

# **ICBSS**

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### **Innovation in the wider Black Sea region: Policies and Structures**

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## PREFACE

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In this paper we argue that from a scientific, economic and geopolitical point of view, it is necessary to improve the understanding of EECA productive structures, scientific and technological activities, entrepreneurial dynamism, and legislative framework, to design an innovation system. The development of innovative capacities becomes one of the main needs in view of a long-term target to achieve economic and social development.

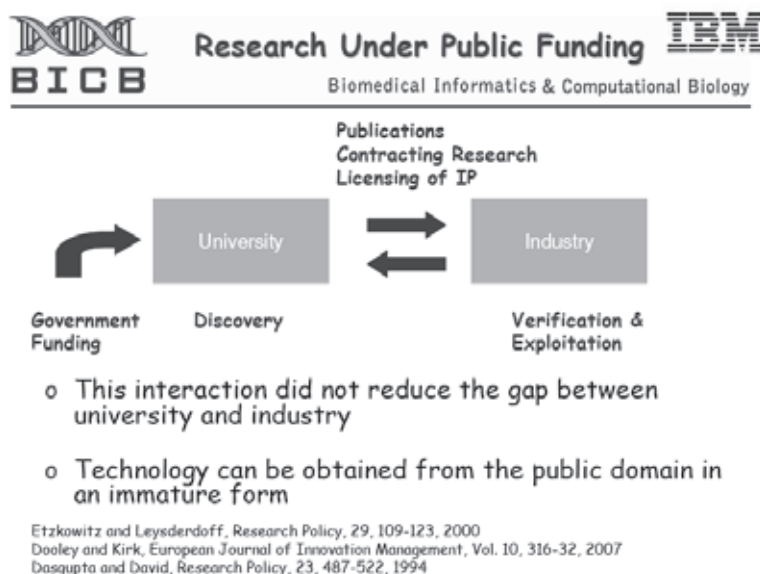
The aim of this paper is: to present the latest developments in innovation policies and in the European Commission's initiatives, to provide insight on successful innovation policies and activities in the countries of the wider Black Sea region including the establishment and operation of innovation related infrastructure such as technological parks, incubators, etc., and to investigate concrete opportunities for regional cooperation in the field of innovation.

The building up of the national system of innovation in each EECA country should be the first step. The integration of the national systems of innovation into an "EECA Innovation Space" appears as a way to reinforce the process. There is a need to identify the key issues related to the improvement of local industrial sectors, their scientific and technological capabilities and the institutional set-up that will be the building blocks of the Euro-EECA Innovation Space.

Moreover, given the need for the science base to link effectively with other subsystems of national and international innovation systems in order to improve overall system performance, policies facilitating such linkages are also needed. Improvements in the performance of the science base will not in themselves be enough to improve the overall efficiency and performance of national and EU innovation systems. For this to occur, improved linkage, transfer and valorisation structures and processes are needed. One way of increasing the potential contribution of research to the overall performance of

innovation systems and to the socio-economic systems within which they operate is to place a greater emphasis on research perceived to be of relevance to societal goals.

Another is to involve science base actors in the development of innovation hotspots, clusters and regional growth poles via the development of smart specialisation strategies, i.e. strategies that lead to clusters differentiated along thematic or sectoral lines that are distributed across multiple regions in such a way that most regions have distinctive but complementary competence profiles. The existence of a truly cross-border research market within the EU and the neighbouring countries facilitated by improved IPR regimes, codes of practice for research institutions and universities, and innovation-friendly standards, regulations and procurement practices would also improve links between the science base and the realisation of innovative potential.



International cooperation with third countries is necessary to address effectively many specific objectives defined in **Horizon 2020**. This is the case in particular for all the societal challenges addressed by Horizon 2020, which need to be tackled at the global level.

International cooperation is also essential for frontier and basic research in order to capture the benefits from emerging science and technology opportunities. Promoting

the international mobility of researchers and innovation staff is crucial for enhancing this global cooperation.

Activities at the international level are equally important to enhance the competitiveness of European industry by promoting the take-up and trade of novel technologies, for instance through the development of worldwide standards and guidelines, and by promoting the acceptance and deployment of European solutions outside Europe.

## **Main Lessons**

The most important lessons to emerge from the Innovation Workshop, that was held in Athens, on 16-17 June 2011, can be summarised as follows:

Governments have an important role to play in fostering research and innovation led growth;

Actions are needed on many policy fronts if widespread obstacles are to be overcome and the performance of the science base improved;

This will involve efforts to ensure adequate inputs to the science base; to rationalise funding mechanisms and public sector research structures; to improve research outputs; and to link the science base with other elements of national and EU innovation systems;

Even if adequate measures are put in place to improve the performance of the science base, research budgets need to be maintained or increased if desirable growth levels are to be attained;

Focused policy packages are needed to avoid spreading resources too thinly, to tackle major societal challenges, and to ensure that the science base is adequately linked to other innovation system elements;

Strong emphases on competition, excellence, building on strengths and cluster development have much to recommend them, especially in conjunction with complementary measures that attempt to rectify weaknesses in innovation systems and ensure their smooth running;

In terms of the development of the ERA, greater efforts are needed to develop legislative and regulatory frameworks capable of facilitating cross-border funding;

Effective human resource development and circulation strategies are critical to the success of any attempts to improve the performance of the science base in the EU.

