

8th  EU Hitachi  
Science & Technology  
*forum*

**Technology &  
its Impact on  
the City of the  
Future**

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S U M M A R Y   R E P O R T

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20-22 May 2005, Athens

**HITACHI**  
Inspire the Next



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It gives me great pleasure to present the summary of the proceedings of the 8th EU Hitachi Science & Technology Forum on "Urbanization and IT, Impact on European Society", which took place in Athens, Greece, from 20th to 22nd May, 2005. The 8th Forum was honored by the presence of Mr. Stylianidis, Deputy Foreign Minister for Foreign Affairs, who kindly officially opened the Forum.

The EU Hitachi Science & Technology Forum's main goal is to contribute to the public policy debate in Europe. Again this year, the presentations by our distinguished guest speakers, and the resulting intense debate by the participants, demonstrate that the theme selected by the Forum members was very close and important to the European citizen's interest. I strongly believe that Hitachi's corporate philosophy, which is to contribute to society through science and technology, is brilliantly illustrated by the 8th Forum. I really hope that readers will share this same feeling with me.

The conclusions reached by the Forum members after intense discussions make most of this summary. These conclusions are somehow unique in the European Union, since they reflect the assessment of technological breakthroughs by a panel of mostly EU skilled scientists. This is, again, the originality of the Forum.

It goes without saying that the Forum success and reputation is made possible through the talent and commitment of our speakers, moderators, Forum fellows and participants. To all of them, my deepest gratitude. My thanks also to Mr. Mark Sharpe who, for the second consecutive year, has made this well thought through summary a perfect reflection of the debates.

*Michiharu Nakamura*

**Dr. Michiharu Nakamura**  
Executive Vice President & Executive Officer  
President, Research & Development Group  
Hitachi, Ltd.



*left to right:*

Dr. Adriano Alessandrini

Prof. Yasushi Asami

Mrs. Kalliopi Bourdara

Sir Stephen Gomersall

Prof. George M. Hazel

Mr Norikiyo Koide



# What is the EU Hitachi Science & Technology Forum?

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Since its creation in 1910, Hitachi has kept its founder's commitment to contribute to society through technology. Once more, this longstanding commitment has been demonstrated by the setting up of the EU Hitachi Science & Technology Forum in 1998 by the Hitachi Corporate Office, Europe.

This Forum brings together European scientists and engineers who have all participated in long-term internships in the Hitachi laboratories or plants in Japan. The Forum was designed to meet two objectives. Firstly, it provides a platform where these Hitachi alumni can address and discuss societal issues related to science and technology in the daily life of European citizens. Secondly, it provides a yearly occasion for all European Hitachi alumni to meet friends and colleagues.

In 1998, the Forum concept was successfully tested at a meeting in France with the working theme: "R&D in SMEs, comparison between the EU and Japan". The meeting started on Friday evening and closed on Sunday afternoon, with large breaks giving free time to the participants. This format has been kept ever since.

The topics and venues for the annual meetings since then have been:

- 1999, Germany: Information technology and its benefits to society
- 2000, Dublin: Electronic commerce and its impact on society
- 2001, Brussels : Life sciences and their impact on European society
- 2002, Budapest: Water Issues and their impact on European society
- 2003, Antwerp: Energy and its implications for European society
- 2004, Stockholm: Transport and IT: impact on European society

In 1999, to allow Forum members greater involvement in the organisation of the event, a working group was created, appointed for one year. With this development the Forum was to be run by its members, on topics selected by its members, for the benefit of its members. This was the Hitachi Corporate Office medium-term objective. Also, in September 1999 a newsletter, European Connexion, was launched as a link between Forum members and Hitachi and as a tool to promote the Forum proceedings.

Since 2001, at the request of Forum members, the meetings have included a presentation on current Hitachi R&D developments. Hitachi executives from the EU and Japan have attended the Forums and answered questions related to Hitachi's activities.

The Forum requires the support of experts who have a keen interest in European societal issues, who will be interested in contributing to the overall success of the EU Hitachi Science & Technology Forum through a strong personal commitment. These individuals comprise the Forum Fellowship. The Forum Fellows are: Mr. Mark Cantley (Advisor, DG Research, European Commission), Mr. Dolf Gielen (International Energy Agency), Mr. Pierre Longin (President, Longin & Associés, Brussels), Dr. Florian Schmitz (Rechtsanwalt, Clifford Chance Pünder, Frankfurt) and Mr. Robert Verrue (Director General, DG Taxation and Customs Union). The chairman of the Forum Fellows is Dr. Michiharu Nakamura (Executive Vice President & Executive Officer, President Research & Development Group, Hitachi Ltd.)

Hitachi, with the active participation of Forum members is committed to contribute to European Society by helping to shape policies which will improve the daily life of their fellow European citizens. In this respect, the EU Hitachi Science & Technology Forum wants to clearly bring the benefits of new technologies to all Europeans.

# Technology and its Impact on the City of the Future

## Executive Summary

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The 8th EU Hitachi Science & Technology Forum brought together around 130 scientists, engineers, executives and policy-makers on the theme "Technology and Its Impact on the City of the Future". The Forum addressed the use of technology in solving urban problems from five perspectives: safety and security, mobility, urban planning, sustainability and new materials.

The Forum heard that the issue of urban planning is as old as mankind itself. From the earliest days of human settlements, people have been looking at how best to structure and organise cities. Over the last 150 years urbanisation has increased dramatically. Between 1850 and 1950 the number of cities with more than a million inhabitants increased from just two – London and Paris – to twenty-seven. This trend has intensified since, to the point where we now see the emergence of mega-cities – "megapolises" – at various locations around the world. In many countries, the urban population not only exceeds the rural population, but the actual area occupied by urban centres is greater than that devoted to agriculture.

Many factors have contributed to this growth. In former times it was driven by the railways, and in certain cities such as Tokyo rail-based commuting is still an important phenomenon. More recently, this role has been taken by the car, with vehicle-kilometres in OECD countries growing five times faster than the population as a whole. In advanced industrial countries, the drive towards individualism and consumerism – the "Me Culture" – has also been a major factor.

