of gasoline for even greater mileage. Houses and apartments were constructed with better insulation materials and equipped with modern heating systems or state-of-the-art technologies for producing heat. Plastics supplanted raw materials. Renewable energy sources were substituted for fossil fuels. E-mail replaced conventional mail. All in all, the efficient utilization of resources was persistently and perpetually improved.

The saga of mankind can be portrayed as an extraordinary, successful struggle against the ever-recurring and consistent temporary shortage of resources. Supply bottlenecks constantly posed a short-term threat of erupting into a conflict over resources, but in the longer term, they served as a driver for life-enhancing innovations. Over the past 30 years, for example, the amount of proven, extractable global natural resources has actually expanded rather than shrunk, in spite of rising populations, greater consumption and the ever-increasing production volumes of most commodities. For some other commodities, the slump in prices in the 1990s directly led to a decline in investment in more efficient technologies for developing additional mining and extraction facilities, which in turn led to depletion of some of the world's natural resources. In this context, the growing global population will likely intensify the battle over resources – at least in the near term. In the long run, however, it is demographic growth that will accelerate the salvational process of substitution, recycling and conservation of resources. And this trend is consistent with recorded history. Hence, there are good reasons to anticipate that future short-term supply shortfalls will not lead to resource allocation conflicts in the long term.

The fear of new mass migration

The world's population is not growing at the same pace everywhere. Demographic growth is more rapid in poorer countries, while the populations in the OECD nations are hardly growing any longer. Europe will soon reach the point when there will be fewer recorded births than deaths, thereby heralding a shrinking population. Today, roughly 730 million people live in Europe, but the population is estimated to decrease to 720 million by 2025 and 670 million by the year 2050. So by the end of the first half of the 21st century, Europe's populace will have declined by nearly 10%. The demographic picture in the rest of the world is entirely different, particularly in Central and Southeast Asia, where population growth continues to flourish. For instance, China's population will have increased to nearly 1.5 billion over the next 20 years. The combined populations of India, Pakistan and Bangladesh will top 2.0 billion people by the year 2050.

The countries with lesser-developed economies will account for roughly 98% of the estimated increase in global population by the year 2050. Consequently, the demographic weight will shift even more heavily from OECD countries to non-OECD countries. While

Photo: Thomas Eugster

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the number of people living in the industrialized nations will remain nearly constant at the present level of 1.2 billion until the year 2050, in the lesser-developed countries the aggregate population is expected to rise, from the current 5.3 billion to 6.7 billion in 2025, increasing to 8.0 billion by the year 2050. Included in these numbers is an enormous surge in the number of young people. Roughly half the world's population is under the age of 25, and around one-third of the populace in the lesser-developed economies is under the age of 15. Education and health care for youth play a seminal role and are becoming increasingly decisive factors in determining whether and how they can succeed in overcoming poverty, improving living standards and thus providing young people with an alternative to squalor, as well as the prospect of hope for a better life.

In order to accomplish this endeavor of the century, kindergartens, elementary and high schools must be financed. However, it is particularly important to prioritize education and then later on to create jobs. The International Monetary Fund (IMF) recently pointed out that today roughly half of the total 200 million unemployed people worldwide are under the age of 25. The current probability that young people will not find employment is about three times greater than for job seekers over the age of 25.[3] The proportion of young people under the age of 25 in the workforce globally shrank from 52% in 1995 to 47% in 2005. Moreover, the demographic trend will not make the search for mass employment any easier for the young people, whose ranks will grow into the billions. What will happen if the youth in the lesser-developed economies believe they have little chance of finding a well-paid job? The consequence would be that many make the journey to the West or the North.

Desperate refugees fleeing Africa by boat in the summer of 2006 dramatically demonstrated to prosperous Europeans just what price some people are willing to pay in order to pursue their dream of a better life abroad. Many others leave their homeland on paths hardly less risky than an overcrowded, ill-equipped boat. Today, about 200 million people are living in a country other than their homeland. That number seems relatively small – a mere 3% of the world's total population. But it becomes significant when looked at from other perspectives. The number of emigrés corresponds to the population of Brazil – the world's fifth-largest country in terms of inhabitants. Two hundred million foreigners is a large number of people even when looking back through history. The trend in international migration has grown tremendously in the last two decades and is expected to prevail in the future. More and more destitute people in the South and the East are discovering the prosperity of the North through the media and the Internet. Some will attempt to migrate to the promised lands, striving to reap rewards for themselves from the riches of an affluent society. Cheap mass transportation provides the means of exodus for ever-increasing numbers of people across the longest distances. Furthermore, modern telecommunications enable these migrants to maintain contact with their homelands, spreading the word about life in a foreign land by simple means. Networks and channels have emerged that can easily trigger chain migration.

The trend in cross-border migration will become stronger rather than weaker in the coming years, the pace should rather accelerate than decelerate, and this will pose greater rather than fewer challenges for the host countries. In search of a better life elsewhere, people will migrate to faraway lands across increasingly vast distances. Consequently, the differences between a receiving society

and its new arrivals – in terms of language, culture and financial means; not to mention ethics and morality – will become even more accentuated. The tendency toward harmonization will probably diminish, while the trend toward confrontation will likely intensify.

The tensions between local nationals and foreigners will increase rather than decrease, particularly since immigration always exerts pressure on the real wages of the replaceable indigenous workforce (which is deemed as a negative factor by those directly affected, although it is a positive aspect for the economy as a whole). In poorly functioning labor markets, unemployment rises when foreigners crowd out the native workers from the job market. In this case, however, migration is not the cause of rising unemployment, but merely a fairly obvious testament to the lack of occupational and geographical mobility and flexibility on the part of the indigenous workforce. Nevertheless, from the subjective perspective of the unemployed native workers, this truth is not comprehensible or suppressed. In assessing the consequences of migration, subjective individual concerns can play a most significant part, while the objective overall economic effects are relegated to a more subordinate role.

For the immigrant societies, migration is generally viewed in a positive light. In the near term, these host countries support the process of adapting to increasingly rapid structural change. But the advantages of immigration are still unacknowledged; they are not consciously perceived. Overall, the benefits are more or less equitably distributed among the members of the immigrant society, without recognizing the benefactors. Indeed, a similarity can be drawn to the way the day-to-day advantages of a well-functioning legal system are taken for granted, with hardly anyone bothering constantly to point out the benefits.

But the local nationals who are looking for employment or searching for an apartment judge migration in an entirely different light. As a result of first-hand experience, they perceive the immigrants as real competitors for jobs or housing. Whoever loses a job or an apartment to a foreigner has little interest in the unacknowledged advantages of immigration for all. Due to the understandable fear of losing their jobs and the often futile search for affordable housing, many indigenous people are wary of immigration, particularly when they are confronted with the everyday problems associated with immigration in urban hotspots. Moreover, they feel that their immediate personal well-being has been jeopardized. Many local nationals also actually believe that foreigners are responsible for congested streets and overcrowded hospitals, for oversized school classes or shortages of housing and recreation areas. Even worse is that some local natives are forced to share already tight social security benefits with asylum seekers, refugees and unemployed foreigners. So while the advantages of immigration are hardly topics of discussion for these people, the negative aspects provide sufficient material to paint a generally threatening picture. Without significant efforts aimed at integration and extensive clarification of the advantages and disadvantages of immigration, international migration could become an explosive mixture to shake the foundation of Western societies on a broad front.

Inequitable allocation of the fruits of globalization

Globalization – meaning, the process of opening up national markets and engaging individual economies in the international division of labor – has paved the way for an unprecedented period of world prosperity. In the second half of the 20th century, the global eco-

In the second half of the 20th century, the global economy grew at a faster pace than ever before in the history of mankind.

nomy grew at a faster pace than ever before in the history of mankind. Global gross national product – as measured in real terms – grew sixfold during that era, with an average annual real growth rate of roughly 4%. By comparison, in the periods 1500 to 1820 and 1820 to 1950, the average annual real growth rates merely stuttered at around 0.3% and 1.5%, respectively.

Wealthy nations were not the only countries that benefited from the fruits of globalization in the second half of the last century. On the contrary: during the period 1950 to 2000, Asia (excluding Japan) and Latin America – with respective real annual GDP growth rates of more than 5% and slightly more than 4% – recorded even stronger economic growth than Europe and North America. Africa was the only region that fell somewhat short, generating real annual GDP growth of approximately 3.5%, which nonetheless noticeably outstripped the 2.7% rate registered in the first half of the 20th century. Globalization has provided the means for more people to live a longer and better life today than ever before in the history of the world. The average life expectancy for newborns in Africa rose from 38 to 52 years and in Asia from 40 to 66 years in the period 1950 to 2000. And although mass poverty is far from being eradicated, it has been reduced. In 1978, roughly one-third of the world's population lived on less than USD 2 per day. Today that figure is about 20%.

Globalization will continue to prevail, and it will likely accelerate rather than decelerate. The process will have more of an impact on the lives of a majority of people, rather than just on a minority. Globalization will incorporate more and more sectors, and new sectors, particularly in area of services, such as education, health care or the insurance industry. The process of globalization will further improve the absolute standard of living in all regions of the world. Not all people, however, will be able to reap equally the fruits of globalization. The gap between rich and poor will continue to widen, and not just in terms of the disparities in wealth among countries. This gap will also prevail – and perhaps particularly with regard to the disparities in wealth within countries – between people who swiftly and successfully adapt to new challenges, and people who are incapable or unwilling to react to such challenges.

