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cutting through complexity™

Research & Innovation

A Romanian growth engine

Prepared in collaboration with
ELI Nuclear Physics

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Contents

Serban Toader
Senior Partner,
KPMG in Romania and Moldova

Transforming science into business

One of the most important R&D success stories: Romanian scientists are commited and ready to to build the only European and International Centre for high-level research on ultra-high intensity laser with the support of the international scientific community and European funding.

We see this as an opportunity to build a regional development hub in Magurele area, around the Research Centre. The scientific case is certified by the international technical experts of the European Union's institutions. The applications that can be developed may be used in numerous industries, from medical, pharmaceutical, waste management, and materials science to the nuclear industry. The potential for a significant number of world-class research specialists to come to Romania is here.

For a regional developmental hub to be attractive to international businesses which commit significant budgets to R&D, transport infrastructure to the Magurele area needs to be enhanced, and business facilities need to be developed around the Research Centre.

We in KPMG have capabilities and specialists that are ready to perform advisory services to deliver effective solutions to connect the business and scientific community, and the public sector to make the Magurele area a success story.

The ELI project demonstrates clearly that economic growth strategies for Romania should also consider research and innovation activities as one of their pillars.

ELI - Cutting edge science

The Extreme-Light-Infrastructure (ELI) will be a European research infrastructure that will use new and emerging laser technologies to generate the most intense light pulses in the world dedicated to the fundamental study and applications of laser-matter interaction.

Identified by the European Strategy Forum on Research Infrastructures (ESFRI) as one of the top priority projects of research infrastructure for Europe, ELI has been brought to organisational and scientific maturity thanks to a 36-month Preparatory Phase (ELI-PP) FP7 project launched in 2007 which involved nearly 40 research and academic institutions from 13 EU Member States.

ELI, according to the decision of the EC Competitiveness Council in December 2009, will be a distributed facility, in Prague (Czech Republic) – Beamlines, Szeged (Hungary) - Attoseconds and Magurele (Romania) – Nuclear Physics, with a total cost exceeding 700 M€, and will be the first large scale research infrastructure built in the Eastern part of the European Community. These first three sites should be operational in 2015. Based on their experience, over the next few years, a facility will be built that can produce 200-petawatt (2 x1017 watts) pulses, 200 times the power of today's most powerful lasers.

The Romanian pillar, ELI – Nuclear Physics (ELI-NP), according to the White Book prepared by more than 100 scientists from 30 research institutions from Europe, the United States and Japan, will consist of the most powerful laser beams (two 10 PW lasers) and the most advanced gamma beams in the word. ELI - NP will open up new research areas for laser, nuclear, astrophysics and fundamental research. The ultrahigh power and intensity of pulses will produce electric fields so strong that they may alter and sense the texture of the vacuum itself. A very broad range of applications will be also studied, such as: nuclear materials and radioactive waste management, industrial tomography and gamma radiography, pharmaceutical radioisotopes, surface characterization using positrons sources, medical imaging, radiation and proton cancer therapy.

The scale and scope of ELI - NP, the expected physics breakthroughs and the opening of new fields of research will offer extraordinary opportunities for cooperation in practically all fields of science and advanced technology: lasers, microelectronics, nuclear physics, material science, life sciences etc.

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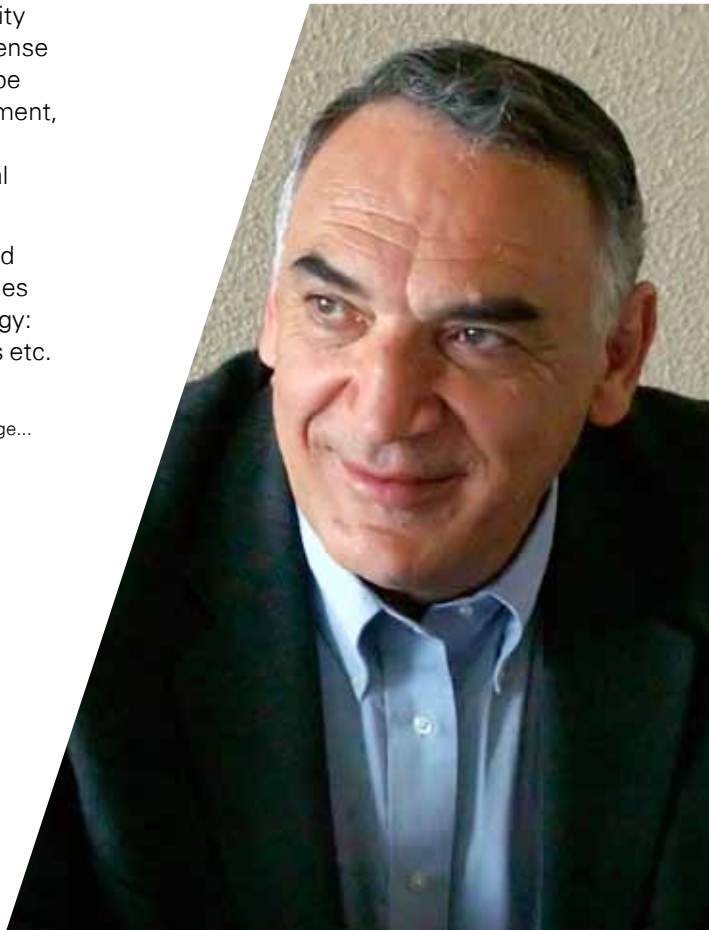


Prof. Dr. Nicolae Victor Zamfir
Director General Horia Hulubei National Institute for Physics and Nuclear Engineering (IFIN-HH), Bucharest – Magurele, Romania
Romanian Plenipotentiary for the ELI Project

The creation of a strong international network of researchers who will share experience and expertise will have a direct impact on the scientific community. Education and research will benefit from excellent conditions, unique experimental capabilities, attracting the best master/doctoral students and researchers from all over the world. An advanced large-scale facility such as ELI –NP will aid Romanian research in developing unique knowledge and competences.

Founded on a solid scientific case, ELI-NP will not only advance our understanding of topics with great impact for society and the quality of life, but will also create opportunities to further develop the area into a science hub – a regional development center and growth engine for the Romanian economy. ELI - NP will constitute a strong attraction for industrial and high-tech companies for products and service suppliers during the construction and operational phases, for use of the ELI-NP facilities and methods to improve their products and, more importantly, for companies that will apply the new technologies to be developed at ELI-NP.

The existing scientific communities – laser, plasma, materials and nuclear physics – shape a high concentration of scientists and a potential to develop Magurele with adjacent facilities into an advanced Science Center. The Horia Hulubei National Institute for Physics and Nuclear Engineering already operates complex scientific equipment - such as the Van de Graaff Tandem Accelerator - and, with vast expertise in radiation detection, control and data acquisition, charged particle accelerating systems, radioprotection etc., is ready to play a central role in implementing the ELI Project in Magurele. Other potential contributing institutions include the National R&D Institute for Laser, Plasma and Radiation Physics, the National R&D Institute for Material Physics, the University of Bucharest, the Polytechnic University of Bucharest and others.

Now, when the White Book of the ELI-NP project and the Feasibility Study have been successfully completed and the project has been preliminary reviewed by JASPERS with very positive remarks, I am really confident in the success of the project knowing that the Magurele scientific community can make ELI work and that research to be conducted will be relevant and valuable to companies from around the world, with a very high value added for Romania.

The ELI-NP facility in Magurele will create a new European laboratory for research in fundamental physics, nuclear physics, astrophysics as well as applications in nuclear materials, radioactive waste management, material science, life science etc.