This endless quest for space and mobility has become a vicious circle: people seek to escape the urban environment by acquiring more space in the urban fringe, so requiring more transport infrastructure, which in turn acts as a locus for further urbanisation. As the keynote speaker, Prof. Stephanis explained, "purposeful growth" has given way to "purposeless expansion". Another speaker, Dr. Laconte, described the situation as being one of *laissez-faire*, a "creative chaos of spaces structured only by their infrastructures".

At the same time our urban communities face drastic changes. Investment in the renewal of social infrastructure, such as highways, hospitals and schools, is under pressure, and in many cases is declining. An aging population creates new requirements for how we structure and organise our societies. A growing recognition of environmental protection requires that we pay

greater attention to pollution and waste, especially in relation to energy and transport. And with crime and other threats increasing, people are looking for our urban environments to be intrinsically safer and more secure.

Thus, we urgently need to regain control of urban growth. Speakers at the Forum provided a clear roadmap for how to proceed. We have to pursue fractal models of urban development, where each individual community or neighbourhood is able to meet its own needs. We have to make our communities more sustainable, optimising land use and minimising consumption of energy and transport. We also have to reach out beyond the central zones to reinvigorate smaller urban and suburban centres. We should build vibrant and creative cities: places for commerce, exchange and interaction.

Technology has a key role to play in this. Biometrics, detectors and tracking technologies can help protect against crime and make society more secure. Use of ICT in the transport sector could make public transport more flexible and reliable, open the way to new services, and optimise our use of infrastructure through measures such as road pricing. Developments such as fuel cells, renewable energy and combined heat and power can help achieve a more rational use of energy in buildings and transport. A whole variety of technologies, from smartcards, to health monitoring and smart elevators, can ensure our urban environments are accessible and barrier-free. New materials, such as high performance concrete, will make cities of the future beautiful as well as functional.

However, these developments cut across many technical disciplines and many policy domains. Realising them will require close collaboration between scientists and technologists from different fields, and between technologists and policy-makers. The "push" of technology deployment should go hand-in-hand with a "pull" provided by an appropriate regulatory framework.

## Introduction

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Around 130 participants attended the 8th EU Hitachi Science & Technology Forum held in Athens, Greece from 20th-22nd May 2005, where they discussed the theme "Technology and its impact on the city of the future". As usual, the gathering attracted a diverse range of scientists, engineers, executives and policy-

makers. Dr. Spyros Konidaris, of DG Information Society & Media, European Commission, served as Forum General Moderator, drawing linkages between the presentations and encouraging participants to engage in a constructive analysis of the issues. Mr. Norikiyo Koide, General Manager of Hitachi Corporate Office, Europe, welcomed participants to Athens. He expressed his appreciation to the guest speakers for agreeing to participate in the meeting and to Dr. Konidaris for agreeing to act as moderator. He also welcomed Hitachi interns from Japan and a variety of other guests from industry and government. In his Welcome Speech Sir Stephen Gomersall, Chief Executive for Europe, Hitachi, Ltd., said the Forum was a valuable opportunity to look at how "technology and imagination combined can create beautiful urban cities". Athens would be the perfect host for this and he thanked the Mayor and the Minister for their support and attendance. He also welcomed Dr. Michiharu Nakamura, Executive Vice President, Hitachi Ltd, other Hitachi colleagues and Forum members. He invited participants to give honest feedback and looked forward to a stimulating discussion.

H.E.M. Evripidis Stylianidis, Deputy Minister for Foreign Affairs welcomed the Forum on behalf of the Greek government and wished it every success. Greece had seen major changes over the last 15 years, the Minister noted, and had responded well to globalisation and EU integration. The 2004 Olympics in Athens had been a major success and had helped put Greece on the world stage.

The country is continuing its transformation from a low-cost economy to a high added value economy, the Minister explained. It has many advantages in this respect. Greece enjoys a stable economic and political environment and is a key link to the fast-growing economies of the Balkans and Black Sea regions. The government's sympathetic stance to business, low-taxes, a favourable climate for inward investment, strong investment in R&D, skills and ICT infrastructure all contribute to make Greece an attractive place to do business.

Mrs Kalliopi A. Bourdara, Deputy Mayor of Athens, welcomed the Forum on behalf of the Mayor of Athens who was unable to attend in person. Athens has changed considerably over recent years, noted Mrs Bourdara. It has utilised EU funds for urban regeneration and tourism, and made great strides in promoting the economic, social and environmental face of the city. The municipality has invested heavily in information and communication technologies (ICT), in areas such as e-voting, e-government services and e-learning. It also hosted a highly successful Olympic Games, which involved the largest ever security operation. Wishing the Forum every success, Mrs Bourdara said she hoped the "conclusions will contribute to disseminate tools and technologies for local government in order to better deploy services for the benefit of citizens."

H.E.M. Hideaki Ninomiya, Minister-Counsellor, Embassy of Japan to Greece, presented the best wishes of the Ambassador and the Japanese government for a successful meeting. 2005 was the year of EU-Japan people-to-people exchanges and the Forum was a visible manifestation of this. He was impressed by the breadth of countries present and by the expertise of the guest speakers. "Scientific communication has a major role to play in explaining the benefit of technology to society", Mr. Ninomiya said. "Athens has a unique history and is an idea place to consider the city of the future".

## **Keynote Speech: Urbanization: Past, Present and Future**

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### **Prof. Basil Stephanis, Department of Civil Engineering, Democritus University of Thrace**

Prof. Stephanis thanked Mr. Koide and Hitachi for the opportunity to address such a distinguished Forum. The issue of urbanisation, he said, was as old as mankind itself. Ever since the first Assyrian, Hittite, Egyptian and Hellenic settlements came into being, people had been looking for solutions as to how best to structure and organise cities.