The catch-up process in Latin America and Asia sparks considerable fear in the leading affluent countries of today because these nations are losing the economic edge they have enjoyed for so long. They are fearful because they face hard and hungry competitors on the global market. And they are apprehensive because countries in Central and Southeast Asia produce goods and services that are almost always cheaper, occasionally better and sometimes both cheaper and better than those produced in Europe. As a consequence, more and more jobs in Europe are coming under greater competitive pressure. Reactionary national protectionism is gaining popularity while many call for safeguards. The collapse of World Trade Organization (WTO) negotiations at the end of July 2006 underscores just how precarious and fragile is the consensus that open markets are better than closed, and multilateral treaties are better than bilateral agreements.

Polluted water, clean air, conservation of the tropical rain forest, preservation of the habitats of rare animals, child labor or prolonged working hours: the losers of the North have apparently become "spokesmen for poor countries," according to one of the world's leading economists, Jagdish Bhagwati, from India. Mr. Bhagwati said, "In reality, however, the views that are presented here are not those of the poor countries – but [the] views [of the rich]." The prevailing concern among the wealthy nations is that they will be simply overrun by international trade. It is historical irony that today the West is hindering the rise of new rivals with the argument of unfair competition. For a long time, the same argument had been used the other way around by the poor nations, which had lamented the unfair competition, exploitation and displacement they suffered at the hands of rich countries, the market supremacists. However, protective fences no longer provide a bulwark against the powerful wave of globalization. Competitors from all around the world will no longer allow themselves to go back into a cage from which they have just been set free.

Structural change is a perennial in the history of mankind. Sometimes it grows at a faster pace, and sometimes at a somewhat slower pace. But at the outset of the 21st century, structural change is burgeoning. In the era of globalization, there are many winners. However, there are also many people who believe that they are worse off, not just because they have less in absolute terms, but also because the gap between rich and poor has become wider. Some engage in more or less peaceful protests, venting their anger in the form of demonstrations and strikes. Others pursue a more aggressive path. Societies are, to a greater extent, confronted with the problem that people who see themselves as losers in the process of economic development, are provoked into adopting militant behavior. The terror of 11 September 2001, the brutal attacks in Madrid and London, and other bombings of airplanes, trains or ships vividly bring to mind just how rapidly the conflict over the fruits of globalization can lead to an end of globalization.

"I hear people say we have to stop and debate globalization. You might as well debate whether autumn should follow summer," proclaimed Britain's Prime Minister Tony Blair in his speech at the Labour Party conference in September 2005. Whether or not globalization incorporates ever-broader circles at an ever-increasing pace, and the tempo of structural change reaccelerates, will not be the decisive factors. What will be decisive is how people in all walks of life prepare in summer for the winter ahead, harvest their fields and preserve the yield in order to live through even the colder days without concern. Globalization presents a fascinating challenge although the pace of transformation will not immediately benefit everyone. Nevertheless, it should improve most of our lives. ■

[1] See also article from Michael T. Klare on page 31 for a detailed analysis of resource-allocation conflicts

[2] The source for all the data in this section is the Population Reference Bureau, 2006 World Population Data Sheet of August 2006.

[3] IMF: Finance & Development, March 2006, page 46.

Interview with Prof. Dr. Glenn Hubbard, Dean, Columbia Business School, Economist → Interview Dr. Anja Hochberg, Credit Suisse Research Team

"The US isn't saving enough to meet its investment needs. We have to do more to prefund expenditure."

Dr. Anja Hochberg: You deal with the subject of wealth from both sides, both as an academic and as an investor. Are you concerned about the ever-growing US current account deficit and the fact that the US is consuming more than it produces, or is that rather less significant to you?

Glenn Hubbard: It is a significant concern. It's clear that the US just isn't saving enough to meet its investment needs. It strikes me that there are two problems here: one is inside the US and the other is outside. Inside the US, national saving simply has to rise. And it's really a statement of our entitlement program, so we need to do much more to prefund the expenditure we will have to make as a nation for the elderly over the next 20 to 50 years. The problems aren't simply in the US, however. Part of the problem with large capital inflows into the US is that parts of the world that are doing a great deal of incremental saving do not have well-functioning financial systems, obvious candidates being China and the oil-rich Middle Eastern states. A large proportion of those savings spill over into the US economy. Just as the US needs to get its house in order in terms of savings, we really need to work on financial intermediation with the emerging Asian and Middle Eastern economies.

With reference to raising the savings ratio, do you think interest rates would have to go up much more than they used to in order to make that happen?

Glenn Hubbard: I don't think so, but what I do think will have to happen is for the public sector to start to make greater savings. In other words, not simply additional private saving, but actually prefunding our entitlement programs. That kind of public sector saving is easier to do.

You have mentioned Asia, and there is not just a redistribution of wealth under way across the world, but also one within China itself. How do you see this situation developing?

Glenn Hubbard: Part of what is happening with regard to wealth in China is a consequence of Chinese economic policy. The fact that it has chosen not to get its financial intermediation house in order and has been keeping its exchange rate at a nonequilibrium level means that it is building a lot of noneconomic capacity and is therefore not allowing many small-scale businesses to flourish. A good path for economic policy in China would be to put more effort into getting the financial and securities markets in order and also to assess its exchange rate.

Might higher savings across the globe affect asset prices? In your capacity as an adviser to the Federal Reserve Bank

of New York, you also look at these issues. Is there a case for a central bank to target asset prices?

Glenn Hubbard: It's not obvious to me that we have a large increase in global saving. What we have is a real change in the composition of saving. The vast bulk of the incremental saving, as I said earlier, is being done in economies which don't have very well functioning financial systems. What that does is spill money over into the international capital market: for example, into US Treasury bills. So you can get a lot of froth in the housing market, as the equilibrium interest rate is held low in safer countries like the US. I don't think there is an argument for the Federal Reserve or any other central bank to directly target asset prices, because in order to do that you would have to believe the central bank has better information about whether there is a bubble. What the central bank has to do is to clear up the bubble if one bursts.

How risky is the US housing market?

Glenn Hubbard: We are not going to see much more nominal house price appreciation in the US market. Overall in the US I don't think we had a housing bubble as economists typically use the term. We had very low interest rates, and there was very high investment in housing given those interest rates. Nonetheless, housing woes will subtract a fair amount from US consumer spending over the next two years. Most economists believe capital spending in the US will take up a good chunk of the slack. That's why most forecasters still see growth in the 2.5–3.0% range. Housing prices certainly remain a real risk, and there are parts of the US where house prices are starting to decline in nominal terms. But nationally I don't believe that's the case.

"If the Federal Reserve had to raise short-term interest rates quite rapidly, that would hurt the economy."

What is your assessment of the trajectory of the US GDP? Do you see a shallow slowdown in coming months or do you think there is going to be a much broader based slowdown?

Glenn Hubbard: I would have to speak in terms of scenarios, because there are a lot of wild cards. If the Federal Reserve has a credible anti-inflationary policy and we don't see major geopolitical events that would disturb energy prices, then I think we are on track to have a modest slowdown, growth slipping into the 2.5% range – not the very rapid rate of growth we've seen recently, but certainly not recession. However, we could see slower growth for one of two reasons. I for one believe the Federal Reserve is a bit behind the curve in fighting inflation. If the Federal Reserve felt it had to catch up and raise short-term interest rates quite rapidly, that would obviously hurt the economy. Also, there could be energy price hikes from geopolitical events. The fact that the consensus is relatively rosy shouldn't be that reassuring. Economists, myself included, are not always so good at predicting turning points.

You were a member of the White House National Economic Council and the National Security Council. How does the need for increased security affect the economy?

Glenn Hubbard: It does so in several ways. First, if there is a requirement for increased military spending over time, eventually that has to be paid for by either cutting down spending or raising taxes. There is also the issue that people need to come to terms with in the US, as well as Europe and Japan, and that is homeland security spending – the amount of money we are paying in terms of higher transaction costs on account of security. I think there has not been enough assessment of whether we are doing this in the most efficient way to help business people maintain high rates of productivity.

Given your experience on the boards of some well-known investment firms, what is your view of the challenges investors are facing today and the message we should take to our clients?

Glenn Hubbard: First of all there are some incredible opportunities. At one of the companies with which I am involved, Ripplewood, we continue to find interesting opportunities around the world. We are extending our presence in Japan. There are abundant opportunities in Europe, in the US, and in the emerging Asian economies. I don't think there is a shortage of opportunities. The question is how you sort these opportunities out. There are a lot of private equity firms around today and some of them have highly skilled people running them and others less so. The question for investors is finding the right kind of private equity with which to work. Private equity as a form of investment can only grow, particularly with the US regulatory regime making public company solutions a little more costly. Private equity becomes all the more attractive. ■

Photo: Johannes Kroemer

Interview with Dr. Vivian Balakrishnan, Minister for Community, Youth, and Sports, and Second Minister for Information, Communications, and the Arts, Singapore

→ Interview Arjuna Mahendran, Credit Suisse Research Team

"Singapore is one of the most open economies in the world, with an open door toward talent."

Arjuna Mahendran: Asia is one of the key areas of growth in the world. What do you believe will be the main challenges to above-average growth in the future?

Dr. Vivian Balakrishnan: The overall prospects for Southeast Asia, China, and India are very positive for the foreseeable future. The commitment to create an ASEAN Economic Community by 2015, which will create a single market and a single production base of more than 500 million people, will accelerate the rate of progress in Southeast Asia further. However, we have to expect the unexpected. For example, we did not anticipate the Asian financial crisis in 1997, global terrorism in 2001, the SARS epidemic in 2003, or the tsunami in 2004. We must prepare for such unexpected but high-impact events. In addition, we still have to contend with high energy prices, with the risk of an oil crisis due to disruptions in the Middle East and high energy consumption in Asia resulting from burgeoning economic growth. Bird flu remains a nascent threat. Terrorism remains a real and present danger in some parts of Asia.

What do you believe is the interdependency between security, economic growth, and wealth?