Innovation Nation

Razvan Nan
Senior Manager
KPMG in Romania

In tomorrow's world, more than in today's, innovation will be the main source of national competitiveness and sustainable economic growth.

Studies show there is a clear return on investment (ROI) in technology to the tax base and the national economy. The Nobel Prize-winning economist Robert Solow showed that more than 80 percent of growth in the first half of the 20th century was driven by advances in technology . More recent economic analyses have found that the same held true for the second half of the twentieth century.

Technological advances supported by public investment in Research & Innovation have been the force behind the creation of entire industries and economic growth.

In order to prepare an innovation national agenda what is required is nothing less than a major commitment of resources, human and financial.

The title of this column comes from the book Innovation Nation written by John Kao and many of the its ideas presented here are also inspired from this book. An Innovation Nation is a country with a widely shared, well-understood objective of continuously improving innovation capabilities to achieve world-changing goals.

Countries everywhere are seeking their own sources of comparative advantage in the innovation landscape.

Taking Singapore as one among many examples, the country is a testament to the idea that a nation doesn't have to be big to be a leading competitor in the global innovation race. The Biopolis and Fusionopolis projects are at the heart of Singapore's R&D. Biopolis was conceived as the cornerstone to a vision to build up biomedical sciences as a key pillar of the Singapore economy. Spread across 30 hectares of land, Fusionopolis is planned to be Singapore's R&D hub for Infocommunication Technology, Media and Physical Sciences and Engineering.

Biopolis is formed of seven architecturally distinctive buildings which contain a mix of government research institutes and biotech start-ups as well as pharmaceutical multinationals. Biopolis hosts numerous foreign luminaries; for example, Alan Coleman, the Scottish scientist who ran the Roselin Institute, where Dolly the sheep was famously cloned in 1996, chose Singapore as the place to pursue his goal of finding a cure for diabetes. When he left Scotland, he said, "I'm a scientist and the type of science I want to do is expensive, and I'll go where the investment is made. Biopolis's American recruits include Sidney Brenner, a Nobel Prize winner from the Salk Institute and Mark Seielstad, who quit Harvard School of Public Health because the "environment was better" at Biopolis. One of the biggest draws is the center's resource-sharing program: all researchers get to use its state-of-the art equipment instead of having to buy their own. Biopolis does not lack quality of life,

> "The Nobel Prize-winning economist Robert Solow showed that more than 80 percent of growth in the first half of the 20th century was driven by advances in technology. More recent economic analyses have found that the same held true for the second half of the twentieth century."

either: it has day care, laundry services, even a bar. Biopolis and Fusionpolis are part of the One North , "city within a city" project, which is adjacent to a large scale tract of underdeveloped real estate set aside for future development.

Singapore commissioned a veritable parade of thought leaders from around the world to offer advice about how to transform the country from an example of efficiency to an enabler of innovation

Other good examples include the Bangalore area in India (where IBM pursued a multi-billion USD investment). Otaniemi Science Park in Finland, which is one of Europe's premier concentrations of biotech and information science companies.

Attracting talent is key. Despite a world that is linked through video communication and the Internet, for the talented, location matters more than ever. Young people want to settle in downtown areas, where they can easily access public transportation and enjoy cultural attractions and night life. And once a city begins to pull in these young scientists and engineers, it creates a snowball effect. The talent hotspot itself becomes a prime attraction, eventually creating what smart young people see as an ideal situation – a critical mass of highly powered minds dreaming up innovative ideas that can bounce off one another. Major corporations go where highly skilled people are, a Silicon Valley executive said a few years ago.

Inspired by the evidence of communities of entrepreneurs, artists, scientists and engineers, a successful talent hunt demands a major effort by national, regional and metropolitan communities. Consultants have adapted to help tailor towns to the tastes of brainy innovators, promoting qualities such as:

- **Quality of life** – since top innovators generally have no problem finding universities and companies eager for their services, they can afford to be picky about things like costs of living, the social scene, and the cultural atmosphere.
- **Opportunities to specialize** – many cities that have successfully attracted top people have developed an affinity for a particular cutting-edge industry.

In his well-known book, The Competitive Advantage of Nations, economist Michael Porter described the concept of clusters; geographic concentrations of interconnected companies and institutions in a particular field. Porter writes "the enduring competitive advantages in a global economy lie increasingly in local things – knowledge, relationship, motivation – that distant rivals cannot match".

Romania, through innovative projects such as Extreme Light Infrastructure - Nuclear Physics (ELI-NP) has the chance of becoming a magnet for talent, and of letting companies and entrepreneurs be the catalysts for an explosion of regional innovation.

Addressing major European scientific needs

In 2010 the scientific world celebrated two anniversaries of laser technology: 50 years since the very invention of laser and 25 years since Gérard Mourou and Donna Strickland invented the revolutionary technique of chirped-pulse amplification (CPA) which enabled physicists to create lasers with orders of magnitudes more powerful than previously. CPA drives most existing high-powered laser installations, like the Vulcan laser at the Rutherford Appleton Laboratory in the UK.

Now Mourou is taking his invention further and is overseeing a project to create the most powerful lasers in the world as part of the Extreme Light Infrastructure (ELI) project of the European Union. 13 countries are participating in the project which will require an initial investment of approximately one billion Euros (approximately 85% funded through EU structural funds and 15% through national funds).

ELI is set to become a European and international centre for high-level research on ultra-high intensity lasers, laser-matter interaction and secondary sources. The laser's pulse peak power and briefness will be beyond the current state-of-the-art and will provide the opportunity to study the fundamental processes of light-matter interaction.

The decision in 2009 to build at least three of the four planned facilities in the Czech Republic, Hungary and Romania marks a shift of EU research infrastructure towards the east and aims to foster the development of a strong research community in this area. ELI also aims to practice a vigorous technology transfer to European SMEs and large firms and also focus on training of aspiring scientists and engineers in the numerous disciplines associated with extreme light.

Project ELI Factsheet

- Extreme Light Infrastructure is an answer to major European scientific research needs
- In a historic shift towards Central and Eastern Europe, the European Union will fund four laser facilities, three of them located in the Czech Republic, Hungary and Romania
- The ELI-NP will be built in Magurele and will carry out in fundamental physics and nuclear physics
- ELI-NP provides an opportunity to bring to life an international scientific research hotspot with adjacent infrastructure projects
- Local businesses, communities and talent will benefit from the development in Magurele alongside researchers and companies

Where is ELI?