For instance, as early as the fifth century B.C. the population of the city state of Athens was 35000 free citizens plus around 100,000 foreign residents (metikoi) and slaves who lived and worked on the city's fringes. Citing what he called "the nightmare of numbers", Prof. Stephanis presented statistics detailing the city's growth from the early nineteenth century to modern times. From just 12000 in 1813, the population grew to around 36000 by 1853, 173000 at the end of the 19th century, and 1.4 million in 1951. At that time Athens accounted for around 18% of the total Greek population, a proportion that today has almost doubled to around 30%. For Greece as a whole, population density has increased from 38 inhabitants per square km in 1896, to 83 inhabitants in 2001.

Growth elsewhere has been even more dramatic. In 1800 no city in the Western World had more than a million people: London, the biggest, had only 959,000, while Paris had little more than half a million. By 1850, London had over two million and Paris over a million inhabitants. By 1900 there were eleven metropolises with more than a million inhabitants including Berlin, Chicago, New York, Philadelphia, Moscow, St Petersburg, Vienna, Tokyo, and Calcutta. Thirty years later, there were twenty-seven cities with more than a million inhabitants, with similar increases in smaller urban centres with populations of over 100,000. By 1950 13% of the world's population lived in cities of 100,000 or over as against 1.7% in 1800. Railroads played a major role in the growth of cities. "Railroad systems were deliberately designed to compel passengers and goods to pass through the metropolis before going elsewhere. Each great metropolis still sits like a spider in the midst of a transportation web, though the railroads themselves have

been sacrificed to the motor car and the jet plane." We see similar driving forces today in air travel, with airports acting as conduits for urban growth.

Turning to the effects of this mobility, Prof. Stephanis argued that "what some have called the urban explosion is in fact a symptom of a more general state - the removal of quantitative limits. This marks the change from an organic system to a mechanical system, from purposeful growth to purposeless expansion." Driven initially by railroads, then by roads and the motor car, urban expansion now knows no limits. London, for instance, now covers an area 650 times greater than in medieval times. The New York conurbation covers an area of 2,514 square miles, and unless something is done there is a real prospect of a "super-city" stretching all the way from Maine to Florida.

Hence, we are entering an era of "megalopolises". In many countries, not only will the urban population be greater than the rural population, but the actual area occupied by urban growth will outstrip that devoted to cultivation. "Megalopolis is fast becoming a universal form", Prof. Stephanis noted, "and the dominant economy is a metropolitan economy, in which no effective enterprise is possible without a close tie to the big city". "Does this represent a final stage in urban development?" he asked.

Prof. Stephanis thought not. He proposed instead a pyramid structure where land area was segmented in inverse proportion to population. Thus, 40% of the surface area would be occupied by settlements of less than 1000 inhabitants; the next 30% by settlements of 10000 inhabitants; the next 20% by cities of 100,000 inhabitants; and the final 10% by cities of over 1 million inhabitants. Computer models showed this approximates roughly to the urban concentration of the Netherlands.

The key steps in realising such a plan, noted Prof. Stephanis, would be to curtail the extension of land occupied by the cities through city planning, increase rural connections by minimising the time in reaching the dominant urban centre, and stimulating productive growth in the smaller urban centres.

## Toward Far-Sighted Urban Regeneration

**Prof. Yasushi Asami, Centre for Spatial Information Science, University of Tokyo**

Tokyo, like many urban centres, was experiencing significant redevelopment, observed Prof. Asami, which was changing the urban structure. Redevelopment projects are like surgical operations in the urban environment, observed Prof. Asami. However, without changing the patient's disposition, it is likely that the similar disease will strike again. How do we move towards the far-sighted regeneration necessary to change the predisposition of cities and urban activities?, he asked.

Turning to the historical context, today the Tokyo metropolitan area comprises some 32 million people. This urban growth has been driven primarily by railways, Prof. Asami noted. The city's population density is smaller than New York, yet its employment density is higher. This situation has been sustained through extensive rail-based commuting; more than three times that of New York or Paris. As a result, both trains and stations are heavily congested. One good point is that Tokyo's railways perform well in terms of energy efficiency compared to cities elsewhere.

Why urban regeneration? Prof Asami asked. Japan experienced a difficult economic situation during the 1990s, a time which has generally come to be seen as the "lost 10 years". A bubble in land prices and large debts in the property and financial sectors have hampered redevelopment efforts. Public policy urgently needed to promote new investment for economic growth.

Taking a strategic approach, investment has been targeted to areas where its productivity is relatively high, which has meant urban areas. Economic recovery has been given precedent over regional equality. Large investments in the metropolitan areas have been successful in inducing large redevelopment projects there. "Urban renaissance" has become the keyword for this movement.

In Tokyo, many redevelopment projects have taken place, which together have changed the outlook in central areas. The increase in floor space has stemmed the rise in rents, making housing in central areas more affordable. This, in turn, has accelerated people's movement back into the central areas: it has become a city for habitation again.

Urban regeneration, urged Prof. Asami, requires more than a series of urban redevelopments, public investments, and countermeasures for bad credits. It is about measures to change urban spatial structure and social structure, so that the city itself can sustain its activity and attractiveness. Often this involves regulatory reforms and changes to the social system so as to induce motivation for self-improvement. As well as landmark projects such as skyscrapers, large cities need regeneration in "ordinary areas" in the suburban and semi-urban periphery. Similarly, small cities and towns also need to look to their own renewal. Prof. Asami then gave examples of many issues affecting regeneration in such settings.

In conclusion, Prof. Asami noted that if we are to avoid the mistakes of the past, regeneration must go hand-in-hand with economic adjustment. We have to be able to express the costs and benefits, such that positive contributions will be subsidised and negative effects will be levied, so that the balance is attained financially for the city as a whole. Shareholding (joint ownership) and community agreements are potential means for achieving this.



## Hitachi's Technologies for the Creation of New Urban Communities

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### **Mr. Kunihiko Ohnuma, CEO Urban Planning & Development Systems, Hitachi Ltd.**

Introducing his presentation, Mr. Ohnuma noted that Japan and Europe face different challenges in the urban regeneration context, but also some similarities. There is much to be gained by sharing ideas and open debate, and he welcomed the invitation to the Forum as a contribution to that process.