## References:

*[http://ec.europa.eu/research/innovation-union/pdf/state-of-the-union/2011/state\\_of\\_the\\_innovation\\_union\\_2011\\_brochure\\_en.pdf#view=fit&pagemode=none](http://ec.europa.eu/research/innovation-union/pdf/state-of-the-union/2011/state_of_the_innovation_union_2011_brochure_en.pdf#view=fit&pagemode=none)*

*<http://ec.europa.eu/research/innovation-union/pdf/erac-report-2012.pdf#view=fit&pagemode=none>*

Horizon 2020

## Abstract

Stimulation of innovation is a priority and a key factor for sustainable economic growth for the leading world economics during the last decade. Innovation became a dominant factor of social and economic evolvement that demands cutting of the period of innovation cycle; strengthening the impact of science on social and economic sphere; significance enhancement of non-economic factors; enlargement of public and corporative expenditures on research, technological and innovation development; globalization and integration of trans-national innovation processes.

The main trends in coordination of innovation activities are global and intergovernmental integration at different regional levels and their intellectual property objects.

Global financial and economic crisis and its consequences brought to a head the necessity to speed up innovation at the level of companies, economic segments and national economics as a whole. In this respect development of integration processes and creation of common innovation strategies for grouping of states such as the EU and CIS, as well as for independent governments and companies becomes the crucial approach to enhance their competitiveness in the world economic area.

Innovation nowadays requires a lot of resources and accompanies very high level of risks so single innovation actors could not generate and exploit them effectively. Innovation is the area of high importance to develop cooperation at the international level.

In the face of the present challenges the new sources of the sustainable economic growth are innovation and environmentally friendly technologies. In this context effective and comprehensive trans-national cooperation in the spheres of science, technology and innovation is strongly demanded.

Development of technology transfer infrastructure, its methodological support, promotion of international collaboration among researchers, entrepreneurs and investors is the task of science, technology and innovation (STI) policy making.

The decision on development of Intergovernmental Target Programme for Innovation Cooperation of Commonwealth Independent States until 2020 was made by the Heads of the CIS Governments on November 14, 2008.

The Programme goals are an enhancement of CIS' economics competitiveness and transformation into innovative economics of social orientation; realisation of the priority-oriented innovation actions through coordination and integration of national

innovation systems the CIS member states and reinforcement of the CIS prestige as one of the world wide centres of technological leaderships.

The Programme is open for the world wide collaborative participation.

The following main objectives of the Programme are emphasized:

- effective utilization of innovation products and investments, enhancement of global competitiveness of national economics of CIS member states;
- provision of economic, industrial, energy and environmental security;
- assurance of sustainable and well-balanced economic growth, improvement well-being and life quality of the CIS citizens on the base of multiplier, symbiotic and synergetic effects;
- producing of economically advantageous products and services by means of essential upgrading of their innovativeness, technological effectiveness, knowledge content, ecological properties as well as reduction of energy intensity and materials-output ratio, implementation of efficient, integrated policy of energy and resources saving;
- intensification of mutually beneficial market under conditions of free labour and capital flows.

The necessity of coordination of common efforts and networking of the innovation partners (education, research, industry, public bodies and businesses) predetermine the following main packages of the Programme:

I. Cooperation in S&T sphere includes:

- Joint research projects
- Commercialisation of the research results
- Coordinating of the national research programmes

II. Increasing the role of human resources for successful STI and economic growth that demand joint actions in education, career development through international people mobility including academic and industrial sector, open labour market

III. Building of the international system for effective access to national research infrastructures

- IV. Coordination of rules and regulations in STI and IPR
- V. Improvement and implementation of the best practice in evaluation procedures
- VI. Establishing of cooperation support structures such as contact and information centres; information virtual services as a gateway-platform for knowledge and innovation (technologies to be transferred, etc.)
- VII. Analysis and monitoring of state-of-the-art of STI development in the countries among it:
  - Technological evaluation
  - Market analysis
  - Foresight activities in order to understand development trends in economy & innovation
  - Road mapping for promising application areas
  - Identification of strategic and emerging important trends
- VIII. Mapping of key actors (research organisations, industrial companies, SMEs, funding agencies)
- IX. Developing system for monitoring of the joint activities and statistics including knowledge exchange and improving of STI statistics.

## **Keywords**

Innovation policies, regional cooperation, economic and social development.



## Creation of the Common Innovation Area for Commonwealth Independent States

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Innovation is likely to contribute to economic performance and sustain a high quality of life. Certain international comparative studies of 2008-2010, such as INSEAD Global Innovation Index<sup>1</sup>, point out that the level of innovation activity in a country correlate with its per capita income. For instance the level of innovation activity in OECD countries is much higher than in most other.