Romania, Magurele

The facility will be built in the grounds of the Magurele research area and will focus on laser-based nuclear physics research

Czech Republic, Dolni Brezany

A brownfield development integrated into the development plan of the small community south of Prague. Purpose: high energy beams devoted to the development and usage of dedicated beam lines with ultra short pulses of high energy radiation and particles reaching almost the speed of light

Hungary, Szeged

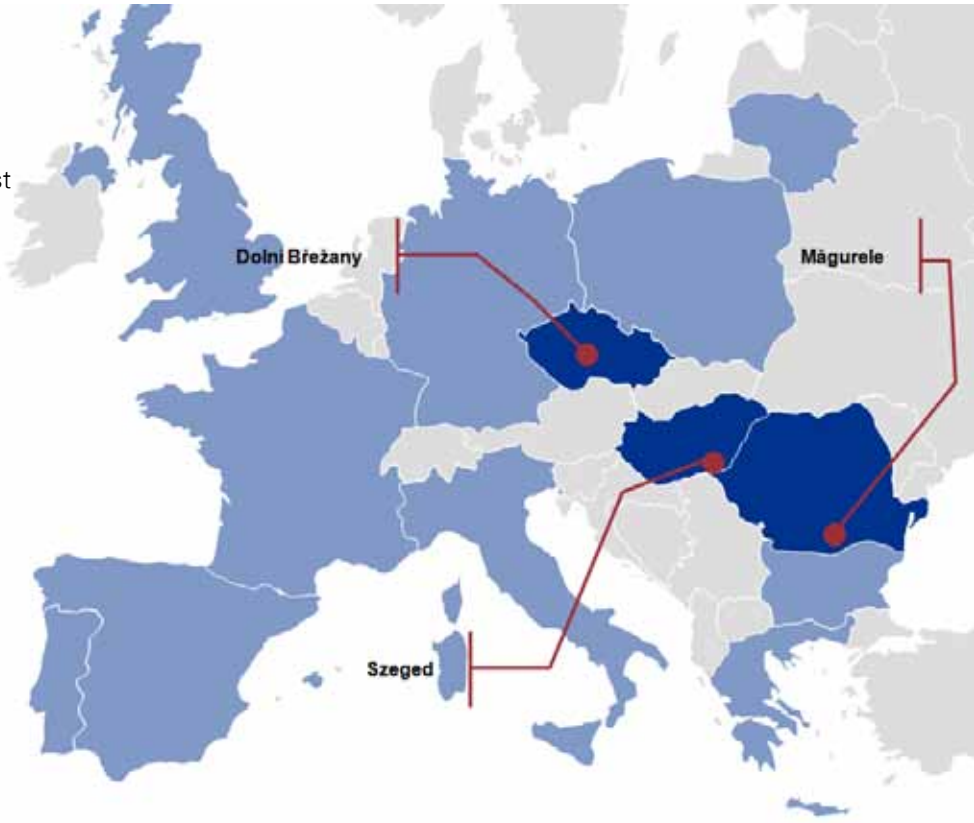
Temporal investigations of electron dynamics in atoms, molecules, plasmas and solids at the attosecond scale will be investigated at the facility to be built just outside Szeged

TBA 2012

A fourth location will be selected for an ultra high field facility investigating relativistic laser-matter interaction, the most technologically challenging feature of the ELI project

Legend:

- ELI program participant and facility host countries
- ELI program participant countries



Magurele: hotspot for science and business

The future of Romanian science

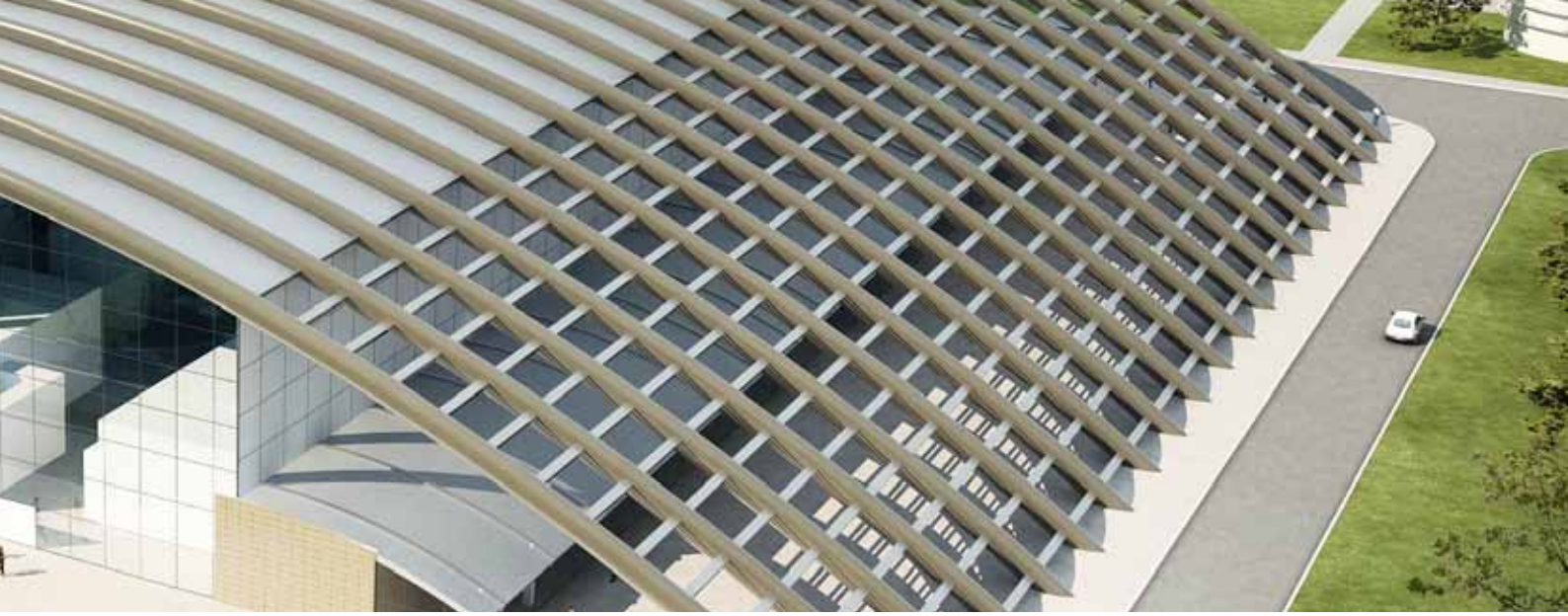
The ELI-NP facility in Magurele will create a new European laboratory for research in fundamental physics, nuclear physics, astrophysics as well as applications in nuclear materials, radioactive waste management, material science, life science etc. But there is more to this project – an opportunity to create an innovation hot-spot for science where researchers and private R&D come together. The Magurele area is a prime candidate for the development of a large industrial park and also for hosting the fourth and most technically challenging part of the ELI project.

Magurele already houses a wealth of research facilities and a well established scientific community. It hosts five national research organizations (e.g. the Institute of Atomic Physics, the National Institute of Physics and Nuclear Engineering, and the National Institute for Laser, Plasma and Radiation Physics), the Faculty of Physics of the University of Bucharest, eight out of 19 strategic research infrastructures, two engineering companies and – most of all – a rich history of science in related fields.

Existing infrastructure is well suited for high-level nuclear physics research: radioprotection measures are already in place, security systems are in accordance with appropriate standards, the environmental protection system has already been implemented, a high speed GÉANT (FO at 10 Gbps) connection is available, and a suitable electricity supply exists. Leisure facilities such as a park, a swimming pool, a tennis field and a football field already exist. Additionally, there will be no development land costs for ELI in Romania as the area is already public property and will be offered free of charge by the Romanian government.

Building the largest lasers in the world

2007	2009	2010	2012
ELI is one of the 35 concepts included in the EU Commission document: "European Strategy Forum for Research Infrastructure"	The ELI Preparatory Phase Consortium designates the Czech Republic, Hungary and Romania to host the first three ELI facilities	The Czech Republic, Hungary and Romania sign a Memorandum of Understanding, laying the grounds for ELI construction and future operation of the facilities	A fourth location for the ultra-high-intensity facility will be selected



Other planned developments in the area include:

- A data Disaster Recovery System – a proposed national strategic digital archive of Romania
- A technological Park for ITC and life sciences expected to host 100 companies by 2015
- An excellence research centre in Romania sponsored by IBM
- A life science research centre possibly focusing on cancer and cell therapy research
- A regional centre for man-induced disaster – part of the National Institute for Earth Physics
- A Mare Nostrum class supercomputer for CERN, ELI and earth physics data processing and modeling
- A Romanian institute of advanced studies
- A scientific park of several universities including the University of Bucharest (Physics, Chemistry, Life Sciences), the Polytechnic University (Energy, Physics, Materials Science), as well as the University of Medicine and Pharmacy

The concept of a gradual and modular development is built into the ELI project itself. The announced development concept is guided by two principles: staged realization and flexibility. A proposed timeline sees an initial capability for 2011-2015 with only basic components being brought online, a second stage from 2016-2020 which includes new experiments and upgrading laser power and gamma beam intensity/energy, and even a third stage after 2020. This plan calls for flexibility to be built into the facility design in order to accommodate future growth and modifications – thus accommodating the needs of additional surrounding facilities as they are being developed.