Setting the scene, he explained that Japan was facing drastic changes in urban communities. Four factors stand out: firstly, investment in the renewal of social infrastructure, such as highways and buildings, is declining. Secondly, a declining birth rate means the population is aging, to the extent that by 2020 almost 30% of the population will be over-65. Thirdly, Japan as elsewhere recognises the importance of environmental protection as represented by the Kyoto Protocol and other measures. Yet despite progress in industry, energy consumption in domestic and commercial buildings continues to rise sharply. Fourthly, although still low by international standards, Japan is experiencing rising crime, including cybercrime, and is also having to face up to the security threats seen elsewhere.

What is the Japanese Government doing about this? Japan sees Total Quality of Life (TQoL) as the key for creating new urban communities. This means ensuring that communities are secure, comfortable and sustainable. On security, for instance, the government has set up a Disaster Information Center Website to aggregate real-time information from several agencies on various aspects such as traffic conditions, weather, environmental parameters. In addition, a variety of new laws and regulations have been adopted to fight crime and cybercrime; improve environmental performance, and make Japan a barrier-free society by ensuring access-for-all.

With over a century of experience in social infrastructure development, Hitachi is well-placed to meet these challenges and has many exciting and viable solutions for urban communities. In the security area, for instance, it has developed secure entrance systems for condominiums, and a wide area network that allows residents to track a child's movements from home through a network of "smart poles" in the local environment. A door-access control system based on finger-vein authentication uses internal body information that cannot be forged easily. Other innovations include building management systems using smartcards and advanced detection systems for chemicals and explosives.

Meeting demands for comfort and convenience, Hitachi's IT Condominium System offers residents a wide range of services, either within their private space, or shared with other residents, or away from

home. Access is by smartcard, PC or cell phone. A home healthcare system can monitor senior's daily activities via a smart wristband and communicate with the carer or hospital if there is a problem. Innovations such as the new designs of elevator, wide moving sidewalks (such as that installed at the new Chubu International Airport), and autonomous walking support help to make society barrier-free.

In the area of sustainability, Hitachi developments include building and energy management systems, bifacial photovoltaic cells (around 1.5 times the energy generation of single-sided designs), and wireless sensor networks for monitoring the condition of buildings and bridges.

Many of these systems are already a reality and are being implemented in customer installations. This proves, said Mr. Ohnuma, that Hitachi is certainly a most trusted partner for the creation of new urban communities.

## Urban Sustainability: A Vision

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### **Dr. Adriano Alessandrini, Dipartimento Idraulica Trasporti e Strade, University of Rome "La Sapienza"**

Introducing his presentation, Dr. Alessandrini asserted that the line between the technological and policy worlds was too rigid. As an interdisciplinary event, the Hitachi S&T Forum helps to break that down, and therefore he was pleased to have the opportunity to present his "wildest dreams".

What is sustainability? Dr. Alessandrini asked. One of the most well-known definitions is that from the Brundtland Commission: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs". While this is understandable, it is not quantifiable. Another, more historical and more emotive definition comes from an ancient native American saying: "We did not inherit the earth from our fathers; we borrowed it from our children". Finally, Dr. Alessandrini offered a definition from the scientific literature: "Sustainability is the ability of an ecosystem to maintain ecological processes and functions, biological diversity, and productivity over time".

Dr. Alessandrini preferred a closed cycle definition: "Sustainability is reached when human activities do not consume resources and do not produce waste". Is sustainability in these terms achievable in cities? he asked. To answer this he posed four practical questions: How much energy does a city use? Would there be room for rationalisation? What would be needed to rationalise? And how much renewable energy is available in a city and would there be room to use it effectively? Taking Rome as his example, the speaker provided some insights.

In Rome, mobility (transport) accounts for around 50% of the city's entire energy consumption. Most of this is

for fossil fuels. Households and offices account for a major share of the remainder, with consumption split between fossil fuels and electricity. Taking average figures for usage and energy efficiency in cars and buses, Dr. Alessandrini estimated that with the current mix of transport modes the average consumption is 6.7 litres per 100 passenger kms. Yet inverting the current modal share of private and public transport – to 20% cars, 60% buses – would cut this average by half. This is even without any changes in efficiency of transport technology. Similar opportunities exist to rationalise energy use in residential and office buildings. Is this a dream? Dr. Alessandrini thought not: "If we combine the efforts of technologists and politicians we can achieve these goals or at least go some way towards them", he maintained. The answer lies in a combination of pull and push. Pull measures attract people toward a more rational use of energy, usually technological measures which improve service quality making it more attractive. Push measures encourage people away from a non-rational use of energy, usually political measures which make the "usual" behaviour less attractive.

A technology that may pull a more rational mobility is "info-mobility" – i.e. greater use of ICTs in the transport context. These could make: conventional public transport more reliable and flexible; make viable some innovative public service (e.g. collective taxi); and open the way to techniques such as automated guidance and more effective traffic control. Push measures for mobility, by contrast, could include policies such as parking pricing, parking rationing, road pricing (as implemented successfully in London and elsewhere) and access rationing.

In energy, implementation of an integrated energy network could help pull a more rational energy use in buildings. Such a network would be organised on three levels - national, local and single building - and would be supervised and controlled remotely. Push measures could include: differentiated energy pricing, strict control on environmental impact, and incentives to use renewable energy. In Rome, for instance, virtually no power is generated by solar energy because there is neither the infrastructure nor the right incentives to support it.

Moving to his conclusion, Dr. Alessandrini asked "Is urban sustainability achievable?". Yes, he answered, but only if the city is defined in a broader sense: it must include the production areas which serve the city and the factories headquartered there. We have to organise things in a more sustainable way so as to cut down on transport and mobility in the first place. Technology plays a key part in this equation: it helps to make rational uses of energy more attractive; it can convince politicians to adopt push measures on energy use; and it can shift the "energy response" away from supply to a more rounded discussion on "energy needs".