However, in the post-crisis period many states face a structural discrepancy between fiscal austerity measures and the need to invest in research and innovation. In 2010 the leading world economies demonstrate a slow and uneasy recovery after a substantial downturn of the previous year. This recovery was an outcome of massive 18-months state interventions in monetary, fiscal and financial spheres. Considerable financial resources, previously obligated for curbing the most severe consequences of the crisis, including liquidity support to the financial sector, allocations to selected sectors of economy (first of all, car manufacturing), funding for new infrastructure, etc. may now be diverted to financial stimulation of innovation-based growth. Moreover, OECD experts suggest keeping certain recovery stimulation measures, such as tax support to private R&D and targeted labor tax cuts<sup>2</sup>.

Many economies attempted measures, mostly in the sphere of infrastructure and taxation, aimed at a structural shift towards "green" economic growth. "Green growth" was put forward as a new paradigm for assuring high growth rates, while attempting a shift towards an economy based on environmentally friendly technologies, with an

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<sup>1</sup> INSEAD Global Innovation Index is calculated for 132 countries by the INSEAD Business School and the Confederation of Indian Industry (CII). For comparison, in 2007 Russia occupied 64th position. The Index assesses progress of innovation readiness in countries; assesses barriers, which prevent state authorities, business and individuals fully benefit from innovation. Input parameters of innovation systems are assessed: institutions and policies, human resources, general and ICT infrastructure, level of market sophistication and technological development, as well as output parameters: knowledge generation, competitiveness and increasing welfare // [http://www.insead.edu/discover\\_insead/Newsroom/2009\\_global\\_innovation.cfm](http://www.insead.edu/discover_insead/Newsroom/2009_global_innovation.cfm)

<sup>2</sup> Economic Policy Reforms 2010. Going for Growth. OECD, 2010.

emphasis on curbing CO<sub>2</sub> emissions<sup>3</sup>. Two thirds of OECD countries<sup>4</sup> made investments in infrastructure projects, implying the development of green, energy saving and energy efficient technologies. Australia, Korea and Japan devoted large part of their stimulus to green growth, including new jobs elated to cleaner production through tax incentives. In the long run, OECD experts suggest supplementing these measures with cost effective policy measures, involving the pricing of environmental externalities, as well as narrowly targeted subsidies (for instance, for “green” R&D)<sup>5</sup>.

**The 2011 study by the World Organization of Creditors (WOC) testifies that economy of Commonwealth Independent States (CIS) grew more than 6 times over the past 10 years, as compared to Asian economies, which grew 4 times and a two-fold growth in economically developed countries<sup>6</sup>.**

However, the crisis averted CIS growth rates. According to the data presented by the Russian Finance Minister A. Kudrin at the meeting of CIS finance ministers on 1 April 2010, the GDP of CIS member-states fell by 7,5% in 2009. This is a marked difference with a 5,5 annual growth before the crisis. However, the growth dynamics differed from country to country. The greatest downturn was observed in Russia, Ukraine, Moldova and Armenia. At the same time, Azerbaijan and Turkmenistan appeared in a favorable position and demonstrated growth even in 2009.

Already in January 2010 economic indicators in most CIS states growing. For instance, in January-March 2010 CIS industrial production grew by 8% on average. By growth indicators in the post-crisis yeas, as per WOC study, CIS was behind Asia and Latin America (9,4% and 7,5% accordingly) and ahead of EU and NAFTA (1,8% and 2,9% accordingly). According to the data of the CIS Intergovernmental Statistical Committee, in January – March 2010 Russia, with its 4,5% GDP growth, was the last but one among the CIS states, while Kazakhstan (+16,4%) and Uzbekistan (+7,6%) headed the list<sup>7</sup>.

At the same time, foreign trade among CIS states was recovering slowly. CIS exports in 2009 lowered by 46 percent, import – by more than 43%, and the foreign economic

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<sup>3</sup> In 2009 Ministers of OECD countries adopted the Declaration on Green Growth.

<sup>4</sup> Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Great Britain, Japan, Italy, Korea, Netherlands, Norway, Poland, Portugal, Spain, Sweden and Switzerland.

<sup>5</sup> Economic Policy Reforms: Going for Growth. OECD, Paris. 2010.

<sup>6</sup> <http://www.woc-org.com/en/index.php?name=News>, accessed on 16 November 2011.

<sup>7</sup> <http://www.bfm.ru/news/2011/03/17/ekonomika-stran-sng-vyroslo-za-desjat-let-bolee-chem-v-6-raz.html>, accessed on 16 November 2011.

turnover fell by 38%<sup>8</sup>. To address these challenges and restore growth in the region, a 10-billion anti-crisis fund of the Eurasian Economic Community (EurAsEC) was created in February 2009. The fund provided support to those EurAsEC and CIS economies, which filed requests and negotiated the conditions.

In 2010 regional country groupings continuously showed GDP growth, which testified to a post-crisis recovery. We note that anti-crisis measures, agreed by regional economic unions, are often linked with implementation of science, technology and innovation (STI) projects. The EU is a visible example, and there are more. The EurAsEC intergovernmental targeted programme “Innovative Biotechnologies”<sup>9</sup> was considered in the end of 2009 by the member states as an anti-crisis measure. This programme is one of the instruments for implementation of the strategy and priority directions for S&T development, intergovernmental coordination and intersectoral cooperation in biotechnology R&D and production of bioproducts<sup>10</sup>.