Dr. Vivian Balakrishnan: Security is a necessary, albeit insufficient, prerequisite for economic growth and wealth generation. This is especially so for countries that wish to attract major investments from abroad. It is absolutely essential to maintain investor confidence.

Do you think that the safety and quality of life in Singapore attracts wealthy people to live here?

Dr. Vivian Balakrishnan: Yes, the safety and quality of life that Singapore offers are important draws. We used to try to attract top-class companies to locate significant elements of their business operations in Singapore. We have now realized it is equally important to attract top talent to relocate to Singapore. This is because companies will always be attracted to locations where a critical mass of top talent is available.

Wealthy individuals/international executives will consider both the "hard" and "soft" aspects of a country when they are deciding where to base their businesses, and equally important, their families. Even in these days of jet-set travel schedules, there is still a need for a secure home base. In Singapore, we deliberately set out to create a safe and attractive environment for families and businesses. We have invested in both the "hard" infrastructure – reliable telecom/cable linkages, sophisticated logistics management – as well as the "soft" factors such as good and safe living conditions, a cosmopolitan lifestyle, world-class medical facilities, a very competitive tax regime, a vibrant art scene, and excellent educational facilities. It is also helped by the fact that Singapore is one of the most open economies in the world, which includes our open-door policy toward talent. One-quarter of our total population of 4.2 million people are foreigners. Singapore encourages companies to find, develop, and deploy talent with different sets of skills for different key positions – regardless of nationality. The opportunity to work and interact among a critical mass of the best in the industry is another selling point for international executives.

To what extent, in your view, is migration important for future economic growth?

Dr. Vivian Balakrishnan: Like most developed countries, we face the challenge of a declining total fertility rate and an aging population. In addition to our efforts to promote higher fertility, we have stepped up our plans to attract and retain more foreign talent. New immigrants bring with them a diversity of experiences, knowledge, and skills that will add to the vibrancy and energy of Singapore. They will also provide a boost to our economy and help in our development of sports, the arts, and culture. We need a critical mass of people and a large pool of talent to make Singapore more attractive and vibrant. This in turn creates a virtuous cycle in which more good jobs are created for

Photo: Ying Yi

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all Singaporeans. Having a diverse and professional workforce made up of indigenous and foreign talents with an enterprising spirit will enhance Singapore's standing in the global economy.

In the past, different cultures, ethnic groups, and religions have been the source of various conflicts in the world. In Singapore, people from different cultures live peacefully and successfully together. What is the key element of this success and could others learn from it?

Dr. Vivian Balakrishnan: First, multiracialism is a founding principle of Singapore's society. Modern Singapore is a result of an open-door policy that attracted immigrants in search of a better life from the Malay Archipelago, China, India, Europe, and the Middle East. Second, we operate on the principle of equal rights and equal opportunities for all, regardless of race, language, or religion. The fruits of success are distributed according to ability and effort – what we call meritocracy. This sense of fairness is essential for cohesion in a heterogeneous society.

Third, we recognize that multiracialism must be based on mutual respect and trust. Various communities enjoy equal status, and each community is free to preserve and promote its cultural heritage, and to practice its customs and beliefs. At the same time, all Singaporeans share a common space where we work, live, and play together. This philosophy can be illustrated using the concept of "overlapping circles" where each ethnic community can be thought of as a circle, and even as we maximize the common space where the circles overlap one another, each community retains its own space. Surveys on the social attitudes of Singaporeans have consistently shown that nine out of ten Singaporeans are optimistic about our current and future race and religious group relations.

Fourth, we do not take the evolution of multiracialism for granted. This requires active management of legal, social, and cultural aspects of our society to promote greater interaction and integration. For example, the Maintenance of Religious Harmony Act (1990) provides for restraining orders against individuals who stir up hatred between our ethnic and religious communities. The Ethnic Integration Program prescribes an ethnic quota for public housing to ensure a representative racial mix in public housing estates and prevents formation of racial ghettos.

"In a survey of Asian expatriates Singapore is ranked as the best place in the world to live."

Community platforms offer ample opportunities for interaction and understanding across communities. Our network of grassroots organizations, spearheaded by the People's Association, a government-community partnership, actively promotes racial harmony. There are also interethnic and interfaith efforts initiated by community organizations.

A recent development on the community front is the Community Engagement Program, which provides a platform for community leaders to come together to discuss social cohesion issues and build networks of trust. The government works closely with community stakeholders to coordinate, facilitate, provide support, and nurture this engagement process.

Fifth, we run our government on a strictly secular basis. Our policies take a national perspective and aim for the overall good of all Singaporeans. The government adopts a neutral and impartial stance on race and religious matters.

Singapore is one of the safest places on earth. It is very rare that so many different people from various cultures can live safely and happily in such a dense area.

Do you believe that the relatively high level of wealth of Singapore's population supports the security of living?

Dr. Vivian Balakrishnan: It is actually the other way round. It is the safety and security of Singapore that helps draw people and overseas investors. This conducive environment, set up by the Singapore government, helps drive the economy and generate wealth. Singapore is a place where things work efficiently, and the system and processes of conducting your business abide by a set of transparent laws and regulations, thus eradicating corruption and unethical behavior. This is only possible with good governance that is coupled with effective laws that are administered in a transparent and fair manner. Singapore has consistently been ranked in international surveys as having one of the lowest crime rates in the world. According to the human resource consultancy ECA International's survey of Asian expatriates in April this year, Singapore is ranked the best place to live in the world. This high quality of living is also reinforced by Mercer's survey, in which we are the best in Asia for quality of life. One of the key determinants of both these surveys is law enforcement.[1]

What kinds of people are coming to live in Singapore, and how long do they stay?

Dr. Vivian Balakrishnan: People from different parts of the world have come and continue to be attracted to live, work, and study in Singapore. Many also eventually sink roots here. These include people from Southeast, South, and East Asia, as well as diverse places such as the Americas, Oceania, and Europe.

What are the advantages for them in Singapore?

Dr. Vivian Balakrishnan: Singapore offers something unique. We are an Asian society with Asian heritage and roots, and yet open and cosmopolitan. We use English as a common language, yet keep our mother tongues and cultures alive. People from various backgrounds can integrate into our society, and at the same time retain their language and sense of identity. We are a multiracial and multicultural society. All the different races and cultures add color and diversity to our cosmopolitan society.

Besides this, Singapore's reputation for having a stable and noncorrupt government, high-quality educational system, safe and secure environment, and an efficient infrastructure are important considerations for those looking to set up business here as well as to raise a family.

"People from all over the world want to live, work, and study in Singapore."

What does the government have to do to prevent or fight epidemic diseases?

Dr. Vivian Balakrishnan: The first point to note is that this cannot be purely the task of the ministry of health. The SARS epidemic taught us that national preparedness requires a coordinated and concerted effort within the government, as well as across the ministries and agencies involved. The second point is that no country can tackle this alone in this modern age of jet travel and international commerce. Countries need to work together to combat this threat. Singapore supports strengthening regional and international cooperation in tackling the problem. There needs to be a coordinated global response to avert an influenza pandemic among humans. Effective communication within the domestic population and the accurate and timely sharing of information with the international community is key to controlling and preventing the spread of infectious diseases. Such sharing of information helps the early warning of disease. It is also important that all countries are transparent in reporting incidents of human infections of diseases such as bird flu. By sharing information and virus samples through the World Health Organization network, the world will be able to better assess the risk of a pandemic.

Singapore has a risk management framework in place and will put in appropriate control measures based on the severity of the disease. Key to this is a robust surveillance system to detect cases as early as possible so that aggressive containment measures can be instituted.

Given your academic background in medicine, are you concerned about epidemic diseases such as bird flu?

Dr. Vivian Balakrishnan: There is much uncertainty about just how severe the next pandemic could be. Some believe it is just a matter of time before a global pandemic breaks out. We can never be fully prepared for a pandemic, given its uncertain nature, but we will still need to plan for it. In fact, it can never be a case of too much planning, because the more prepared we are, the better we can cope with outbreaks. In planning, we have taken a practical approach. We try to work out as realistic a scenario as possible, and constantly review and update our response plan when we receive new information about the characteristics of the virus and the disease. The preparation involves not just the Singapore Ministry of Health, but also other domestic agencies. Today, a baseline plan is in place. We will be able to delay the introduction of the disease and possibly slow down the rate of transmission with proactive surveillance and aggressive treatment and ring-fencing measures.

Environmental pollution is a real danger for centers such as Singapore. You have taken numerous measures to prevent pollution, but what exactly is needed to maintain the high quality of living?

Dr. Vivian Balakrishnan: Because we are a densely populated small island, we have always taken environmental protection seriously, even before it was fashionable to be "green." We cannot afford pollutive and hazardous activities. We have made a point of being a "Garden City," where every bit of earth is turfed or has flowering shrubs or trees growing. At the same time, we have continued to work with other countries to identify the underlying causes of environmental problems and in developing workable solutions for environmental challenges such as climate change, management of hazardous chemicals and wastes, ozone depletion, and marine and air pollution, which are global in scope and impact.

Notwithstanding this, the responsibility for sustaining our environment cannot rest just on the government. Commitment and joint ownership by the people and public and private sectors is essential for a continued high quality of living. As we strive toward environmental sustainability, we also constantly explore how best we can exploit technology creatively and effectively. Fortunately, we have converted a necessity (our inadequate local supply of water) into a business opportunity by becoming a world leader in the processing and recycling of water. We will continue to invest in research and development of new environmental technologies that will be in great demand over the coming decades, both locally and internationally. ■

[1] BT report dated 11 April, p. 3, and ST report dated 4 April, p. 12

Investing for security

War and the more pervasive fear of conflict are driving governments and individuals to spend more on bolstering their security. For investors, the zeitgeist of fear means selecting companies which offer innovation in protection. The peace dividend has become the peace-of-mind dividend.