2015	2018	2016-2020
Latest date for facilities in the Czech Republic, Hungary and Romania to achieve initial operational capability	Latest date for the fourth facility to become operational	Facilities will be upgraded following technology validation

Shared features of successful European science parks

Following the opening of the first science park in Europe in 1972 in the UK, the concept of large research establishments where companies and other organizations come together in the interest of scientific research has boomed. Today, European nations host a wealth of science parks. However, not all of them have been successful in attracting scientists, companies and resources. Research into the success factors of science parks provides an insight into what such an establishment needs to thrive.

Location factors are particularly important. Science parks require exceptional transportation infrastructure in terms of road access, a rail link, and proximity to airports. The location also needs to be convenient and pleasant with a supportive living and working environment so that researchers will like the place and will be willing to work there. Park residents appreciate the convenience of a nearby restaurant, hotel, post office, bank, quality schools etc.

University support: Close cooperation with local universities and the availability of a highly skilled local workforce are additional location-specific factors.

Park design and management are critical: The physical layout of the park has to provide for possible extension. Strict controls and restrictions on development need to be established and enforced to retain a pleasant working environment.

Competition: Another issue is competition - the cost of the site needs to be comparable to that of other locations available.

Finally, *the attitudes and actions of the local community*, including government institutions, utility companies, educational institutions, financial institutions, NGOs etc. matter. All these organizations must join forces to create a welcoming atmosphere.

Cambridge Science Park

Europe's oldest science park

Founded in 1972 by Trinity College, University of Cambridge, the Cambridge Science Park is a thriving community of science and technology related businesses with close links to the University. Examples of present occupants include Broadcom, Toshiba Research and Philips.

The park has almost 150,000 square meters of R&D accommodation in total with a large number of buildings available: companies can establish their presence in small, under 100 square meters laboratories or in large, over 4,500 square meters buildings. The park can offer specialized research facilities like biology and chemistry laboratories, optical table rooms, high capacity server suites, office space etc.

Along with the abundant supply of services in the area of the University of Cambridge campus, support operations at the science park address an array of requirements of businesses, which are based there. For instance, a conference centre, a health and fitness club, a child nursery, a bar and a restaurant are among the on-site facilities.

Source: Cambridge Science Park

The Cambridge Science Park has almost 150,000 square meters of R&D accommodation, and can offer specialized research facilities like biology and chemistry laboratories, optical table rooms, high capacity server suites, office space etc.

Photograph used by permission of Cambridge Science Park

UK: Harwell Oxford Science and Innovation Campus

Science, Technology and Business at Harwell Oxford

The development history of the Harwell Oxford "science, technology and business park" follows a similar pattern to that of the Magurele location. Initially the home of Britain's Atomic Energy Research Establishment, the site was reinvented as a business park in the mid 90s after the decommissioning of the experimental reactors.

Today, the Harwell Campus is populated by 4,500 employees working for over 150 organizations including GE Healthcare, AEA Technology and the European Space Agency. One of the largest lasers in the world – the Vulcan – can be found at the Rutherford Appleton Laboratory inside the campus. Harwell is well connected: 85 km from Heathrow airport, near the M4 motorway, and with a local bus service and a rail service to various locations including London.

At Harwell Oxford Campus companies can find:

- A close cooperation between organizations
- Existing facilities and development land of various sizes to establish presence
- Interim offices
- Meeting and conference rooms
- Support services such as building insurance, utilities, reception, maintenance, cleaning, relocation, high speed internet connection, accommodation, security (dedicated police force, CCTV, alarms, and access options)

Employees can also benefit from services such as:

- Car sharing scheme
- Three on-campus catering facilities
- Three preferred hotel options off site and one inside the campus
- Bank office
- Sports and leisure club
- Local bus station
- Nursery
- Shops
- Post office

Source: Harwell Oxford

Swiss, France: CERN and the Large Hadron Collider

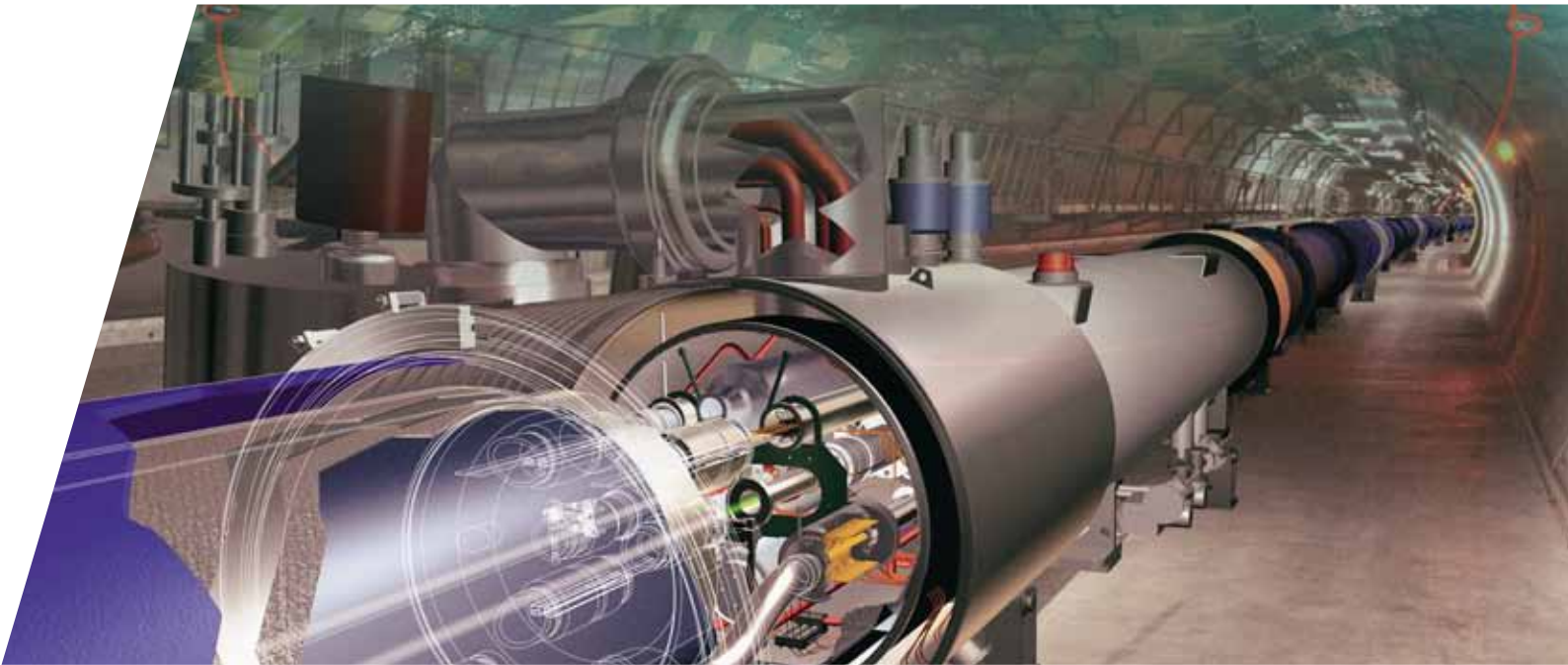
Finding out what the Universe is made of

The European Organization for Nuclear Research (CERN), located near Geneva on the border between Switzerland and France, is one of the largest fundamental physics research facilities in the world. CERN has 20 European member states and Romania is a candidate to join later in the decade. CERN's flagship scientific instrument, the Large Hadron Collider (LHC),is a major project involving over 10,000 scientists and engineers from over 100 countries – at a cost of 3 billion Euro just for the accelerator instrument itself (excluding operating expenses, experiments and detectors funded by universities and others).