An agreement to jointly implement venture projects was made by Russia, Belarus and Kazakhstan in 2010. To this end the countries intended to use the framework of the Common Customs Union and create a joint venture fund in nanotechnologies<sup>11</sup>. To this end, the EurAsEC intergovernmental Council approved the creation of the EurAsEC Center for High Technologies with the support of JSC “Russian Venture Company” and JSC “National Innovation Fund” of the Republic of Kazakhstan<sup>12</sup>.

These cross-border initiatives of the last few years are meant to fill in the gap in STI cooperation after the dissolution of the Soviet Union. During that period the traditional research links had faded away, while the state budgets could not afford substantial R&D expenditure (see table 1).

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<sup>8</sup> <http://www.rg.ru/2010/04/02/strany.html>, accessed on 16 November 2011.

<sup>9</sup> Decision # 422 of the Intergovernmental Council of the Eurasian Economic Community “On the intergovernmental targeted programme of the Eurasian Economic Community “Innovative Biotechnologies”, Moscow, 09.06.2009.

<sup>10</sup> <http://news.gazeta.kz/art.asp?aid=272265>, accessed on 16 November 2011

<sup>11</sup> <http://news.gazeta.kz/art.asp?aid=325640>, accessed on 16 November 2011

<sup>12</sup> <http://www.rusventure.ru/press-service/news/detail.php?ID=147>

**Table 1. Dynamics of R&D expenditure as a share of GDP  
in CIS members states [%].**

<b>CIS member- states</b>	<b>1990</b>	<b>1995</b>	<b>2000</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>
Azerbaijan	1,0	0,3	0,3	0,3	0,2	0,2	0,2	0,2	0,2	0,3
Armenia	2,5	0,1	0,3	0,3	0,3	0,3	0,2	0,2	0,2	0,3
Belarus	2,3	1,0	0,8	0,7	0,7	1,2	0,7	0,7	0,6	0,6
Kazakhstan	0,7	0,3	0,2	0,3	0,3	0,3	0,3	0,2	0,3	0,2
Kyrgyzstan	0,7	0,3	0,1	0,2	0,2	0,2	0,2	0,3	0,2	0,2
Moldova	1,6	0,8	0,6	0,4	0,4	0,4	0,4	0,6	0,5	0,5
Russia	3,0	0,8	1,2	1,3	1,9	1,2	1,2	1,3	1,2	1,2
Tajikistan	0,7	0,1	0,1	0,06	0,06	0,1	0,1	0,1	0,1	0,1
Ukraine	2,3	1,3	1,1	1,2	1,2	1,1	1,0	0,9	0,9	0,9
CIS	1,6	0,52	0,45	0,45	0,5	0,51	0,43	0,45	0,47	0,48

Sources: CIS statistical newsletters, 2004, # 18, p. 69; 2006, # 18, p. 61, 2007, # 18, p. 86, 2008, # 18, c. 65, 2009, # 18, p. 131, 2010, # 19, p. 8, Science in Russia, Moscow, CSRS, 2004, p. 194.

*By 2009 National Innovation Systems of CIS countries were also characterized by the troubles often seem in other regions: decreasing R&D personnel, low levels of patenting and commercializing of research results, low business R&D expenditure and low high-tech exports.*

***As we may observe, STI policy-making by the regional country groupings at the post-soviet space is done with consideration of the international, including the EU experience. Greater economic competitiveness of its member-states is the primary goal of the EU STI policy. Moreover, the EU clearly links the integration and STI policies.<sup>13</sup> This practice is especially important given the cultural, geographic and other diversities of such country groupings as the EU and CIS.***

Many STI policy instruments require the active involvement of many stakeholders and usually significant financial and human resources, while at the same time they are characterized by high risk and uncertainty. The EU experience of European Technology Platforms and other initiatives tells us it's therefore viable to opt for programmes based on responsibility shared between the public and private sector, i.e. choose from a range of models offered by public-private partnership (PPP).

Integration processes within CIS have not been going very fast. In fact, different countries and country groups within CIS have developed different integration pace. This resulted in the creation, after the dissolution of the Soviet Union, of a variety of sub-regional country groupings at the CIS space, including the Union State of Russia and Belarus, Customs union of Russia, Belarus and Kazakhstan, Eurasian economic community of nine countries, as well as Central Asian union and GUUAM – alliance of Georgia, Ukraine, Uzbekistan, Azerbaijan and Moldova. It was thus essential to choose an integration model that would combine both hard and soft integration forms. To this end, integration in STI sphere fits this purpose perfectly.

Despite the existing difficulties, such as post-crisis recovery and substantial difference of the CIS states' National Innovation Systems (NIS), eight of them decided to join forces in implementation of a joint Programme for Innovation Cooperation (PIC). These are economies of a variety of sub-regions and of different size: Armenia, Belarus, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan and Ukraine. The Programme remains open to any country, within or outside CIS, to join at a later stage.