Giles Keating, Head of Global Research, **Lars Kalbreier**, Head of Global Equities & Alternatives Research

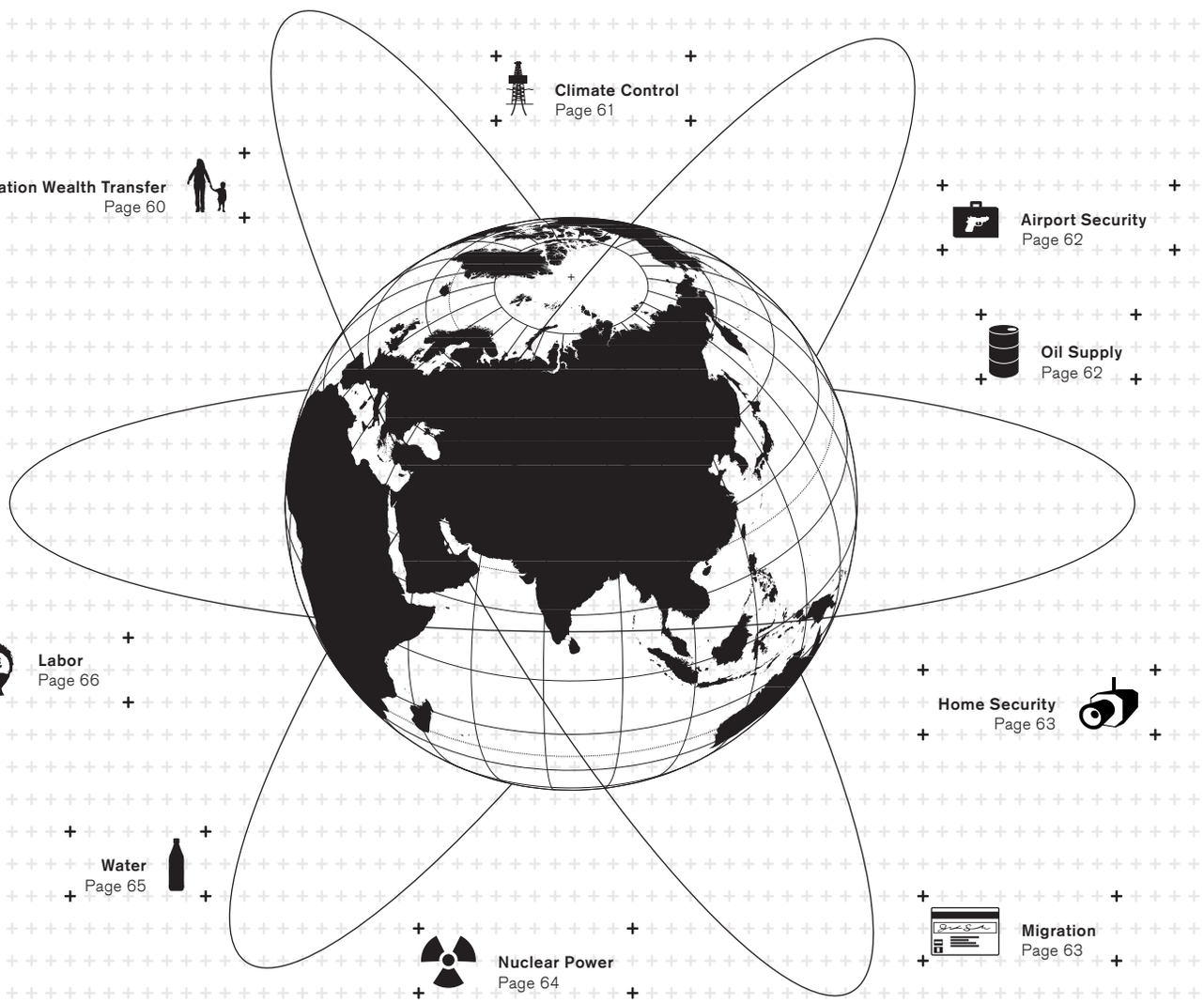
Individuals' focus has switched significantly since the 1990s, a time when technological development, peace and economic progress gave rise to hopes of a better future. Our current decade is more an era of rising concerns: about the environment, energy, dwindling natural resources, health and the threat of terrorism (even if the number of outright wars is declining – see also page 4). Take away all these worries and you might still fear your job is at risk from globalization. As a result, security has emerged as a major issue for most individuals: security of the individual against crime, security against diseases and accidents, security against economic distress and social distress as well as every other type of protection for the individual against a hostile environment.

The quest for protection has started to draw investment into a wide range of industries aimed at improving collective and personal security. National defense budgets are arguably the most obvious form of spending on security. Globally, government defense spending is assumed to have been more than USD 1 trillion in 2004, according to the Stockholm International Peace Research Institute. Together with military spending, investments in police forces are unanimously considered to be security investments, too. Traditionally, defense contractors and arms or weapons producers have been the beneficiaries of these kinds of investments.

However, since the 9/11 attacks, a much broader range of industries has been catering to the forces of law and order: technology companies developing biometrical scanning devices, face or even behavior-recognition systems, detection systems for explosives, robotics, CCTV cameras, smart cards and so on. Particularly for personal security, the supply of services has spread beyond the traditional public spending realm and now encompasses a burgeoning number of private companies. The state does not provide sufficient protection against all risks to the individual, starting with the basics such as food deprivation and mortal illness; rising to injury or loss of wealth, at least not to the extent that people desire. Furthermore, unlike the government, the private sector offers personalized security services (such as private doormen), seen as a kind of panacea for individual worries. Domestic security services are a key example: surveillance technology is becoming affordable, and security firms are providing intelligent alarm systems and guarded housing – formerly seen only near violent neighborhoods – in all regions of the world. Digital codes, Plexiglas windows and special locks also come under this category.

Computer network security is a major issue for all large private companies, which spend a considerable amount of money on preventing hacker attacks, personality theft, and other new kinds of electronic crime. Security is becoming a global theme and individuals are increasingly willing to incur additional expenses in order to protect their health, finances and well-being. Advanced safety technologies in cars are one obvious example: the airbag was invented to protect the driver; some new models have at least one airbag per passenger. Now companies are using technology to actively pursue the prevention of accidents with radar and other early-warning systems. The demand for safety extends to advanced tests for food, water purification devices, individual energy generators, tax advice and tailor-made banking services to protect fortunes. Operating in a hostile environment, people are ready to finance all the tools and services needed to improve their sense of security.

The rising demand for safety and the myriad new security services have not only benefited large corporations, but have also given a boost to small companies at the beginning of their business life in the world of protection. Our recommendations will nevertheless focus on larger companies that are positively geared to the global trend. ■



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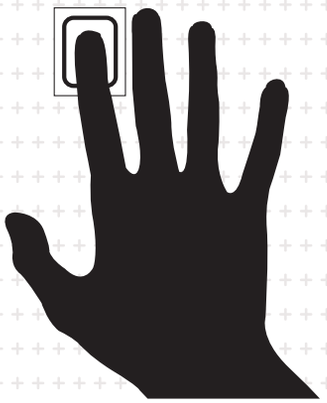

The introduction of fingerprint recognition devices by Bloomberg, one of our key data providers, ensuring that only licensed users can access its vast information pool, has brought biometric access into our daily lives at Credit Suisse. Biometrics will soon be part of life for everyone. For example, the city of Zurich is introducing fingerprint recognition in order to enter public swimming areas. In the information society, amid the growing importance of networked accessibility to valuable stored data, creating a secure environment and guarding against illegitimate access or leakage of information are now prerequisites.

Biometric devices using fingerprints are becoming increasingly popular as a personal identification tool. Finger vein authentication technology, using the unique pattern of veins crisscrossing in a person's fingers for identification, will take biometrics onto the next level. A high-contrast image generated via a light-transmission technology would be matched with a preregistered profile, which would enable highly accurate individual authentication. Forging an identity would be extremely difficult, as the vein biometric data are inside the body. Further advances will see iris scanning develop, possibly even in combination with fingerprints. Face recognition software tools connected to surveillance cameras at border crossings or airport check-ins could reinforce security. Next-generation passports will soon hold information on a chip, drastically improving the security of personal documents. The potential for this technology is enormous – just think of the possibilities for ATM machines, cars, accessing condominium complexes, credit card usage and the banking business in general. Marc-Antoine Haudenschild

Generation wealth transfer

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With roughly 76 million baby boomers in the US alone controlling some USD 15 trillion in assets – the most money per person on average of any age group – financial companies are gearing up to face their biggest challenge (although it may equally prove to be an opportunity). If planned and invested wisely, the boomers' accumulated wealth should ensure a comfortable retirement.

But that is not a long-term certainty. Assuming just 3% annual inflation over 20 years, the purchasing power of one dollar almost halves to a mere 55 cents if not reinvested. The risk that retirees will outlive their funds has, in part, fueled the success of banks, brokers, asset managers and insurers: those who fear hard times save more. While wealth management continues to blossom as an attractive growth segment, however, the financial services industry is finding it difficult to engineer an all-in-one device suitable for clients' every purpose.