The CERN complex hosts thousands of scientists, engineers, students, and support staff at one time. Some are full time employees, while others come from all over the world to conduct research. Some stay for a few days and attend various events, whereas others may spend months or even years working on an experiment. In order for this to work, a comprehensive set of services adapted to the needs of everyone working at CERN is offered on-site:

- Transportation: bus / car rental with special fares and procedures for CERN, car share scheme, local bus stop, shuttle bus to campus locations and airport, bicycle rental, fuel pump, helicopter platform
- Dedicated hotels and apartments/ agencies
- Services: restaurants, post office, bank office, travel agency, insurance, computer store, phone store, clothing store, storage, cleaning
- Educational: library conference halls, meeting rooms, training centre
- Leisure: picnic area, fitness trail, rugby field, football field
- Child care: nursery and child play area
- Emergency: medical and fire brigade

Source: CERN



KPMG

cutting through complexity™

Four initials
Infinite ideas

KPMG established its first office in Romania in 1994. We now have offices in Bucharest, Timisoara, Cluj, Iasi, Constanta and Chisinau (Republic of Moldova) and we are one of the leading professional services firms in the Romanian and Moldovan markets. We currently have around 600 employees, both local staff and expartriates.

Piet Klynveld founded the firm Klynveld Kraayenhof & Co in Amsterdam in 1917. He was known for his personal touch. He delegated very easily and was a good 'networker.' He loved art and music and just two things in his life were more important: his work and his practice. He died in 1946 leaving behind the largest accounting firm in the Netherlands.

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Sir William Barclay Peat was born in Scotland in 1852 and founded the accounting firm William Barclay Peat & Co in 1870. WB Peat was appointed as auditor of the Privy Purse (the finances of the British Monarch) and was knighted in 1912. He died in 1923 and three of his sons and their descendants have succeeded him as partners of the firm.

In 1911, whilst crossing the North Atlantic by ship, Peat discovered that he was not the only accountant on board. James Marwick was also there. The two Scots hit it off quite well on the week long trip. By the time the journey had ended, they had hammered out a rough working agreement on how to establish Peat's firm in the New World (USA) and to gain Marwick, Mitchell & Co, a firmer hold in the Old World (UK.).

James Marwick in his younger days was described as a six-foot-six, restless and energetic Scot. He was born in Edinburgh in 1862 and qualified as a Chartered Accountant in 1886. In 1891, he traveled to Australia to take a banking examination as well as other work in the USA and, in 1897 he decided to set up an accounting practice in New York. The practice rapidly grew across the USA and Canada.

In 1957, **Reinhard Goerdeler** became a member of the Managing Board of DTG in Germany, a firm which was a key founding member of Klynveld Main Goerdeler (KMG). In 1986, KMG merged with Peat Marwick International, ultimately forming KPMG in 1987. **Goerdeler was the first Chairman of KPMG, and also the first President of the International Federation of Accountants (IFAC**), the global organization for the accountancy profession.

Major science parks

		Number of people	Number of organisations	Examples of businesses	Development area	Main research fields
Belgium	Louvain-la-Neuve Science Park	5.100	160	KPMG, Huawei. Coface	231 ha	Life science, chemistry, ITC
Finland	Otaniemi Techology Hub	16.000	800+	HP, Nokia, Microsoft	100 ha	ITC
France	Sophia Antipolis	30.000	1300	HP, Honeywell, Orange, IBM	2300 ha	Life sciences, ITC, Electronics
The Netherlands	Science Park Amsterdam	n/a	80	Maxwell, TATA Communications	70 ha	Life sciences, ITC
United Kingdom	Cambridge Science Park	5.000	100+	Philips, Toshiba Research	62 ha	Diversified
United Kingdom	Oxford Science Park	n/a	60	IBM, Sharp, Tokyo Chemical	30 ha	Life sciences, ITC
The Czech Republic	Czech Technology Park	240	40	National Research Council	19 ha	ITC

Sources: LLN Science Park, Otaniemi Technology Hub, Sophia Antipolis, Science Park Amsterdam, Cambridge Science Park, Oxford Science Park, Czech Technology Park

The business case for ELI Magurele

Construction of the ELI nuclear physics facility in Magurele and subsequent operation is likely to promote community development and economic activity in the surrounding area. Based on how development has taken place at other landmark research facilities, we expect that the planned Magurele facility will create opportunities like:

- Increased demand for transportation services to and from the facilities south of Bucharest. Frequent destinations are likely to include the airports, recommended housing facilities and the city centre. For instance, at CERN, transportation to and from the facilities is available through scheduled bus routes, an organized car pool service, bus and car rentals etc. This creates an opportunity for charter companies, cab companies, as well as car and bus rental companies to meet the increased demand for transportation services. A four lane road and an upgrade of the nearby ring road of Bucharest to motorway grade are already planned. Additionally, electric transport and an "eco-village" transit system within the campus are planned.
- High-standard hotel rooms and apartments located in the proximity of the facility will be required especially due to the nature of the scientific work to be performed at the ELI-NP. Recommended facilities will play an integral role in the logistics of doing scientific research in Magurele. Already, an international campus is being drawn up with housing facilities for up to 1,000 researchers, sports facilities, conference and exhibition halls etc.
- Demand for other services e.g. food, retail, postal services, banks, hairdressers, storage etc. in the areas adjacent to the science and housing facilities will increase dramatically. The quality of services will need to meet the demands of the scientific community.
- Safety and health services will be sought in order to comply with regulations, prevent undesired events, monitor the health of employees, respond to accidents and illnesses etc.
- The ITC infrastructure of the area will have to be developed, maintained, and constantly expanded as more and more facilities may be built around the hub. Scientists and companies will need to communicate effectively and securely internally, within the ELI project, and with the wider scientific community.
- Private providers of electric power will be able to take advantage of the vast electricity needs of the project.

The solid business and scientific cases for this project should turn the Magurele area into an international hub, with scientists and companies migrating towards this centre of interest. As researchers and companies pool their resources and focus their R&D efforts on specific locations, the supporting infrastructure will follow, generating employment and improving living conditions of residents. The result – communities and businesses flourish alongside scientific research.