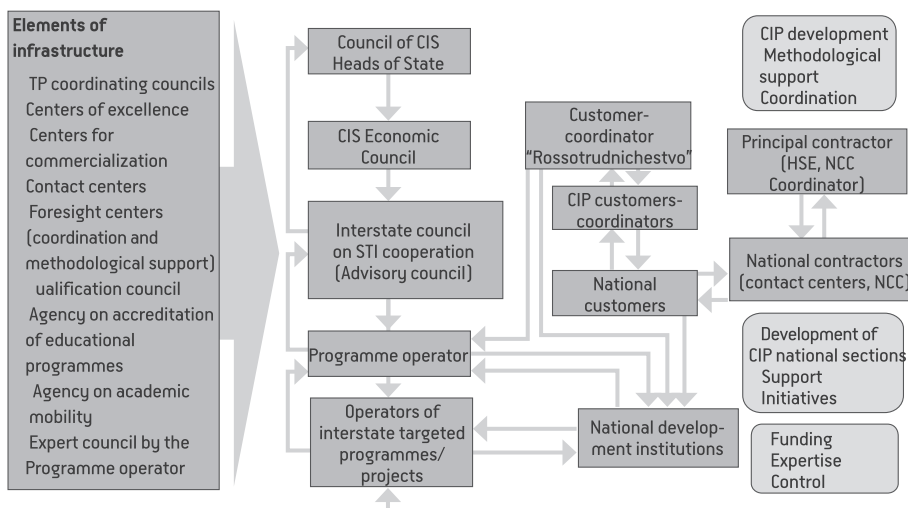
The decision to develop an Intergovernmental Targeted Programme for Innovation Cooperation between CIS member states until the year 2020 was made by the CIS Heads of Government on November 14, 2008. The draft Programme was approved at the

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<sup>13</sup> EU experts and officials shared integration experience with officials from Belarus, Russia and Kazakhstan at the conference "Technical regulation – 2012. Policy instruments for the creation of a common economic space", which took place on 25 March 2010 in Moscow. Press-release of the EU Delegation to Moscow. 25.03.2010.

extended attendance meeting of the CIS Heads of Government Council on 19 November 2010, while the word “targeted” was taken away from its name, thus opening space for transition to a large-scale multipurpose programme.<sup>14</sup> The final approval was made on 18 October 2011 at the 58<sup>th</sup> meeting of the Council of the Heads of the Governments of CIS in St.Petersburg. Unfortunately, Moldova had to abstain from signing PIC due to inability to complete domestic formalities. As noted by the Russian Premier Putin, adoption of this document “will allow for removal of many barriers and a big step in advancement of trade and economic relations, laying the foundation for further advancement of the CIS”<sup>15</sup>.

The text of the Programme was developed by the Russian Federal Agency for CIS, Russian Nationals Living Abroad and International Humanitarian Cooperation (Rossotrudnichestvo) in collaboration with the Russian National Research University “Higher School of Economics”, as well as agencies representing CIS member states and the CIS Executive Committee. It was grounded in the provisions of the CIS Economic Development Strategy and in the Guidelines for Sustained High-tech Cooperation between CIS member states, adopted over the past two years. The Programme management scheme is shown in Picture 1.



<sup>14</sup> <http://premier.gov.ru/eng/events/news/12987/>, accessed on 16 November 2011

<sup>15</sup> <http://rs.gov.ru/node/28010>, accessed on 16 November 2011

Similar to the EU STI support programmes, the PIC's end goal is boosting the global competitiveness of the CIS economies. This will be done through approximation and ultimate integration of the national innovation systems: legislation, funding programmes, high-tech projects, etc. For instance the Programme contains a list of some 120 existing high-tech projects that could be merged, extended or be granted other support. Moreover, the document suggests a number of advanced STI policy tools, such as development of technology platforms, establishment of centres of excellence, and so forth. These tools will be integrated with existing ones, already applied at the national level. To give an example, Russian technological platforms are intended to be made accessible to all CIS member states. It was also initially the intention to collaborate with European partners on projects and programmes in the Asia-Pacific countries.

The creation of common innovation space to which the PIC aims to contribute, and its definition has initiated a debate among the Programme partner organizations. In order to lift all uncertainties, the principal contractor, Higher School of Economics, proposed a definition of the term for the Programme<sup>16</sup>. The interstate innovation space is understood, first of all, as a socio-cultural, economic and information environment, where states execute joint actions for the development of S&T, deployment of new technologies, unification of S&T capacities, resources and efforts for national economies' sustainable development. Secondly, it is viewed as a unity of institutions, principles and mechanisms for implementation of STI policy, harmonization of the state programmes, standards, conditions for appearance and implementation of innovative projects, consistency of legislation regulating development and performance of national innovation systems in the interest of the CIS member states and their citizens.

The social orientation of PIC is reflected in its goals and the rationale, describing the outer – global – tendencies and frameworks. Appearance of innovation in education, healthcare and social care is a welcome path for technology development in the region. Likewise, the 2012 calls of the EU FP7 are directed towards addressing social challenges, like ageing, that Europe faces.

Structurally, PIC is divided into five sub-programmes: the interstate innovation cooperation, advancement of S&T capacity, human resources for innovation, the joint use and further development of high-tech infrastructure and the interstate regulation of operations in high-tech sectors. The document also contains sections devoted to operational matters, including Programme management, funding for innovation

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<sup>16</sup> <http://www.hse.ru/news/recent/38006443.html>, accessed on 20 November 2011.

projects, planning and monitoring and evaluation.