## Athens 2004 Olympic & Paralympic Games – Technological Solutions and Security Planning in a Modern City

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**General Vassilios Konstantinidis, Director, Center for Security Studies, Hellenic Ministry of Public Order**

General Konstantinidis's presentation looked at the role of security in the context of modern cities. The Athens Olympic and Paralympic Games in 2004 had taken place against the background of a highly negative security environment. Yet the security operation organised by the Greek authorities had been widely recognised as an outstanding success by visitors, the Olympic family and the international community. Several factors contributed to this success, General Konstantinidis noted: comprehensive planning; build-up of international co-operation; and close internal coordination between many Greek agencies and services.

Olympic security planning started as early as 2000 and had three main objectives. Firstly, it aimed to preserve a safe and peaceful environment for the Games within Greece. Secondly, all those having a role in Olympic security should be able to go about their duties unobstructed. Thirdly, requested protection was to be provided to members of the Olympic family as well as all visitors and spectators.

This approach was reinforced by critical decisions made early on in the planning cycle. A Command, Control & Coordination System (C3) was set up at national level connecting all entities and services involved. A Counter-Terrorism Plan was developed covering the full spectrum of threats, and security planning overall was closely integrated into general planning for the Games. However, it was also decided that a proper balance needed to be maintained between security measures and the festive character of the Games. Plans are no good if they cannot be acted upon, so special efforts were devoted to ensuring all the resources necessary to implement the plan were available. Finally, the Greek authorities focused on building up international co-operation, so as to ensure a flow of information and in certain cases special assistance.

General Konstantinidis then detailed the many measures taken within this integrated security framework. These extended well beyond the immediate Olympic facilities to cover critical infrastructure, such as airports and power networks, which were potential terrorist targets. Of particular relevance for the Conference was the Greek authorities' use of technology. Significant investment was made in sophisticated equipment and training throughout the security sphere. For instance a system known as C4I linked all operational centres, so improving the communication between the agencies and services involved – some 70 in all.

The experience has served Greece well. It showed how to utilise state-of-the-art technology, excellent human resources and sophisticated infrastructure within a modern city. As well as achieving a flawless running of the Games themselves, it has created a new security model applicable to other events and cities worldwide. To help share this experience and expertise, the Greek government has set up a new unit, the Center for Security Studies (KE.ME.A), under General Konstanidinis's direction, to become a focal and reference point of future co-operation.

## **Mobility and Connectivity in the City of the Future: The Seven Deadly Wins**

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### **Prof. George M. Hazel, Managing Director, McLean Hazel Ltd.**

Prof. Hazel was enthused by the diversity of cities. Cities are all different, he said, but there are some common factors". The first question should be "What sort of city do we want?" Unless you get the land use right the rest doesn't matter", he continued. Prof. Hazel had identified seven factors – or wins – to achieve this.

Urban planners identify three modes of development in modern cities. The mono-centric or hierarchical, where development is focused on a central hub. Secondly, there is poly-centric development such as London, where there are multiple centres within the urban area. Thirdly there is fractal development, such as seen in a tree, where each branch or sub-level mirrors the system as a whole. The later is still being understood and attracting great interest.

Win 1 was that transport is about people and goods, not vehicles. Mobility and connectivity are a demand derived from what people and businesses need to do, where they need to be and how they get there. We have to define what kind of city we want and to express those aims in terms of economic, environmental and quality of life factors – not transport measures. Win 2 is that the City is a Place of Exchange. We have to maximise the exchange space – the space devoted to commerce and interaction rather than to moving around. Good examples can be found in Edinburgh's Royal Mile, and in Copenhagen and Boston (US). Related to this is Win 3: the City is a Place of Movement and Connectivity. We have to maximise movement and connectivity, for both people and goods, but minimise movement space. Again Prof. Hazel quoted examples: Edinburgh (Scotland), Curitiba (Brazil), Rennes (France) and the ULTra System in Sweden.

Wins 4 and 5 were that the City is a Place of Chairs and a Place to Enjoy. We have to create spaces that let people make the most of the cityscape, for instance by maximising places to sit and shop, whether indoors or outdoors.

The City is defined by its arrival points, Prof. Hazel

explained, so his sixth Win was that we have to create great arrival experiences. Good examples here include Lugano Station, Venice, Grand Central Station in New York, the new TGV station in Avignon, and the new shipping terminal in Yokohama.

Finally, Prof Hazel noted that the City is a complex system of interactions, and so his final Win was that we have to understand and influence these interactions. We could do this by integrating policy thinking across a number of areas: land use, economy, environment, social inclusion and quality of life. We also needed to embrace change and develop better systems. And then we needed to test our concepts against the "Sevens Deadly Wins".

Looking forward to the workshop exercise in the afternoon, Prof. Hazel asked "what kind of systems will be needed in Agathopolis? His answer covered a wide range of options: better movement and connectivity systems; better virtual connectivity; better transport information and traffic management; and better transport pricing, logistics and engine technology. He urged participants to identify the problems and understand their cause and then to develop solutions that agree with city objectives, future growth patterns and new technologies. These solutions should be integrated with other policy areas and could be tested against the "Seven Deadly Wins".

## **Urban Systems Management in the Global Economy**

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### **Dr. Pierre Laconte, President, Foundation for Urban Environment**

Dr. Laconte's presentation focused on the policy dimension of urban planning.

Starting with some societal trends, Dr. Laconte noted that in advanced industrial countries the trend over the last one hundred years has been towards individualism and consumerism. People favour choice, equality and individual rights over group solidarity. This "Me Culture" has become a major factor in urban change. For instance, it encourages lower density urbanisation, as people opt for detached houses with parking spaces – and the roads to get them there. The automobile, in particular is a major determinant of our urban spaces. In OECD countries, new cars are increasing four times faster than new babies, and vehicle-kilometres travelled are growing five times faster than the population. Mobility is increasing much faster than the economy as a whole.