Infrastructure is key

	Magurele	Szeged	Dolní Brezany
Distance from city centre Distance from airport	18 km Bucharest 34 km OTP	5 km Szeged 165 km BUD	20 km Prague 32 km PRG
Available road infrastructure	Ring road under construction	Motorway	Motorway grade ring road
Public transportation to area	Sporadic bus service from Bucharest. Existing railway lines (not serviced) and new ring railway planned	Bus service and nearby tram lines in Szeged. Train service to Budapest	Bus service to tram line and metro line. Planned metro line within 3km by 2017

Sources: public maps, schedules

How can local and global businesses benefit

Making Magurele work

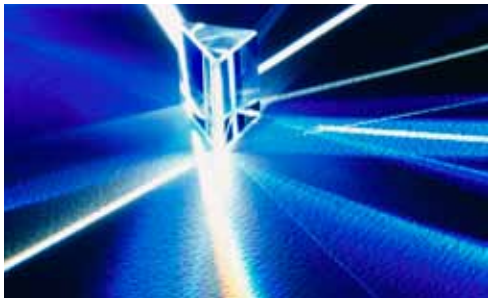
Making Magurele work is not an easy task. The proposed science hub faces competition from existing facilities such as the one south of Oxford in the UK and also within the ELI project. For example, the designated locations in the Czech Republic and Hungary benefit from a better existing transportation infrastructure. Szeged is already planning a close cooperation with the local University and a new "science city" alongside the laser building. Romania's advantage is underscored by the existing scientific community and the vast tradition of nuclear research in Magurele. The success of the project depends both on the service infrastructure which needs to be developed by private companies and on government involvement to build transportation infrastructure and new science-related facilities through national and EU funds.

What is ELI for?

- Medical sciences, especially imaging and cancer treatments
- Pharmaceuticals

- Nuclear materials and radioactive waste management
- Materials science

- Electronics
- Software development



- Optics

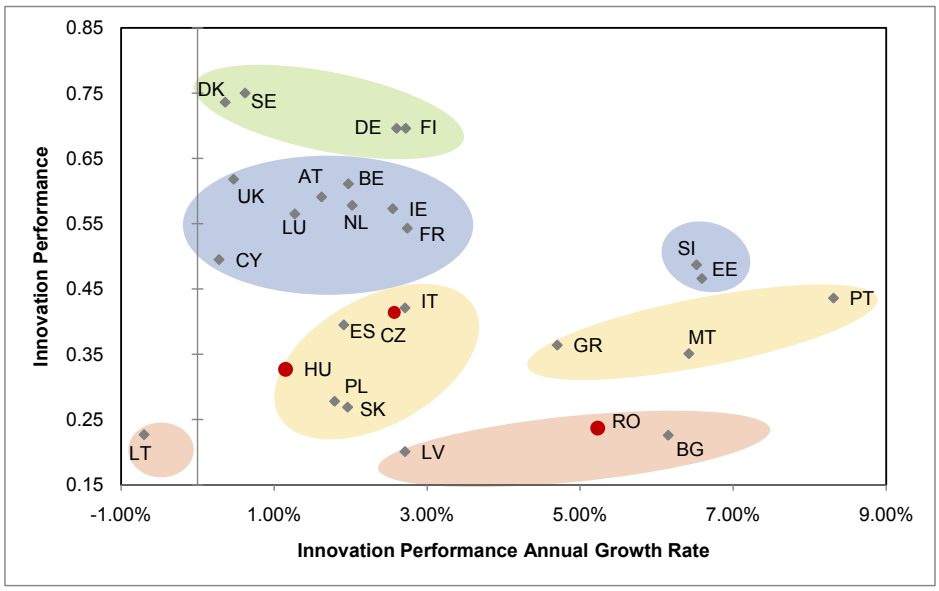
The Innovation Union

The European Commission has recently expanded its commitment to enhance the Union's innovativeness. Part of the Europe 2020 growth strategy, the Innovation Union initiative aims for an increase in R&D spending to three percent of GDP and could lead to 3.7 million additional jobs and a €795 billion GDP increase by 2025. These measures should generate more jobs, a greener society, an improved quality of life and enhanced competitiveness in the global marketplace.

The Innovation Union addresses three main issues through its over 30 action points: turning Europe into a world-class science performer, removing obstacles to innovation and revolutionizing the way the public and private sectors work together. Major objectives include:

- Excellence in education and skills development: training additional researchers, promoting attractive employment conditions, creating new curricula to fill "skills gaps", creating an independent multidimensional ranking system of university performance, and developing innovation e-skills
- Building the European Research Area by adopting a framework to remove obstacles to cross-border cooperation and mobility and also completing at least 60% of the priority European research infrastructure, including ELI.
- Focusing more funding instruments on Innovation Union priorities and enhancing access to finance for R&D: designing successor programs of FP7 and CIP, reviewing of state aid policies for R&D and attracting private finance (European Investment Bank, venture capital funds etc.)
- Creating a single innovation market: adopting proposals on EU patents, linguistic regimes and a unified system of dispute settlement; creating a government procurements market for innovative products and services of at least €10 bn.
- Promoting openness and capitalizing on creative potential: creating a "European Design Excellence" label and institutions, ensuring open access to publications funded through public funds, developing an European knowledge market for patents and licenses
- Leveraging policies externally: to encourage leading academics, researchers and innovators to live and work in Europe

Source: European Commission



Legend:

- Innovation leaders
- Innovation followers
- Moderate innovators
- Modest innovators
- ELI host country

Source: Innovation Union Scoreboard 2010

EU innovation compared to the USA and Asia

The Innovation Union initiative is largely an emergency response to the state of European R&D which is falling behind competing nations. The recently released Innovation Union Scoreboard shows that the EU is not only behind the USA and Japan by almost 50% in relative performance, but it is not growing fast enough to catch up either. The largest deficiency of EU R&D when compared to that of the USA and Japan seems to be linked to private enterprises. While the Union is maintaining its advantage over Russia and India, Brazil and especially China are reducing their performance gap every year.

The report also contains performance measures of individual EU countries and other states of Europe and groups countries into four categories according to their overall innovation performance:

- Innovation leaders: Sweden, Denmark, Finland, Germany
- Innovation followers: United Kingdom, Belgium, Austria, the Netherlands, Ireland, Luxembourg, France, Cyprus, Slovenia, Estonia
- Moderate innovators: Portugal, Italy, the Czech Republic, Spain, Greece, Malta, Hungary, Poland, Slovakia
- Modest innovators: Romania, Lithuania, Bulgaria, Latvia

Exploring the origins of creativity

Approaching the issue of creativity from an environmental perspective, essentially building a theory of creative spaces, several idea generation patterns can be identified. The age old image of spontaneous ideas and "eureka" moments does not appear to apply to most inventions. Conversely, great ideas seem to emerge as a result of a mental process spanning long periods of time, even years. Most notably however, good ideas seem to arise as a result of discussion – when people come together and share their own thoughts publicly. The nature of creativity of individuals and organizations operating in fertile environments such as research parks, business clusters, universities, computer networks and even cafes thus becomes obvious. For example, one can argue that the internet and the frenetic interaction which it spurs between participants is an environment for high creativity. Similarly, when individuals and organizations interact, cooperate, and share in a science park environment, innovation is bound to happen.

Embarked on a quest to discover determinants of creativity, best-selling author Steven Johnson provides an insight into the origins of great ideas in his 2010 book "Where good ideas come from: The natural history of innovation".

Romanian Scientist are Among the Best in the World

Nature.com: The government is now launching schemes to bring Romanian science into the international arena. In 2010 the country became a full candidate member of CERN, the European particle-physics facility near Geneva, Switzerland, and also became a founding member of two major European facilities: the Extreme Light Infrastructure, which will develop the world's most intense lasers to study matter at high energies, and the particle accelerator Facility for Antiproton and Ion Research in Darmstadt, Germany. This year there are plans for the launch of a twinning scheme, which would allow scientists working abroad to set up a parallel lab in Romania. That way they could contribute to science in Romania without having to risk leaving a good job elsewhere; and local staff would benefit from greater contact with international science.