- I. *Cooperation in S&T sphere includes:*
  - *Joint research projects*
  - *Commercialisation of the research results*
  - *Coordinating of the national research programmes*
- II. *Increasing the role of human resources for successful STI and economic growth that demand joint actions in education, career development through international people mobility including academic and industrial sector, open labour market*
- III. *Building of the international system for effective access to national research infrastructures*
- IV. *Coordination of rules and regulations in STI and IPR*
- V. *Improvement and implementation of the best practice in evaluation procedures*
- VI. *Establishing of cooperation support structures such as contact and information centres; information virtual services as a gateway-platform for knowledge and innovation (technologies to be transferred, etc.)*
- VII. *Analysis and monitoring of state-of-the-art of STI development in the countries among it:*
  - *Technological evaluation*
  - *Market analysis*
  - *Foresight activities in order to understand development trends in economy & innovation*
  - *Road mapping for promising application areas*
  - *Identification of strategic and emerging important trends*
- VIII. *Mapping of key actors (research organisations, industrial companies, SMEs, funding agencies)*
- IX. *Developing system for monitoring of the joint activities and statistics including knowledge exchange and improving of STI statistics.*

These sub-programmes are formed in a way similar to interstate targeted programmes - STI funding programmes which exist in a number of states at national level and at the CIS level<sup>17</sup>. Importantly, targeted programmes are a well-known and well-developed tool for the CIS member states. However, the implementation modality for each sub-programme differs substantially, which implies an organisational necessity to preview a variety of tools: interstate target programmes and a number of innovation projects,

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<sup>17</sup> A list of CIS targeted programmes was approved by the Council of the CIS Heads of Government on April 16, 2004.



implemented on the basis of public-private partnership.

There were a number of other stumbling blocks that the Programme developers had to face and overcome in their work. Namely, in the process they realized that “the current system does not allow for using mechanisms of state guarantees, budget crediting, bonded loans, tax, customs, and tariff preferences. Additionally, it does not allow for the implementation of obligatory preferential terms when buying innovative products, the use of constitutional contracts or other mechanisms of public-private partnership”<sup>18</sup>. Most importantly it was also a challenge to set up a supranational Programme regulatory body, as well as to identify and agree upon sources for Programme budget.

Setting thematic priorities is always a difficult topic in programmes similar to the one discussed here. Areas of cooperation in the CIS Programme for Innovation Cooperation represent the common denominator for the variety of countries’ STI priorities: Aerospace and transport; Global security; Living systems; Nanotechnologies; ICT; Medicine and Health; Manufacturing and industrial infrastructure; Agriculture; Social infrastructure and Energy efficiency and sustainability.

As PIC was meant for the benefit of a variety of organizations from different sectors, there is a necessity to coordinate common efforts and networking of the innovation partners working in the areas of education, research, industry, public bodies and businesses. Rossotrudnichestvo is the PIC principal coordinator and will put forward a proposal concerning PIC operator until the end of 2011. The functions of the CIS intergovernmental council on STI cooperation were extended to cover PIC Advisory council duties. The organisations – national partners, involved in PIC development, were authorized to perform as National Contact Centers. The principal implementing organisation at the stage of PIC development, National Research University “Higher School of Economics” will become the coordinator and methodological support center for the seven National Contact Centers in CIS countries. In October – November 2011 financial mechanisms occupied the agenda of PIC stakeholders and decision-makers.

The PIC developers used the huge international experience under the Programme shaping process specifically the EU Framework R&D programmes and Competitiveness and Innovation Framework Programme. Among the lessons that PIC may learn from the European framework programmes is the one to overcome excessive bureaucracy associated with application and reporting for Community funding. Researchers and

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<sup>18</sup> F. Mukhametshin, Head of Rossotrudnichestvo, speaking at the extended attendance meeting of the CIS Heads of Government Council, 19 November 2010

innovators simply do not have the time and financial resources to spend on paperwork that are comparable to resources required for project implementation. This is even more the case for the new and transition economies than it is for the European states. PIC will be, at least for the first years, a learning-by-doing mechanism and will most likely undergo substantial adjustments in the years to come.

Similar to the three levels of STI indicators, developed to track progress towards STI goals of the Europe 2020 strategy (Headline indicators, an Integrated Framework of R&D&I Core Indicators and a Comprehensive set of Indicators for Science, Technology and Competitiveness), PIC has a set of strategic, programme level and operational indicators. Strategic (macro) performance indicators are divided into three blocks - social, economic, and competitiveness. The system of macro indicators was intended as a basis for modeling innovation-based and investment-oriented economies in the CIS states, as well as to monitor achievement of the PIC strategic goals.

Programme level indicators are meant to monitor ongoing programme activities and characterize the level of progress towards the development of innovation-based economies. They were formulated on the basis of basic national statistical STI indicators, calculated by the CIS member-states, as well as basic indicators of the EIS.

Moreover, the document previews operational indicators to track implementation of individual projects and activities.