Turning to the European situation, Dr. Laconte presented a series of maps on European spatial distribution. Development is concentrated within a few highly urbanised regions, stretching from London in South-East England, through Paris in eastern France and Hamburg in northern Germany, to Milan in northern Italy. This poly-centric distribution has been characterised by some observers - what Dr. Laconte called "the peripheral and maritime regions lobby" - as "the evil blue banana" or the "evil black pentagon". In aiming to reduce disparities between European regions, EU policies have favoured peripheral remote



*left to right*

Gen. Vassilios Konstantinidis

Dr. Pierre Laconte

The audience

Mr. Pierre Longin

Dr. Jacques Lukasik



and less-developed regions at the expense of the existing urbanised clusters. Yet it is urban areas that are the real victims of peripherality, Dr. Laconte argued: funds are being moved away from central regions to the periphery and away from cities where most Europeans actually live.

The actual picture is much more complicated, Dr. Laconte argued. For example, satellite observations from Ireland clearly show the nature of the dynamic change. Over the last ten years the urbanisation, i.e. the transformation of agricultural land into urban features such as infrastructure, residence, shopping, etc, is now de facto covering the whole country. EU financed programmes aimed at revitalising agriculture by improving access to farms are shown to provide in fact a subsidy to second residences, as no signs of agricultural activity appear in the plots benefiting from these subsidies and farm buildings appear to have been transformed into residential use (conservatories, swimming pools, etc.).

Turning to the role of cities, Dr. Laconte noted that urban planning as a regulatory framework for urban development has lost part of its clout, because of the growing structural role of the transport infrastructures: airports, motorways, urban rail investments, etc. The planning of these infrastructures is part of specialised engineering disciplines, leaving little authority to the urban planning function. The Laissez Faire and creative chaos of spaces structured only by their infrastructures has become the underlying philosophy of many urban developments. It is often associated with the US urban planning practices. The challenge to cities is therefore to be able to conceive and implement an integrated urban project, achieving "place building", within the constraints of a changing global context.

Finally, Dr. Laconte presented some examples of what he considered good urban planning. They included Zurich, Switzerland, where a policy to limit parking to 90 minutes has encouraged a strong shift to public transport and for people to relocate back within the city boundaries; and Louvain-la-Neuve, a university town in Belgium where Dr. Laconte himself had a major involvement. These examples showed that "integrated planning remains possible as well as desirable, if a strong willed individual or group has developed a vision and the implementation tools", Dr. Laconte concluded.

## **Building for the Future – Concrete: A New High-Tech Material of the 21st Century**

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**Dr. Jacques Lukasik, Senior Vice President, Scientific Affairs, Lafarge**

Cement is a hydraulic binder (a glue for stones!) and is the most important manufactured material in the world. Cement-based concrete is the most widely used material globally: around 1.7 billion tonnes of cement are

produced each year, giving rise to 6 km<sup>3</sup> of concrete – roughly 1 m<sup>3</sup> for everyone on Earth!

Throughout history civilizations have searched for building materials. Today's Portland cement, the binding agent for concrete, was invented in 1824. But a scientific approach to concrete is recent, with high performance concrete having been developed only within the last 25 years. Examples of what can now be achieved include the Normandy suspension bridge and the Millau bridge, both in France.

Concrete is an extremely versatile building material but has some major disadvantages in that it is brittle and its flexural and traction strengths are weak. Steel reinforcement (re-bars) can improve these properties but may expose the concrete to a corrosion risk. In addition, a high quality surface finish requires a great attention.

What does sustainable concrete imply?, asked Dr. Lukasik. It means concrete production which is focused on CO<sub>2</sub> reduction, using alternative raw materials and supplementary cementitious materials, and less water. Sustainable concrete precisely meets customers' specifications, is aesthetic (in terms of superior surface quality), durable (resistant to environmental aggressions), and recyclable. Such a product will make a major contribution to social progress, economic growth and environmental protection.

Lafarge has developed such a concrete, marketed under the trademark Ductal®. It is the result of an intensive research programme between Lafarge, Bouygues and Rhodia, supported by the French Ministry of Research and Industry and European Commission programmes. It is a breakthrough that comes from combination of inventions, including nanotechnologies and use of fibres rather than steel for reinforcement. These give it attractive properties such as highly improved compressive and flexural strengths, ductility and surface finish.

Lafarge's customers have used this innovative material in a variety of high profile projects, including 2cm thick, 5x6m canopies for a train station in Calgary (Canada), a 120m span, 3cm thick deck for a footbridge in Seoul (South Korea), and the Sakata-Mirai footbridge in Japan with a 50m span. The latest project to be launched next year is R. Ricciotti's European and Mediterranean Civilization Museum in Marseille. What does the future hold for concrete? Dr. Lukasik was optimistic. Thanks to further research efforts, concrete of the 21st century will be a truly high-tech composite material; it will be sustainable and environment friendly; and it will exhibit innovative functional characteristics. Lafarge has recently joined a European research network called NANOCEM to advance these aspects.



*left to right*

Mr. James Mitchell

Dr. Michiharu Nakamura

The Opening Panel

Mr. Kunihiko Ohnuma

Prof. Basil Stephanis

## Parallel Working Sessions

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To consider the issues raised by the guest speakers, Forum participants split into a series of working sessions. Mr. Jean Freymond, of the Centre for Applied Studies in International Negotiations, Geneva and Mr. James Mitchell, Forum Member, London explained the rules.

Participants were to be civil servants in the imaginary city of Agathopolis – literally "good city" in Greek. Agathopolis was a European city and its citizens believed technology was a powerful tool to address city problems. Each Group was presented with recent newspaper articles outlining some of these urban problems. Participants were invited to propose technological solutions to these and related issues. The Groups were to consider the solutions from the point of view of their own departments and departmental priorities.

## Urban Planning

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### **Moderator: Mr. Jean Freymond**

The first group to report was Agathopolis's "Department for Urban Planning". The Group had considered three topics: disaster planning, urban systems management, and the regulatory framework. They believed disaster planning needed to take account of two types of technology: preventive, such as sensors and detectors; and disaster handling, such as portable medical devices. Implementation of technology should be considered as a package which also includes education and communication, both with the general population (especially those most affected) and with rescue teams, doctors and other professionals.