Despite heightened demand, customers' perceptions of the ability of financial institutions to meet their needs in retirement have diminished. Client-centric bank organizations that are predicated upon advice-led relationships and client demand, as opposed to a product sales culture, will be in the best position to gain customers' trust, and with it, long-term success. Of the current products on the market, until recently (with the exception of real estate investments), variable annuities have been the only successful financial products that protect wealth, offer a steady income and protect purchasing power. Though already developed and popular in the US, variable annuities are only now gaining prominence in Japan, and are just being launched in Europe. Eric Güller, Gregory Siegel, Christine Schmid

Climate control

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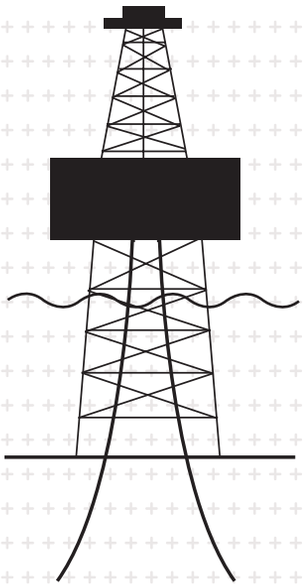

Since the birth of industrialization at the end of the 18th century, CO_2 emissions have grown exponentially. The air's CO_2 content has risen by a full 35%, with disastrous consequences for the equilibrium of our world's climate. Human health is increasingly affected by climate change whether through heat waves, a diminishing ozone layer or tropical diseases in northern regions.

CO_2 pollution from energy production is the main reason for global warming and has to be reduced. Nevertheless, in our view it is unlikely that sustained high energy demand can be satisfied by carbon-neutral energy sources such as wind, hydro and solar power. Demand for energy is rising fast and conventional power production has still a cost and source (mainly space) advantage.

Carbon dioxide capture and storage (CCS) is emerging as a promising technology to help reduce CO_2 emissions from fossil fuel combustion and functions. The process is simple: CO_2 emitted by coal power plants or gas drilling platforms is isolated before it can find its way into the atmosphere and is instead transported to a subterranean geological formation, such as saline aquifers or deflated oil fields. Several industrial-scale storage projects are in operation. At Statoil's Sleipner gas field in the North Sea, 7 million tonnes of CO_2 have already been captured and are now stored 1,000 meters below the ground. CCS is compatible with most current energy infrastructure, uses many of the same technologies proven to be economically feasible, and is therefore expected to contribute as much as 50% to worldwide CO_2 mitigation efforts by 2100, according to the UN. Miroslav Durana, David Brönnimann

Commodities

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China's rapidly growing economy has a hearty appetite for commodities. The Beijing Olympics alone will require three million tonnes of steel, mostly for construction. This is enough to consume almost an entire year's production in Germany. Such a tremendous need for infrastructure creates a significant supply shortage in several commodities. In the light of this shortage, China and the US are vying to secure their access to important resources: in metals, both the world's superpower and the developing superpower have turned their interest toward Africa, including countries with political risks that seemed little suitable for international investment in the past. In addition to this, China has improved its ties with Latin America and has become the largest client of Iranian oil while the US has stepped up its military presence in the Middle East.

Looking ahead, the short-term outlook for commodities is somewhat dampened as the current slowdown of the economic growth is acting as a drag on prices. Due to the cyclical nature of commodity prices, the outlook should improve as soon as economic growth picks up again. Structurally, we expect more intense competition for the access to increasingly scarce resources. The current weakness of supply in some industrial metals and energy will likely extend to other commodities (soft commodities, nickel, gold, silver, platinum) as the competition between China and the US escalates. Such competition is already visible on the African continent; in Congo for copper and cobalt, and in Ivory Coast for soft commodities. Hervé Prettre, Tobias Merath

Airport security

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Following the UK government's recent announcement that it had foiled terrorist attempts to use liquid explosives on planes from Heathrow and Gatwick, all kinds of fluids are now under suspicion. Detection at airports is having to become even more complex. More than 6,500 IONSCAN® detectors of drug and explosive traces are already in operation worldwide. But many airports need upgrades since they still operate two-dimensional X-ray systems. Modern CAT scanners which generate three-dimensional pictures facilitate the detection of hidden explosives far more effectively.

The use of detection systems is about to be expanded into public areas such as train stations and airports. The key will be to improve the speed and accuracy of equipment. Chemicals and X-ray are the traditional methods used to detect dangerous materials in luggage or containers, but among the new technologies, the use of low-frequency radio waves (quadruple resonance) is being developed. State-of-the-art, automated explosive detection systems at airports are able to handle 1,800 bags per hour. Baggage and people scans are still undertaken separately although this might change. An ideal solution would be to combine baggage scans and people scans in one go, significantly reducing queuing time at airports. Over the next few years, we expect an improvement in the rate of elimination of terrorist threats at airports. The US took the lead earlier this year by creating a new unified authority, the Transportation Security Administration (TSA). The annual budget under the control of the TSA to cover aviation, transit and port security is expected to run at somewhere between USD 2 billion and USD 6 billion. Patrick Matti, Markus Mächler

Oil supply

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In recent years, international oil companies (IOCs) have struggled to replace 100% of the oil and gas that they extract. Oil fields in the North Sea and the US have already peaked and in some cases are exhibiting steeply declining production volumes. But in regions where reserves are still located close to the Earth's surface, such as in the Middle East, access for Western oil companies is often impeded or altogether impossible. The Russian market is becoming more and more reclusive in the wake of political developments, and in Latin America – particularly in Venezuela and Bolivia – we are observing a rising trend towards the renationalization of energy resources.

Hence, oil majors are entering into increasingly risky regions such as Northern and Western Africa, parts of the Pacific as well as the former Soviet states, resulting in a sharper risk profile for the IOCs. As a consequence, political instability, acts of sabotage, wars, storms and strikes threaten to cause more disruption on the supply side in future and may substantially influence the price of oil. The depletion of conventional oil reserves and the sharp spike in oil and natural gas prices have also prompted IOCs to focus their attention more and more on unconventional means of extracting fossil fuels. Oil sands, which make up two-thirds of the world's oil reserves, are, together with liquefied natural gas (LNG), the most promising alternatives to conventional oil and gas production. By far the biggest oil sands deposits are located in Venezuela and Canada. A stable political and macroeconomic climate, plus favorable tax conditions, make Canada a better opportunity for investment than the Latin American country. Andre Frick

Home security

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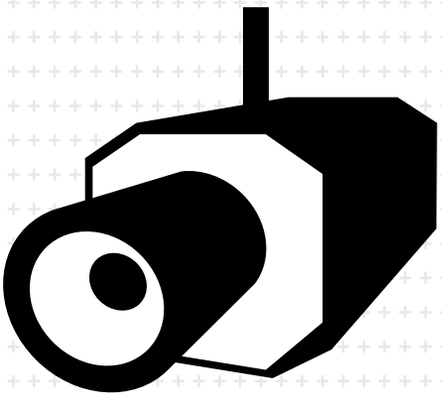

In an era of escalating geopolitical tensions, climate change and religious conflict, the need for personal security is likely to increase. One domain where people can do a lot to boost security is in their own home. The domestic security sector is already developing as a key growth market. In 2000, less than one out of five homes in the US were equipped with surveillance systems, but since then market penetration has risen by close to 40%. The focus on improved security has shown positive results in recent years. For example in Germany, the number of registered break-ins decreased by 12% between 2000 and 2003, with a corresponding increase in the number of unsuccessful break-in attempts.

Greater sales of home security systems are not the only good news for the industry. In addition to the fundamental desire to prevent theft and burglaries in one's own home, there is an increasing need to moderate environmental influences such as the pollen count, heat, dust and humidity, as well as monitoring the household's energy consumption and householders' health. Given aging populations, health insurers' drive to cut medical costs could promote a telediagnostics model, and technological advancements in telematics are making remote monitoring increasingly economical and practical. The industry trend is to combine all these requirements into one solution, whereby a mobile phone becomes the remote control for the entire home security system. Wherever you are, you can control all the functions in your home or your weekend house without being there. In the near future, technology will enable you to answer the front door even when you are on the other side of the world. Uwe Neumann

Migration

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Rapidly increasing migration, whether geographical or social, is carrying millions of people out of poverty and up to higher echelons of modern society's income scale. The primary catalysts behind this trend, in our opinion, are increased future job prospects for immigrants created by the aging of host countries' populations, and salary rises designed to maintain long-term social security in developed countries: witness the influx of new workers into the US. Access to the banking system for those at the lowest end of the income range is consequently a growing necessity.

This emerging population dynamic, resulting in a primary need to transfer money back home to support the families of successful migrants, has spawned demand for very low-priced (but very widely sought-after) basic retail banking services. As a result, remittance volumes have shot up to USD 232.3 billion in recent years, leading the way to profitability in this popular business.

Within five years, these once-new clients may have become regular, established retail banking customers, able to support growth and supply cheap deposit funding for the banks. In addition, migration totaling 3% of the workforce of high-income countries could lead to a global output gain of USD 356 billion by 2025. This is estimated to be double the gain from the heavily discussed full trade liberalization, and a clear benefit for the world economy.

Christine Schmid, Gregory Siegel, Marc-Antoine Haudenschild

IT security

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The value of traditional IT security functions is diffusing throughout the entire infrastructure, with the concept of "secure systems" winning out over "security systems". The occurrence of virus attacks is almost certain to continue in coming years and they are likely to become more sophisticated, but the economic value of defending against them is diminishing. Security is being incorporated into the operating system and into Internet browsers, while Internet service providers (ISPs) offer the software as a free value-added service. Comcast is one example of an ISP offering free antivirus software to encourage broadband subscriptions.

For corporations, traditional IT security against the likes of virus attacks, is diffusing into the network architecture delivered by companies such as Cisco, EMC, Oracle, IBM and others. Each has made significant acquisitions in this area. Business clients increasingly want to buy security inside the network rather than as a separate add-on.