With a view to promote and increase participation in PIC, the document previews the creation of National Contact Centers (NCC) in each of the participating CIS countries. PIC's NCC are supposed to provide information and consultative support to organisations and researchers willing to take part in PIC programmes, national and international scholarship programmes and educational activities in the sphere of innovation. Moreover, NCC are expected to sustain databases of contacts, partner and employee search tools, as well as to assure stakeholders' access to these databases. NCC also contribute to establishing business contacts and partnering of innovators – enterprises and organisations in the CIS countries. Providing feedback on the course of programme implementation, needs and difficulties that arise to the CIS Executive Committee is another task of NCC.

The best of international experience is also reflected in the PIC part concerning the support to centers of excellence – universities and research organisations – that will be identified in the CIS states in the beginning of Programme implementation. These centers will serve to test educational programmes for CIS innovation cooperation cadre.

Centers of excellence will be an element of the technological chain of the capacity building process, coordination of national research programmes and STI policy.

When it comes to execution, activities of the interstate targeted programmes are implemented on the basis of a road map, proposed by national contractors (agencies involved in PIC development) to the principal contractor. All customers (governmental agencies) and all contractors are invited to submit their proposals, while it is the customers who are ultimately responsible for approval of the road maps' structure, timeframe and costs.

These road maps form part of interstate targeted programmes and individual innovative projects, which were elevated to the programme status. Road maps are developed for each sub-programme, innovation project and PIC as a whole. The PIC contains also document offers a detailed action plan of activities necessary to launch the Programme, including monthly timeframe, customers and contractors.

The Programme is open for the world wide collaborative participation.

## Abstract

It is widely acknowledged that incubators are a technology transfer mechanism and a means of promoting entrepreneurship and the commercialization of new knowledge and innovations (Phillips 2002; Peters et al. 2004). The associational positive impacts of business incubators are usually measured by their contribution to job and wealth creation, outcomes resulting from accelerating the value-added process inherent in supporting small and medium sized enterprises (SMEs) which are the vehicle of an economy's growth potential (EC 2002). The indisputable importance of incubators has been the focus of much research since the mid 1980s placing emphasis on a number of main topics and research questions (see Hackett and Dilts 2004). One of the most important questions regarding the role of incubators and the incubation process relates to their effectiveness as a regional and local development strategy that might achieve economic growth and social cohesion among the peripheries of developed countries (Peck et al. 1996).

Recent research findings bring the spatial context into the analysis of the critical determinants for incubators' success, suggesting that it is favorable environments that will benefit the most by the presence of business incubators (Tamasy 2007). In line with this view, we argue that incubators might contribute to regional performance, subject to the existing regional endowments base. In other words, the operation of business incubators might enhance regional performance through the generation of multiplier effects but we might anticipate that these multiplier effects will be higher the more endowed a region is.

The present study undertakes a comparative analysis of the development of business incubators and technoparks in the BSEC member countries. We estimate three intensity indicators for business incubators and technoparks activity and use both a uniform and a weighted rank order of the BSEC member countries to illustrate regional differences in the intensity of incubation activity within the Black Sea. Exploratory analysis reveals that a region's endowments base differentiates its ability to benefit from additive effects generated by the presence and operation of business incubators.

## Keywords

Incubators, technoparks, regional performance, development strategy

# Technological Parks and Incubators in the Black Sea region

Prof. Panagiotis Liargovas

## 1. Introduction

One of the most important questions regarding the role of incubators and the incubation process relates to their effectiveness as a regional and local development strategy that might achieve economic growth and social cohesion among the peripheries of developed countries (Peck et al. 1996). The ways in which the impact of incubators might be measured and quantified depend upon the multifaceted nature of the incubator – incubation phenomenon that assumes a complex set of interrelationships, which -in addition- evolve dynamically through time. Lalkala (2002) sums up the evolution of the incubator concept in a three generations continuum. The 'first generation' incubators in the 1980s were essentially offering affordable space and shared facilities to carefully selected entrepreneurial groups. Business incubators of that mode were primarily concerned with assisting firms in reducing their fixed costs, which is a prerequisite for success and survival, at least during the early stage of a firm's establishment. In the 1990s, the need was recognized for supplementing the affordable work space with counseling, skills enhancement and networking services to access professional support and seed capital, for tenants within the facility and affiliates outside. This has led to the 'second generation' incubator. During this phase, the need of firms to cope with the risks associated with lack of, for example knowledge expertise and capital, has also become one of the major concerns of incubators. Starting in 1998, a new incubation model emerged in parallel, a model constituting the third generation of evolution. This is intended to mobilize ICT and provide convergence of support towards creating growth-potential, tech-based ventures (Lalkala 2002).

The empirical part of the study analyzes the incubation activity in the Black Sea member countries by bringing into the analysis three dimensions, namely the type of incubators, the intensity of their activity and the spatial context within which incubators are embedded. Two main types of incubators namely business incubators and technoparks are analyzed using 2010 data on the number of business incubators and technoparks, tenant firms and employees, derived from the Science Park and Innovation Center Association's (SPICA) Directory. The intensity indicators estimated, refer to the ratio of

tenants per incubator, employees per incubator and employees per tenant firm and are estimated for both the business incubators activity and technoparks activity. The rank position of Black Sea member countries is then produced using both a uniform and a weighted estimation of these intensity indicators.