The use of technology usually involves trade-offs between cost-effectiveness, personal freedom and security, and it is essential that key stakeholders are involved. Technology should be user-friendly but should not be completely reliant on human actions – in some cases people may actually get in the way or make mistakes.

The Group concluded that "technology is a tool to help the city move forward". Companies like Hitachi should work together with communities in developing and implementing appropriate technologies.

## Mobility

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### **Moderator: Mr. Mark Cantley**

Why and when is Agathopolis gridlocked?, the Group asked. The reasons, they thought were obvious: people needed to travel for leisure or to get to and from work/school. And of course goods needed to be delivered and collected from the city's factories and shops. How can technology help? They came up with two strategies. The first was that technology could be used to reduce demand through approaches such as tele-

working. E-services are already being developed and their use should be encouraged. Greater use could be made of "UDUs" (unattended delivery units) in homes to make online shopping more attractive.

The second strategy was using technology to facilitate movement and mobility: so that things happen when people expect them to happen. This includes aspects such as: optimising route guidance for both private and public transport; intelligent traffic management systems; better public transport, and bicycle-friendly policies.

With environmental issues a major concern, specific measures may be required to reduce or prevent smog. These could include reducing the number of vehicles entering the city, and clean fuels such as hydrogen and/or fuel cells for all transport.

## Security & Safety

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### **Moderator: Dr. Florian Schmitz**

Agathopolis's "Department for Urban Security" had had a wide ranging debate. Their key questions were: What are the open questions and facts? What are the threats in Agathopolis? What technologies do we have to address these threats? And finally, issues of acceptability - do Agathopolians want these technologies? To get things into perspective, the Group noted a few "home truths". Security is an insurance – you need to have it but hopefully it will not be needed. But we also have to keep a balance. Citizens were much more likely to get their wallets stolen than be the victim of a terrorist attack, so as authorities they had to plan accordingly.

The Group identified a variety of threats together with potential solutions which they labelled reactive and proactive. Areas where further research was considered necessary included: more reliable biometric recognition, detectors for biological agents and explosives, and better means of tracking criminal activity online. Evacuation could benefit from better systems to inform the population without creating panic, real-time control systems, and improve real-time communication between operators.

The Group ended on a note of caution. All of this was potentially pretty intrusive: do Agathopolians want these technologies? The answer would likely depend on the legal framework, but who is going to influence this and how?

## Building Technology and Materials

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### **Moderator: Dr. Dolf Gielen**

The "Building Technology Research Center" (BTRC) of the City of Agathopolis reported on the scientific and technological solutions for the city's present problems and future needs.

The Group concluded that technology has the potential to influence three areas relevant to the City's

planning and operations: materials, energy savings and resource management. Their recommendations focused on three types of buildings: multi-storey office buildings, flats, and single family homes.

Among the many solutions proposed were: greater use of porous materials to absorb noise pollution; noise reduction coatings on walls, better thermal insulation, use of large heat capacity materials, on-site co-generation of heat and power, and better design so that building materials are reusable and recyclable.

## Urban Sustainability

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### **Moderator: Mr. Pierre Snoy**

Finally, Agathopolis's "Department of the Environment" reported. The Group considered a wide spectrum of energy and environmental issues.

On energy, they reminded the audience that the 2003 Forum came to the conclusion that nuclear power was a vital part of our energy generation strategy and should not be overlooked. In addition, they emphasized key roles for biofuels, energy storage and energy efficiency.

On waste, the Group considered that reuse was better than recycling. The City Authorities should promote better education on how to dispose of unusual waste such as batteries, computers and drugs. And the use of waste compactors should be encouraged to reduce volumes going to landfill and the frequency of waste collections.

Turning to air pollution, a high-density network of pollution monitors could be used to map pollution, identifying sources so that they can be targeted. Similarly, aerial thermal imaging could be used to identify buildings lacking proper insulation.

More "off-the-wall" ideas included: "intelligent toilet bowls" that filter out pollution-rich urine; a double filter cigarette, and use of noise-cancelling technology at source.

## Panel Discussion

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Opening the general question & answer session, Dr. Konidaris thanked all of the guest speakers and session rapporteurs for their contributions. Having heard from the experts, it was now time to bring the debate to "demos", the people. The "forum" – in its literal sense – was open, he said.

A Forum member from France noted that in his country the process of desertification was being reversed: families were moving back to rural areas and taking advantage of technologies such as broadband to achieve a better quality of life. "What is the future for the rural regions?", he asked. Dr. Laconte said this was a very interesting point, and echoed his own observations about Ireland. He saw it as a very positive development for rural economies. Desertification is no longer necessary and ICT could take development to

them. He also reiterated that satellite imagery offered exciting new ways to monitor rural activities. In addition to the CORINE programme mentioned in the paper, INSPIRE, a new EU initiative would be operational by 2009 offering new services, many of them free. Mike Parr noted that, in the UK at least, rural broadband was still a problem. Telcos are not interested in providing such services in rural areas and need to be forced to offer full service coverage.

Dr. Nakamura asked for the panel's views on the aging population? How should cities of the future reflect their needs? Pierre Snoy said that local authorities were taking account of elderly persons but are the systems actually practical for the elderly to use? On usability, Mike Parr noted that "access for all" approaches were – or should be – an issue for all technology companies. If equipment and services are designed with the least technology-literate groups in mind then they tend to be more usable for everyone.

Preservation was another important issue. Pierre Snoy noted that retrofitting new technology to preserved buildings is often very difficult; heritage authorities usually impose stringent restrictions. Dr. Alessandrini agreed, and noted that it could be a particular problem in places like Rome which has a surplus of historical buildings. The right approach was to maintain a balance, preserving heritage while providing a good quality of life for the current occupants. New technologies, such as mobile and wireless communications, made this much easier.