Modern software is also enhancing the usage of existing hardware security equipment by enabling additional features. A good example is video surveillance technologies, which are vastly increasing law enforcement agencies' ability to be vigilant across a wider area. "Smart" video technologies can distinguish certain patterns of motion and bodily features to warn in real time of potential hazards such as fires or threatening activities. Technology is also central to adapting traditional surveillance and vigilance capabilities for use in the digital world, including e-mails, VoIP (voice over internet protocol) conversations, instant messaging and wireless telephony. Steven Soranno

Nuclear power

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The fear of disaster has influenced public opinion on nuclear energy ever since the Three Mile Island accident in 1979 and the Chernobyl disaster in 1986. However, the public seems more and more willing to accept the drawbacks associated with atomic energy, as nuclear power generation is now seen as a bulwark against global warming. A sustained rise in oil prices and an increase in global electricity demand are also prompting a renewed focus on nuclear energy. Emerging market countries are leading the way, building huge nuclear facilities to feed their energy-hungry economies.

Nuclear's track record is impressive. Since the first commercial operation of nuclear power in 1951, only two major accidents – those mentioned above – have occurred. Meanwhile, nuclear technology has advanced dramatically, making catastrophes far less likely. Still, the political feasibility of new projects remains highly sensitive to public perceptions of safety. Incidents such as the emergency plant shutdown at Forsmark in Sweden at the end of July 2006 could only serve to reinforce some countries' endeavors to become free of any dependency on nuclear power.

Then there are unresolved issues about the long-term storage of nuclear waste. Scientists have been searching for alternative approaches including disposal in space. Another potential problem is the tight uranium market. Based on the current usage levels, it is estimated that there is approximately 50 years of uranium reserves left. However, this could be shortened given the 31 nuclear plants currently under construction, adding to the 438 existing nuclear power plants in the world, according to the International Atomic Energy Agency (IAEA). Miroslav Durana, Angelina Chang, Ruth Yeoh

Car safety

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Improved car safety has reduced the number of deaths on US roads by around 10% year-on-year. The number of fatalities per one million cars declined from 180 in 1985 to 101 in 2004, according to US insurance statistics. This was mainly due to three advances: the mandatory wearing of seat belts, followed by the development of airbag technology in the late 80s, and antilock braking systems and electronic stability programs one decade later. New active safety systems are now finding their way into production. Dynamic speed control is one of them. This technology enables drivers to maintain a steady distance from the car in front at any speed. It is a form of passive communication between cars which might soon evolve new functionality with which cars not only scan their environment but also start to pool information with other cars. The next major step is likely to be in Intelligent Transportation Systems (ITS), when traffic control starts to provide additional data for orienteering, such as speed, red-light and incident information. In Japan, where the technology infrastructure is well advanced, the development of ITS is now finding broad support.

ITS would seamlessly connect cars as mobile objects within a network infrastructure, enabling drivers to use information to help reduce accidents, ease congestion and soften environmental impact. Advances in ITS through the systematic linkage of road infrastructure and visual traffic surveillance could connect other modes of transportation, as well as serve various social and environmental needs – such as sending emergency notification about an accident or vehicle theft and making automatic payments at gasoline stations. Marc-Antoine Haudenschild, Markus Mächler

Water

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Daily average water usage in the US is equivalent to 2,800 bottles per citizen. Only 8% of this is directly used at home for drinking and washing. The bulk of usage (69%) is for agriculture and farming, while industry consumes the remainder. Investors are starting to realize that water is becoming an increasingly scarce commodity. Distribution is uneven and hence very profitable.

But it is also a sensitive issue. First, there is the ethical question of whether and to what extent water is a public good. How to approach the provision of drinking water in instances of market failure is open to debate. It also involves treading a fine line between the necessary ceding of the state's authority to dispose of water on the one hand, and its obligation to prevent private utilities abusing their power when determining prices for the delivery of drinking water on the other. It is a question of who spends money on providing drinking water, and who is allowed to make a profit.

This raises concerns about the degree of private-sector involvement in water supply, which is still viewed in many countries as a public service. The example of two privately owned companies in France, Veolia and Suez, is illustrative: both play an indispensable role in the security of water supply and related services, supported by an incentive system that is designed to encourage private businesses to participate in and conserve water supply. Finally, there is the question of rights over the ownership of water, especially the extent to which a water source may be privatized and commercialized. The provision of legal security is crucial for companies and investors, especially with respect to the guarantee of ownership. Olivier P. Müller, Beat Alpiger

Labor

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Technology is advancing but it requires software engineers and electronics experts to carry progress further. The demand for highly skilled labor is likely to be amplified by worrisome demographic trends, particularly in Western Europe. *Le Vieux Continent* is becoming just that: the over-60s account for a little over 20% of the population today. By 2050, that percentage will have doubled but in a far smaller total population. In Germany alone, half a million people will be lost annually from the labor force from 2020, according to the Institute for the Study of Labor in Bonn. The current shortage of highly qualified employees is thus undoubtedly bound to increase.

Political and cultural factors, however, are likely to limit requisite supply in the immediate years ahead, increasing the need for European economies to attract and allocate the labor that does arrive efficiently. Increased demand for highly skilled workers in developed economies has been one of the many major consequences of globalization. This has been facilitated by the decline in communication and transport costs triggered by the IT revolution and the reduction of tariff barriers. Together with major political changes, globalization has transformed the specialization of production.

While the immigration of poorly skilled workers may tend to depress the wages of their native peers, a fact which has provoked a wide-ranging debate in the developing world, the arrival of highly skilled workers to developing countries should generate beneficial effects for host economies. Intelligent and adept workers are the driving force behind innovation and rising productivity, fueling economic growth and return on capital. Robin Seydoux

Investments

Biometrics

Hitachi (HOLD) expects to generate JPY 100 billion in sales over the next three years, through the promotion of finger vein authentication and related systems on the global market. In comparison to the Japanese electronics giant's total sales of JPY 9,464.8 billion, as of FY 03/06, this might look modest, but forms just one part of the suite of security systems being developed by Hitachi, such as X-ray scans and explosives detectors. Marc-Antoine Haudenschild

Generation wealth transfer

Given the enormous change confronting society, wealth providers need to be properly positioned. Competition in the asset accumulation industry is intense, with banks, brokers, asset managers and insurers all battling for market share. On the one hand, clients' desire for annuity and inflation protection vehicles favors insurance companies with product structuring know-how such as AIG (HOLD), Hartford (BUY) and ING (BUY). On the other, banks with a clear client-driven culture, strong customer relationships, and broad distribution capabilities such as UBS (BUY) or Merrill Lynch (BUY) are best placed to profit during the spending phase of their customers' lives. Eric Güller, Gregory Siegel, Christine Schmid

Climate control

Schlumberger (BUY) and ConocoPhillips (HOLD) both have a strong position in carbon dioxide capture and storage (CCS). Schlumberger launched the first industry-scale CCS-based project by extracting CO_2 from gas production on Statoil's Sleipner gas field in the Norwegian North Sea and the plan is to continue until 2020. ConocoPhillips is developing a project off Scotland, where natural gas will be taken and converted into CO_2 and hydrogen gas. The hydrogen gas will be burned in a power station to generate electricity, while the CO_2 is permanently stored in an aging oil field in the North Sea. Miroslav Durana, David Brönnimann

Commodities

We estimate that competition for resources in commodity-rich countries could increase in the coming years, creating spikes in commodity prices as supply becomes squeezed. However, in the next months the temporary slowdown of the economic growth shall exert some downward pressure on commodity and metal prices in particular. Once economic growth starts to pick up again, investors shall buy long-term forward and future contracts of industrial metals (copper, zinc) and soft commodities long term forward (accessible via the GSCI Agriculture index) as we expect price appreciation once market participants realize that access to commodities will get increasingly difficult and a potential source of international conflict. Hervé Prettre, Tobias Merath

All ratings as of October 2, 2006 – ratings are subject to change, please refer to our homepage: www.credit-suisse.com or ask your Credit Suisse contact person.

Airport security

When the British police claimed to have thwarted a plot to blow up airplanes bound for the US using liquid explosives in August 2006, all fluids were banned from aircraft cabins with immediate effect. Currently there are two large providers of liquid detection systems in the market: Smiths Group (BUY) in the UK and General Electric (BUY) in the US. Smiths Group is selling a machine called Sentinel II, which is able to analyze traces of explosives, chemicals and drugs as people are passing through security. The system can process seven persons per minute. Smiths generates 12% of its sales from detection systems, and demand is growing. Patrick Matti, Markus Mächler

Oil supply

Canada has been thrown into a veritable "sand rush" in recent months. Canadian companies like Petro-Canada (BUY), Encana (BUY), Canadian Natural Resources (BUY) and Nexen (BUY) are likely to be very well positioned to profit from the dawning era of unconventional oil and gas production. But in the present environment, other countries' national oil champions like Petrobras (BUY), Gazprom (HOLD), Lukoil (BUY) also appear destined to rank among the winners. All three energy companies possess enormous conventional reserves and they have privileged access to an almost inexhaustible resource base in Brazil (Petrobras) and Russia (Gazprom and Lukoil). Andre Frick

Home security

Nowadays purchasers of surveillance systems are often provided with a service pack wherein a commercial security firm offers instant help in the case of an alarm. The recent spin-off from Securitas AB Securitas Direct (BUY) is a specialist for home security systems with double-digit growth potential. One of the global leaders in safety systems is Kaba (HOLD), providing mechanical and electrical access as well as security systems. Siemens (BUY) already offers a wide range of products for home safety, although the contribution to the German group's corporate results is small. Ulrich Kaiser

Migration

Banks' interest in this segment is on the rise. The Spanish financial firm BBVA (BUY) is at the forefront, offering immigrant banking services through its network, which includes Dinero Express in Spain and Bancomer Transfer Services, the current leader in Bajalta California. Other players such as HSBC (BUY) and Citigroup (BUY) should also benefit due to their global presence and technology-driven retail platforms. Other banks are trying to capture those at the lowest end of the income range in their home countries. For example, the latest initiative from Royal Bank of Scotland (HOLD) recognizes the reliance on free cash machines, especially for those people of limited financial means, by situating 300 new automated teller machines in the poorest regions. Christine Schmid, Gregory Siegel, Marc-Antoine Haudenschild