Source: nature.com, 2010

Funding structure

The 7th Research Framework Programme has a total budget of EUR 50 billion for 2007-2013 and is designed to finance research, technological development, and demonstration projects based on individual or collaborative research.

The basic principle in funding within FP7 is co-financing. The larger part of project financing needs is allocated for cooperation research projects (32 bn. Euro), while fundamental research will receive 7.5 bn. Euro. Additionally, the capacities programme is allocated 4 bn. Euro and a further 4.75 bn. Euro are for research fellowships.

Cooperation with third countries is encouraged in FP7 to foster competition and also to support third-country scientists facing problems with a global character. Specific action within the Programme allows SMEs to access research centres of excellence and research development.

Source: European Commission

Seventh Framework Programme

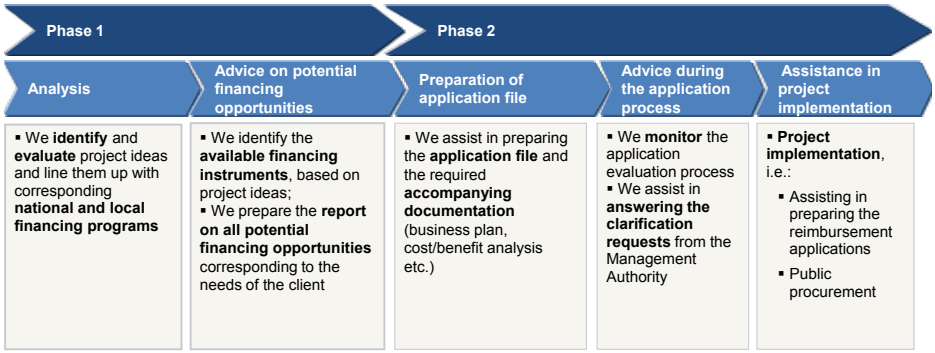
Objectives:

- Cooperation: to gain leadership in key scientific and technology areas by working together
- Ideas: to sustain European knowledge by fostering individual teams to compete at a European level
- People: to strengthen human potential through support to training and development of European research careers
- Capacities: to enhance the EU's innovation and research capacities through large infrastructure projects
- Regional cooperation, supporting research for the benefit of SMEs

Source: European Commission

Romanian scientists are committed and ready to build the only European and International Centre for high-level research on ultra-high intensity laser with the support of the international scientific community and European funding.

What KPMG Advisory Department can do to assist you



Serban Toader
Senior Partner,
KPMG Romania and Moldova

KPMG support infrastructure contractors, operators, investors and government organizations through the lifecycle of complex infrastructure projects and programs. We offer advice on the following:

- Planning, structuring and management of new infrastructure investments
- Procurement and financing support
- Improvement and monitoring of construction and operations
- Restructuring of distressed projects
- Investment due diligence assistance
- Infrastructure related audit, tax, accounting and compliance issues.

The demand for energy, transportation, water and social infrastructure is continuously growing. The tight fiscal position in which many governments find themselves following the financial crisis means that project finance will continue to be a key enabler of infrastructure strategies.

Daniela Nemoianu
Executive Partner,
KPMG in Romania

I see in ELI both a success for the Romanian research community and a huge opportunity for economic development. We can assist companies with Corporate Finance advice to take advantage of this opportunity and participate in developing the Magurele area.

Razvan Mihai
Executive Partner,
KPMG in Romania

At KPMG Romania we have experience in dealing with strategic projects for the country. I believe we have the tools and the people to bring our contribution to ELI's succes.

Florin Banateanu
Advisory Director, EU Advisory and Public Sector
KPMG in Romania

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Program and Project Management Services

KPMG's world-class Project Management Methodology has been used to manage all types of development initiatives, from infrastructure and social service projects to major public sector reform programs. The methodology covers the entire project management spectrum, from initial planning and budgeting to the tendering and selection of contractors:

- Project management rules (project organization, communication rules, expected results, quality management, project planning)
- Project management (project documentation, risk management, third party communication management, monitoring and managing total effort, acceptance tests, financial management and monitoring)

Contact

Daniela Nemoianu
Executive Partner
Tel: +40 (372) 377 732
Email: dnemoianu@kpmg.com

ELI-NP: The chance of being at the core

How many times does a region, even a country of our size, have the chance of nurturing and making the dream of a worldwide flagship project in science and technology become reality? Romania has this chance, and it depends on our vision, on our actions now, today, tomorrow and during the next few years. It depends on how much we shall want to be able to tell the story of using this opportunity, ELI-NP, to develop not only an amazing European Research Infrastructure but also a whole high-tech cluster, innovation Hot-Spot, "Magurele Lasers City", by fostering public-private partnerships and using properly the mix of Cohesion Funds, private investments and public funds.

Being at the frontiers of science and technology, ELI-NP has to play a unique role as an attractor of world renowned scientists, as well as for private companies, thereby boosting advances in science and innovation, as well as international cooperation, and the internationalization of Romanian research and Higher Education.

It is a multiple opportunity for us; the chance of being at the core of ELI-NP developments which will mean new knowledge, technologies, intellectual property and patents, as well as the chance to further develop the existing scientific and technological facilities and capabilities in Magurele,which have produced many outstanding achievements in science and technology, and which possesses an impressive Intellectual Capital. All of these are core competitive advantages; giving the chance to make science and innovation, embodied into a pan-European and international Research Infrastructure, a success story of using Cohesion Funds for high-tech regional development, in fact for innovation.

Due to the uniqueness of the Research Infrastructure and the possibility of doing interdisciplinary research, ELI-NP will attract the best scientists from all over the world; this will foster a campus of excellence, concentrating universities and high tech-companies as well as public and private research organizations.

Magurele Lasers City will be a place where the creative class will want to work and live and it will become an example, for ourselves and for others, of successful high-tech driven competitiveness in a region and beyond.

It demands vision, commitment and action!

Prof. Dr. Adrian Curaj
Member of the International Advisory Board ELI-NP

Views

A game changer

"ELI-Nuclear Pillar represents Nuclear Photonics, an emerging brand new discipline to explore and control nuclei by photons. Unlike the standard approach in the present nuclear physics where a charged particle beam (or beams) bombards these charged particles to spew out deep interior secrets of the constituent particles through the large penetrating momenta, our approach is through photons, chargeless massless particles. ELI is a game changer in 21st Century science. This is firstly because ELI will change the way we conduct the fundamental scientific investigation. Secondly, ELI is not only for analysis, but also for synthesis, encompassing many disciplines and will serve to integrate these disparate disciplines. Thirdly, significantly, it involves a new participation from a geographical region that has never hosted a major international scientific installation. I wish to contribute to the embodiment of this fantastic vision of ELI-NP on the Board."

Prof. Dr. Toshiki Tajima *is well known as the inventor of laser electron acceleration. His research focuses on subjects such as high field science, laser acceleration, ultrafast science, as well as crossfield of laser and accelerator. He is currently a professor at the Ludwig Maximilian University in Munich and serves in numerous committees for laser-related research, including the Scientific Council of ELI-PP as Chairman and the Scientific Advisory Board of ELI-NP.*

Open access to science

"ELI is a vital new European Research Infrastructure identified by the European Strategy Forum on Research Infrastructures (ESFRI) since its first strategic Roadmap on 2006.

ELI NP will be an essential pillar of a European Research Infrastructure Consortium (ERIC), based on scientific and technological cutting edge and managerial excellence, providing unique laboratories or facilities with user services for the efficient execution of top-level European research, offering open access to all interested researchers based on scientific excellence thus creating a substantial clear pan-European added value with respect to regional facilities.