Dr. Nakamura and Pierre Snoy were both concerned about the role of local communities. Prof. Hazel said that the best way to ensure community involvement was through the fractal city. Local involvement cannot be achieved through committees; you have to build it from the bottom up. Dr Alessandrini agreed this required more than technology. We all need social networks, he maintained. While developments such as telework may solve some problems, they may create others and increase people's feelings of isolation and alienation.

Finally, regarding security issues, Dr. Laconte noted that in the United States measures imposed in the wake of 9/11 were having unexpected consequences. For instance, the well-respected academic Richard Florida had written about the "flight of the creative class", arguing that measures such as the Patriot Act were stifling creativity and innovation. It is essential Europe does not repeat this mistake.



## Closing of the Forum

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### **Dr. Michiharu Nakamura, Executive Vice President & Executive Officer, Hitachi, Ltd.**

In his closing remarks, Dr. Nakamura said that Athens was "one of the oldest and historically most important cities in the world. This was the ideal place to have a forum addressing the issues of science & technology and its impact on the city of the future."



*During the Welcome Reception and Working Sessions*

He continued: "It is our dream to realise a society in which all people lead healthy, wealthy, comfortable and safe lives. We have discussed future social infrastructure in the working sessions from various aspects such as environment, security & safety, mobility, urban planning and building technology. We, industry, are providing solutions for 'next generation life line' in combination with leading-edge technologies represented by global products. We are always tightly collaborating with our partners and users to identify customer's requirements and to create the best solutions for them."

Dr. Nakamura expressed his thanks to all the distinguished guests and Forum members who had participated and contributed to the discussions. Particular thanks were due to Mr. Stylianidis, Deputy Minister of Foreign Affairs, and Mrs Bourdara, Deputy Mayor of Athens for their warm welcome and policy of revitalization. Without the support of the people of Athens, the Forum would not have been such a success.

Dr. Nakamura offered special thanks to Mr. Norikiyo Koide, who would be returning to Japan shortly. "The success of this Forum, as well as the previous ones, were largely the result of his enthusiasm and leadership", Dr. Nakamura said. He had done much to build bridges between science & technology and society, and between European and Asian cultures. Dr. Nakamura invited participants to join with him in expressing thanks to Mr. Koide and best wishes to his successor, Mr. Takahashi. From the floor, Mr. Chris Marsh expressed his own thanks to Mr. Koide on behalf of Forum members and announced that members would be forwarding a small gift as a token of their appreciation.

Finally, Mr. Longin announced that the next Forum would be both "traditional and innovative". It would be traditional in the sense that it will be held in the same format at the same time of year. The innovation came from the fact that the topic and location had yet to be fixed and would be decided by the Working Group later in the year on the basis of feedback received through the questionnaires. It was therefore in Forum members' interests to return this to the Hitachi Europe office – a true example of "demos" in action!



*From left to right: Mrs. Kalliopi Bourdara, Sir Stephen Gomersall, H.E.M. Eviropidis Stylianidis, Dr. Michiharu Nakamura, H.E.M. Hideaki Ninomiya, Prof. Basil Stephanis, Dr. Spyros Konidaris.*

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### Speakers

<b>Dr. Adriano Alessandrini</b>	University of Rome "La Sapienza", DITS Dipartimento Idraulica Trasporti e Strade, Rome.
<b>Prof. Yasushi Asami</b>	University of Tokyo, Department of Urban Engineering, Center for Spatial Information Science, Tokyo
<b>Prof. George M. Hazel</b>	Managing Director - McLean Hazel Ltd., Edinburgh
<b>General Vassilios Konstantinidis</b>	Director, Center for Security Studies, Hellenic Ministry of Public Order, Athens
<b>Dr. Pierre Laconte</b>	President, Foundation for Urban Environment, Brussels
<b>Dr. Jacques Lukasik</b>	Senior Vice President, Scientific Affairs, Lafarge, Paris
<b>Mr. Kunihiro Ohnuma</b>	CEO Urban Planning & Development Systems, Hitachi, Ltd.
<b>Prof. Basil Stephanis</b>	Department of Civil Engineering, Democritus University of Thrace

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<b>Forum General Moderator:</b>	Dr. Spyros Konidaris, Advisor to the Deputy Director General, DG Information Society & Media, European Commission
<b>Report Prepared by:</b>	Michael Sharpe, MS Consulting & Research Ltd, Birmingham, UK

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## Working Group 2006

The working group was set up in 1999 to give the Forum members the opportunity to become more personally involved in the selection of the Forum topics, and subsequently in shaping the Forum agenda. The current working group consists of the following members:

- Fabrice Serey (chairman)
- Hans Craen
- Chris Farren
- Nikola Knezovic
- Eldo Mabiala

## Acknowledgement

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We would like to express our sincere appreciation to the distinguished speakers for their valued contributions, to the members of the Working Group 2004-2005 for their commitment to successfully identify the best topic for the Forum, and to all the Forum members for their active participation and enthusiasm.

Our gratitude goes to Dr. Konidaris (EU Commission) who, once again, kindly accepted to be the general moderator of the Forum, to the Greek officials whose support was key to the Forum success, and particularly to Ambassador Corantis

We would also like to sincerely thank the Forum Fellows, whose advises, throughout the preparation of the Forum, were extremely valuable, and who have kindly accepted to act as moderators during the parallel working sessions. In that task, they were supplemented by Mr. Jean Freymond (CASIN) and by Mr. Pierre Snoy (European Representation, Global Business Relations, Inc.), our sincere thanks to them too.

Finally, we would like to present our deepest respect to the Embassy of Japan in Greece, an in particular Mr. Sugiyama, who has managed to have the 8th EU Hitachi Science & Technology Forum being part of the 2005 EU-Japan Year of people-to-people Exchanges official program.

Mr. Koide, the previous General Manager of Hitachi Corporate Office, Europe has now returned to Japan. During more than five years, he has been supervising the organization of this Forum and most of its success is due to his vision and his commitment to contribute to European society through this yearly gathering. We wish him to be as successful in his new assignment as he was while in Europe.

**Ko Takahashi**  
General Manager  
Hitachi Corporate Office, Europe

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