IT security

Nice Systems (BUY) is a leader in video and telephone analysis. Its voice technology digitally analyzes telephone conversations to detect intonation, stress and keywords. Its video technologies analyze motion patterns, and look for irregularities, such as unattended packages. Verint Communications (HOLD) is a leader in communications interception and analytics, including VoIP and e-mails. Citrix Systems (BUY) and WebEx Communications (BUY) are leaders in enabling service workers to reduce their travel time by working remotely or participating in virtual meetings. Steven Soranno

Nuclear power

In our view, nuclear power utilities and uranium producers are most likely to benefit from the renaissance of nuclear energy. We recommend the following two stocks for exposure to the nuclear power theme. EDF (Electricité de France, HOLD) produces, transmits, distributes, imports and exports electricity. The company provides 92% of French energy consumers with electricity, and 78% of that electricity comes from nuclear power. Cameco Corporation (BUY) supplies nuclear power plants worldwide with uranium and operates uranium mines and facilities in Wyoming, Nebraska and Saskatchewan. Miroslav Durana, Angelina Chang, Viet Hung Tran

Car safety

Despite the increasing number of cars and the rising complexity of traffic rules and networks, the rate of fatalities on the road has slowed due to active and passive safety features. Passive safety systems are built into the car's structure. Mandatory seat belt wearing, up to ten airbags per car and other active safety systems such as electronic stability programs (ESP) and antilock braking systems (ABS) all significantly contribute to current high standards of protection. The world's biggest supplier of seat belts and airbags is Autoliv (HOLD). Active safety systems like ESP or Pre-Safe are available from Continental (BUY) which is one of the two market leaders. Marc-Antoine Haudenschild, Markus Mächler

Water

Nestlé (BUY), with its international water brands Poland Spring, Nestlé Pure Life and Vittel, and Danone (BUY), with Evian, Aqua and Wahaha, are global leaders in selling bottled water and each has a market share of 11–12%. Whereas Nestlé has a particularly strong position in North America, Danone has a significant footprint in Asia, especially China. Coca-Cola (BUY) and Pepsi (BUY) are active in the mineral water business, and their respective shares of the US market are about 15% and 12%. Major water services companies are Veolia (BUY) and Suez (HOLD). Ciba's water treatment business accounts for about 5% of its sales. The US group General Electric (BUY) is a prominent provider of technology for seawater desalination plants. Olivier P. Müller, Beat Alpiger, Huong C. Belpedio

Labor

Adecco (BUY), the world's leading staffing company, should benefit from the secular trend towards highly skilled specialists. In addition to its global reach, the solutions provider should profit from bolt-on acquisitions and a strong presence in the underdeveloped high-margin specialist staffing market in continental Europe. Adecco already handles around 10% of the total temporary recruitment market here, but redressing the expected shortage of highly skilled labor in years to come will play to its strengths. European employers, of course, will need to become more flexible themselves. The French specialist staffing market, for example, is only about one-quarter the size of the UK specialist market. Robin Seydoux

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Alois F. Bättig is a member of the Private Banking Management Committee of Credit Suisse in Zurich. Since January 2006 he has headed up the Business Area Private Banking Europe, Middle East and Africa. Alois F. Bättig first joined Credit Suisse in 1974 and has since served the company in numerous capacities in the Private Banking field. His career has included assignments abroad, most notably in Singapore, the UK and the US. Before taking on his present assignment, he was in charge, from October 2002, of Credit Suisse's onshore European Private Banking operations. Before that he held responsibilities for various offshore Private Banking markets, both in Europe and overseas. Alois F. Bättig was born in Switzerland in 1958 and is a graduate of the Zurich Business School as well as the Swiss Banking School. He is married.

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Since October 2005, Ursula Ackermann-Liebrich has been Academic Director of the Swiss School of Public Health (SSPH) and Chair of the Institute for Social and Preventive Medicine at the University of Basel (part-time professor). After studying medicine in Basel, she worked for four years in the health care sector in Chile, before continuing her education at the London School of Hygiene and Tropical Medicine. In 1993, Dr. Ackermann was the first full professor of the Faculty of Medicine at the University of Basel and appointed Head of the Department of Public Health. Her primary research interests include the environment and health – particularly the effects of air pollutants on human health – women and health, as well as the evaluation of medical and preventive performance. Ursula Ackermann-Liebrich was born in Switzerland, is married and lives in Basel.

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Diane J. Mundt currently heads a team of experts in nanotechnology at ENVIRON International Corporation in Amherst, Massachusetts, where she has worked since 2003. She has over 25 years of experience in the application of epidemiological methods in the field of occupational and environmental health. Dr. Mundt's interests are particularly focused on the health risks posed by chemical compounds. Following her studies in epidemiology at Harvard University, Dr. Mundt began her career at the National Cancer Institute in the USA. She received her doctorate from the University of Massachusetts. From 1998 to 2000, she worked at the Health Effects Institute (HEI) and thereafter became Director of Public Health Policy at Applied Epidemiology, Inc. As member of various committees and advisory bodies, Diane J. Mundt has been actively engaged in promoting the health and safety of nanotechnology.

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Daniel Vasella has been CEO of Novartis since the company was founded in 1996, as well as Chairman of the Board of Directors of the pharmaceuticals group since 1999. Dr. Vasella was born in Fribourg, Switzerland, in 1953. He studied at the Universities of Bern and Fribourg, and graduated with an MD. Among other medical positions, he worked as a senior physician at the Inselspital in Bern. Dr. Vasella is a member of the International Board of Governors of the Peres Center for Peace, and chairs the International Business Leaders Advisory Council for the Mayor of Shanghai. He is also a member of the Dean's Advisory Board of Harvard Business School, as well as a member of the board of directors of the US firms PepsiCo and INSEAD. He was awarded a Doctor honoris causa from the University of Basel in 2002.

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Michael T. Klare is the Five College Professor of Peace and World Security Studies (a rotating appointment at Hampshire College, Amherst College, Mount Holyoke College, Smith College and the University of Massachusetts at Amherst) as well as Director of the Five College Program in Peace and World Security Studies (PAWSS), positions he has held since 1985. He previously served as Director of the Program on Militarism and Disarmament at the Institute for Policy Studies in Washington, D. C. Among his credentials, Dr. Klare is also a member of the advisory board of the Arms Division of Human Rights Watch. He is deeply engaged in research and writing on US defense policy, the arms trade and global security issues, as exemplified by his latest book, titled "Blood and Oil: The Dangers and Consequences of America's Growing Dependency on Imported Petroleum."

Prof. Dr. Andreas Wenger, Director of the Center for Security Studies (CSS), ETH Zurich 35–40
Andreas Wenger assumed the post of Director of the Center for Security Studies (CSS) at ETH Zurich (Swiss Federal Institute of Technology) in September 2002, an organization that deals with issues relating to security policy. Since 2003, he has also taught as Professor for International and Swiss Security Policy at ETH Zurich. Dr. Wenger's research interests encompass all aspects of security politics and strategic assessment, in particular, as well as the historical development of international relations. Following his studies in history, political science and German literature at the University of Zurich, Andreas Wenger expanded his knowledge in the field of global affairs at Princeton University. Dr. Wenger was born in Switzerland in 1964, is a writer and editor of numerous publications, among them "Living with Peril: Eisenhower, Kennedy, and Nuclear Weapons."

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Adrian Collings has worked at the World Nuclear Association (WNA) since the beginning of 2001. He has a background in the international aspects of nuclear energy. In the 1980s he was Head of International Relations at the UK Central Electricity Generating Board, where he worked closely with the late Lord Marshall on the establishment of the World Association of Nuclear Operators. Subsequently, he was Head of International Relations at the UK nuclear utility "Nuclear Electric" (later, British Energy). During this period he was responsible for establishing and later managing the Nuclear Electric office in Brussels. He has also worked as Expert Adviser on nuclear matters to the Economic and Social Committee of the European Union.

Prof. Dr. Thomas Straubhaar, Director of the Hamburg Institute of International Economics (HWWI) 45–50
Thomas Straubhaar is cofounder of the independent Hamburg Institute of International Economics (HWWI), where he has served as director since the beginning of April 2005. Since 1999, he has been President of the Hamburg Institute of International Economics Archive (HWWA). In this regard, he is also Professor of Economics, particularly focusing on economic policy, at the University of Hamburg. The economist studied and earned his professorship at the University of Bern. His research interests encompass international economic policy, regulatory policy, and welfare and social policies. Dr. Straubhaar has published numerous articles and books, among them "Migration in the 21st Century – from Threat to the Rescue of the Social Market Economy?" Thomas Straubhaar was born in Switzerland in 1957, is married and has three children.

Prof. Dr. Robert Glenn Hubbard, Ph. D., Dean of the Graduate School of Business, Columbia University 51–53

Dr. Robert Glenn Hubbard was named Dean of the Graduate School of Business, Columbia University in July 2004, where he has also taught as Professor of Finance and Economics since 1988. Dr. Hubbard's research interests range from tax policy and the currency markets, to corporate and international finance. In addition to his academic career, he also worked in the public sector. His tenure as Chairman of the Council of Economic Advisers from 2001 to 2003 included advising President George W. Bush on economic, tax and fiscal policy issues. The economist regularly writes articles on the economy and is author of two leading textbooks on economics and the financial markets, among other publications. Robert Glenn Hubbard was born in Florida in 1958, is married and the father of two children.