The use of Structural Funds for the construction of ELI NP, and of other existing financial tools and initiatives for education, innovation and regional development, is likely to make a significant contribution to the development of Romania. The development of components, materials, and services for the construction, operation and maintenance of ELI NP acts as a driver of industrial innovation, will support technology transfer and will ensure that scientific results are transmitted rapidly to industry. ELI NP will play a key role in ensuring the synergy towards competitive research and innovation performance."

Ionel Andrei *serves as General Director of the General Directorate for Programs of the Romanian National Authority for Scientific Research and as a member of the Executive Board of the European Strategy Forum on Research Infrastructures.*

An innovation generator

"The function of Research Infrastructures as prime movers of Innovation and economy: the case of ELI

Pan-EU Research Infrastructures (RIs) attract scientists for the quality of the facilities, and industries for the availability of technologies and products with wider market applications. The interplay between research challenges and industrial innovation involves technical training, education and management. RIs are at the core of Innovation cycles between research and industrial development, creating synergies between excellence, capacity building, industry and education.

The ESFRI roadmap gives the opportunity to build one of these attractors and the choice by Romania on ELI is based on a global/EU perspective. Will attract efforts from different national and EU resources. It has the potential to involve also public-private partnerships, as a "smart specialization" with the development of advanced and diffusive technologies in a common EU-wide vision and a global potential market.

The investment of Structural Funds will, thus, generate future returns to industries, education and the overall local economy. The quality and attractiveness of the infrastructure will be the basis for a longer term investment by the EU and its scientific communities."

Professor Carlo Rizzuto *is the current Chair of ESFRI and Chairman of Elettra, Sincrotrone Trieste ScpA.*

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TAX

Addressing local taxation issues, with a global mindset

Facing local and global challenges requires the ability to think beyond the present and act now.

KPMG Tax experts can work with you and your business, thinking beyond tax, to provide insightful business opinions

Contact:
Ramona Jurubita
Partner
Head of Indirect Taxation Services
rjurubita@kpmg.com

Tax facilities for R&D activities

As a direct result of the recent amendments in the law on tax incentives available for companies conducting research and development ("R&D") activities, KPMG Romania has assembled a highly specialized team, focused on the applicability in practice of this incentive.

To sum up, companies can benefit from an additional 20% deduction in respect of certain cost items linked to R&D activities, as well as from accelerated deduction for the related equipment. If properly implemented, the applicability of the incentive could lead to a significant reduction in a company's effective tax rate and competitive advantages for companies applying it.

The tax incentive could be particularly useful for companies involved in highly dynamic sectors, where innovation and development of new processes and products is a key factor in preserving market share. Such industries include the automotive sector, pharmaceuticals, and software development.

KPMG has developed this R&D focused team to cut through the complexity of recent legislative changes and confusing interpretations. We aim to help companies which carry out potentially qualifying R&D activity to understand the complex rules and benefit from tax deductions if they are entitled to them.

As well as helping eligible businesses to benefit from R&D incentives, our Tax team can also assist with related tax administration once they have been obtained. They will analyse the eligibility of the companies' activity as a whole for the R&D incentive, review costs eligible for applying the incentive , review underlying documents and liaise with the relevant authorities.

What people say about ELI

"We will open areas still unexplored. For ELI to be the world's most performing feature, we will build new tools to safely explore science frontiers. With such an outstanding position we will make discoveries that will change humanity"

Gerard Mourou, ELI Project Coordinator and inventor of revolutionary laser technology

"ELI is a gateway for discussion about a regional development cluster in the Magurele area, encompassing: the six national research institutes, active universities, and a great scientific tradition…"

Adrian Curaj, Member of the International Advisory Board ELI - NP

"Magurele will later be able to host other projects of national interest such as the Data Recovery Centre – a digital national archive of Romania"

Adrian Curaj, Member of the International Advisory Board ELI - NP

"ELI could not exist without nuclear physics. In the summer of 2009, we were able to bring part of the project to Romania, especially because there are three strong physics communities in one place at Magurele: laser, plasma, and nuclear physics"

Nicolae Zamfir, General Director "Horia Hulubei" NIPNE

"ELI has the full support of the Government, being a major point of the government program"

Daniel Funeriu, Ministry of Education, Research, Youth and Sport

"The ELI development in Magurele is the largest ever success of Romanian research and also the first European infrastructure in the East"

Daniel Funeriu, Ministry of Education, Research, Youth and Sport

"ELI is also tipping the scales of Europe's portfolio of major infrastructures eastwards"

Michael Banks, Physics World Magazine

The presence of three major facilities in the Czech Republic, Hungary and Romania will allow these nations to attract researchers from abroad, as well as inspiring future generations of researchers

Michael Banks, Physics World Magazine

"Hi-tech concentration will attract businesses – soon, an industrial park will become possible (benefiting from structural funds from the European Union Regional development Fund)"

Adrian Curaj, Member of the International Advisory Board ELI - NP

„Japan will support this project given its uniqueness and expected results. There are parts of this project which are of direct interest to us"

Toshiki Tajima, ELI Scientific Coordinator

"ELI will create new scientific communities and it will be a magnet for hi-tech companies"

Wolfgang Sander, Director of the Max Born Institute for Nonlinear Optics and Short-pulse Spectroscopy Berlin

"The tide may just have turned for Romanian scientists. The government there is boosting funds and seems to know what is required for them to be spent wisely, and how to overcome scepticism among research émigrés. The Romanian government has a serious long-term plan for science, and this deserves recognition."

Nature Magazine, January 2011

Contact us

Serban Toader
Senior Partner
T: +40 (741) 800 800
E: stoader@kpmg.com

Daniela Nemoianu
Executive Partner
Tel: +40 (372) 377 732
Email: dnemoianu@kpmg.com

Razvan Mihai
Executive Partner
Tel: +40 (372) 377 747
Email: rmihai@kpmg.com

Florin Bănățeanu
Director
Tel: +40 (372) 377 796
Email: fbanateanu@kpmg.com

Razvan Nan
Senior Manager
Tel: +40 (372) 377 801
Email: rnan@kpmg.com

KPMG in Romania
Bucharest
Victoria Business Park
DN1, Sos Bucuresti Ploiesti, nr. 69 - 71
Sector 1, Bucuresti 013685
Tel: +40 (741) 800 800
+40 (372) 377 800
Fax: +40 (741) 800 700
+40 (372) 377 700
Email: kpmgro@kpmg.ro
Web: www.kpmg.ro

Cluj
Power Business Centre
18-20 Calea Dorobantilor
Cluj, 400117, Romania
Tel: +40 740 333 344
Fax: +40 753 333 800

Constanta
208 B-dul Mamaia, 2nd floor
Constanta, 900540, Romania
Tel: +40 (0) 756 070 044
Fax: +40 (0) 752 710 044

Iasi
29 Str. Saulescu, 3rd floor
Iasi, 700010, Romania
Tel: +40 756 070 048
Fax: +40 752 710 048

Timisoara
30 B-dul. Mihai Viteazu
Timis, 300222, Romania
Tel: +40 (256) 22 13 65
Fax: +40 (256) 49 93 61

KPMG in Moldova
Chisinau
202 Stefan cel Mare str, 9th Floor
MD-2004, Chisinau
Republic of Moldova
Tel: + 373 (22) 580 580
Fax: + 373 (22) 540 499
E-mail: kpmg@kpmg.md
Web: www.kpmg.md