Dr. Vivian Balakrishnan, Cabinet Minister, Singapore 54–57

Dr. Vivian Balakrishnan is Singapore's Minister for Community Development, Youth and Sports as well as Second Minister for Information, Communications and the Arts. He was appointed as Minister of State for National Development in 2002 and Minister of State for Trade and Industry in 2003. He began his political career after studying medicine at the National University of Singapore and specialized in the field of ophthalmology. He worked at Moorfields Eye Hospital in London between 1993 and 1995. In 1999, he was appointed Medical Director at the Singapore National Eye Centre. From 2000 to 2001, he served as Chief Executive Officer of the Singapore General Hospital. Vivian Balakrishnan was born in 1961, is married and the father of four children.

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Rating Change History as of 02/10/2006

Company	Rating	Date (since)
ADECCO N (ADEN VX)	BUY	22/11/2005
	HOLD	17/08/2005
	BUY	22/03/2005
	HOLD	24/11/2004
	BUY	22/07/2004
	HOLD	26/04/2004
AM INTL GROUP (AIG US)	HOLD	10/08/2006
	BUY	02/12/2005
	HOLD	15/10/2004
AUTOLIV (ALIV SS)	HOLD	10/06/2005
	BUY	18/01/2005
BBVA R (BBVA SM)	BUY	08/11/2004
	HOLD	03/11/2003
CAMECO (CCO CN)	BUY	18/07/2006
CDN NATURAL RES (CNQ CN)	BUY	09/06/2006
CITIGROUP (C US)	BUY	20/10/2000
CITRIX SYSTEMS (ctxs)	BUY	20/09/2006
COCA-COLA CO (KO US)	BUY	08/09/2005
	BUY	16/02/2005
	HOLD	14/01/2005
	SELL	16/09/2004
	HOLD	26/07/2004
	BUY	18/02/2004
CONOCOPHILLIPS (COP US)	HOLD	26/07/2006
	HOLD	27/04/2006
	BUY	28/09/2005
	BUY	27/04/2005
	BUY	30/07/2004

Company	Rating	Date (since)
CONTINENTAL AG (CON GR)	BUY	04/05/2006
	BUY	13/08/2003
DANONE (BN FP)	BUY	22/02/2006
	HOLD	20/07/2005
	BUY	26/04/2005
	HOLD	15/01/2004
EDF (EDF FP)	HOLD	22/09/2006
EMC (EMC US)	HOLD	08/06/2006
ENCANA (ECA CN)	BUY	09/06/2006
GAZPROM NEFT (GAZ LI)	HOLD	12/07/2006
	HOLD	29/09/2005
	HOLD	18/08/2005
	BUY	07/05/2004
	BUY	06/02/2004
GENERAL ELECTRIC (GE US)	BUY	08/02/2005
HARTFORD FIN SERV (HIG US)	BUY	20/06/2005
HITACHI	HOLD	26/09/2006
HSBC HLDG (HSBA LN)	BUY	24/02/2006
	HOLD	13/12/2004
	BUY	03/08/2004
	HOLD	14/01/2004
	BUY	05/08/2003
ING GROEP (INGA NA)	BUY	06/03/2006
	HOLD	11/08/2005
	BUY	07/01/2005
KABA HLDG N (KABN SW)	HOLD	07/03/2006

Company	Rating	Date (since)
LUKOIL SP ADR (LKOD LI)	BUY	30/05/2006
	BUY	19/01/2006
	BUY	26/05/2005
	BUY	07/05/2004
	BUY	06/02/2004
MERRILL LYNCH & CO (MER US)	HOLD	25/05/2006
	BUY	13/05/2005
	HOLD	15/07/2004
NESTLÉ N (NESN VX)	BUY	15/01/2004
	HOLD	16/09/2003
NEXEN (NXY CN)	BUY	09/06/2006
NICE SYSTEMS SP. ADR (nice)	BUY	21/09/2006
PEPSICO (PEP US)	BUY	04/01/2005
	HOLD	21/04/2004
PETRO-CANADA (PCA CN)	BUY	09/06/2006
PETROLEO BR SP ADR (PBR US)	BUY	13/07/2006
	BUY	28/02/2006
	BUY	18/10/2005
ROYAL BK SCOTL GR (RBS LN)	HOLD	04/08/2006
	BUY	28/02/2006
	HOLD	04/08/2005
	BUY	25/02/2005
SCHLUMBERGER (SLB US)	BUY	28/04/2006
	BUY	16/01/2006
	BUY	24/01/2005

Company	Rating	Date (since)
	BUY	26/09/2003
SECURITAS DIRECT (SDIRB)	BUY	02/10/2006
SIEMENS R (SIE GY)	BUY	15/12/2004
	HOLD	24/02/2004
SMITHS GROUP (SMIN LN)	BUY	11/08/2006
	HOLD	14/02/2006
	BUY	01/09/2005
SUEZ (SZE FP)	HOLD	09/09/2005
	SELL	21/06/2005
	HOLD	02/06/2005
	SELL	11/04/2005
	HOLD	05/03/2004
	BUY	30/01/2004
UBS N (UBSN VX)	BUY	01/11/2005
	HOLD	09/08/2005
VEOLIA ENVIRONN. (VIE FP)	BUY	18/09/2006
	HOLD	24/01/2006
	REST	19/12/2005
	HOLD	19/09/2005
	BUY	10/05/2005
	HOLD	05/11/2004
	BUY	25/09/2003
VERINT COMMUNICATIONS	HOLD	22/09/2006
WEBEX	BUY	22/09/2006

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Rating Allocation as of 02/10/2006

	Overall	Investment banking interests only
BUY	47.03%	47.52%
HOLD	48.47%	48.60%
SELL	3.60%	3.24%
RESTRICTED	0.90%	0.65%

Relative performance
At the stock level, the selection takes into account the relative attractiveness of individual shares versus the sector, market position, growth prospects, balance-sheet structure and valuation. The sector and country recommendations are "overweight," "neutral," and "underweight" and are assigned according to relative performance against the respective regional and global benchmark indices.

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The stock recommendations are BUY, HOLD and SELL and are dependent on the expected absolute performance of the individual stocks, generally on a 6- to 12-months horizon based on the following criteria:

BUY	10% or greater increase in absolute share price
HOLD	Variation between –10% and +10% in absolute share price
SELL	10% or more decrease in absolute share price
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A	Obligor's capacity to meet its financial commitments is strong
BBB	Obligor's capacity to meet its financial commitments is adequate, but adverse economic/operating/financial circumstances are more likely to lead to a weakened capacity to meet its obligations
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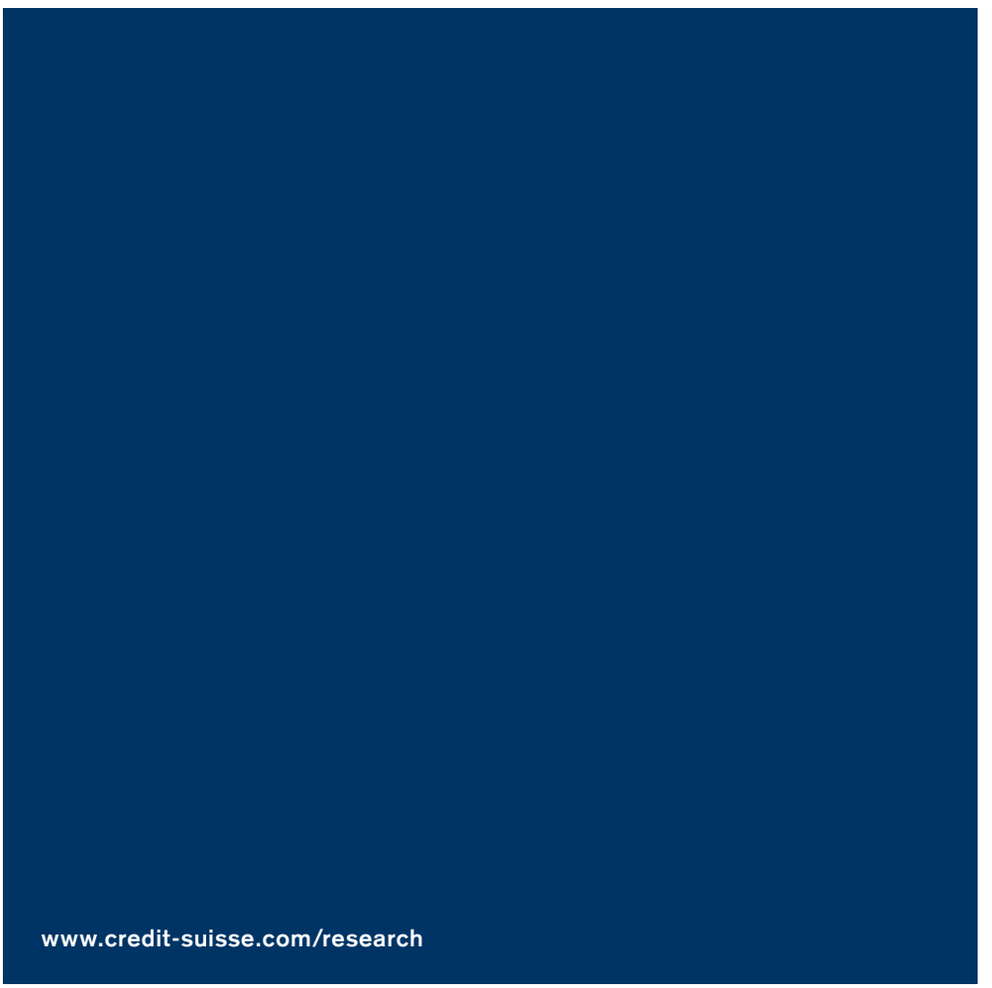
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