The rest of the paper is organized as follows: part two briefly reviews the theoretical strands used to analyze the contribution of incubators to regional development. Part three is devoted to an analytical presentation of incubation activity in the Black Sea area. Part four builds an exploratory analysis of the regional variations in incubation activity across the Black Sea member countries, while part five concludes the paper.

## **2. Business incubators and regional development**

According to Phan et al. (2005), fruitful theoretical contributions regarding the assessment of the economic impact of incubators should consider multiple levels of analysis, including not only the type of incubated firms and the organizational level of incubators, but also the spatial context in which incubators are embedded and in which economic outcomes arise. The importance of the regional context has been implicit in the study of business incubators success, yet a theoretical basis for including it in studies evaluating the effectiveness of incubation activity is still lacking (Tamasy, 2007).

The role of the external environment as a prerequisite for incubators' success has recently been studied in Tamasy (2007) and Daskalopoulou et al (2010) to suggest that favorable environmental conditions will most likely enhance the successful performance of incubators. In the case of an unfavorable environment, successful incubators should be linked with superior leadership and planning. In line with this view, we argue that incubators might contribute to regional performance subject to the existing regional endowments basis. In other words, the operation of business incubators might enhance regional performance through the generation of additive effects and we might anticipate that these additive effects will be higher the more endowed a region is.

Following this, it is important here to present a more detailed discussion on the amount and types of resources that different incubators require, in order to have a clearer view on the possible differences in the sets of regional endowments that could also result into different effects. The most usual distinction between different types of incubators refers to technological parks, on the one hand, and business incubators, on

the other. This relates to first, the fact that technology business incubators are clearly differentiated from other types of incubators (Smilor and Gill 1986; 1987; Lichtenstein 1993; Melkers et al. 1993) and second, to the fact that technology business incubators are characterized by an inherent capacity for larger economic impacts through facilitating technology transfer (Mowery 1988; Malecki 1991; Phillips 1996; 2002).

Business incubators are centered on the lease of premises on favorable terms with all necessary communications and equipment installed, and the provision of help in finding production premises, organizing training and consulting. Technology parks on the other hand, are assigned for entrepreneurs developing and processing a technological idea, while granting them the necessary premises, infrastructure and consulting services (KTU, 2001).

To the extent that the establishment of an industrial estate requires fewer and, most importantly, qualitatively different resources compared to a technology center (EC 2002), different outcomes are to be expected in environments promoting each type of business incubators. Here we argue that incubators will most likely offer to their host regions (at a local, regional or even at the national level) an accelerated outcome of the region's pre-existing endowment level. In other words, we argue that the outcome of incubators is inherently linked to the resources embedded in their establishment as well as the wider resource base of a region.

### **3. The development of business incubators and technoparks in the Black Sea**

The development of business incubators and technoparks in the Black Sea member countries is analyzed in order to draw more conclusions with respect to the position of each Black Sea member country and in particular the regional variations among them. Data comes from the Science Park and Innovation Center Association's (SPICA) Directory for 2010 as well as domestic sources.

In 2010, a total number of 122 business incubators were recorded for the Black Sea member countries, (Table 1). The average number of business incubators per member country is almost 11, although this figure presents quite high variation across Black Sea member countries. The lowest number of business incubators is reported for Azerbaijan, with 1 business incubator in 2010, while Russia reports the highest number of business incubators, with a total number of 52 business incubators in 2010. Tenants amount to 3,797 firms, while employment amounts to 1,884 persons.

Similarly to the great variation observed as regards the total number of incubators, the number of tenant firms and the number of employees among Black Sea member countries, also present high levels of variation. Azerbaijan reports the lowest number of tenant firms (only 10) while Russia reports the highest number of tenants with a total number of 2,246 firms in 2010. As regards the number of employees, again Azerbaijan again reports the lowest number with only 12 employees while Russia reports the highest number of employees, a total number of 6,143 in 2010 (Table 1).

**Table 1. Distribution of business incubators, tenants and employees in Black Sea member countries**

<i>Country</i>	<i>Incubators</i>	<i>Tenants</i>	<i>Employees</i>
Albania	3	12	75
Armenia	2	33	650
Azerbaijan	1	10	12
Bulgaria	6	320	2,724
Georgia	3	14	125
Greece	5	44	140
Moldova	2	21	98
Romania	14	93	332
Turkey	14	512	3,627
Ukraine	20	492	4,914
Russia	52	2.246	6,143
<i>Descriptive statistics</i>			
<i>Total</i>	122	3.797	18.840
<i>Average</i>	11.09	345.18	1,712.72
<i>Minimum</i>	1	10	12
<i>Maximum</i>	52	2.246	6.143
<i>St.deviation</i>	14.93	659.77	2,253.32

Source: SPICA Directory and domestic sources



As regards technoparks, it should be noted that the performance of Black Sea countries is very poor. Only five countries report technoparks in 2010: Greece, Turkey, Ukraine, Armenia and Russia. Their total number in 2010 amounts to 22 parks. The average number of technoparks per member country is around 4.4. The lowest number of technoparks is reported for Armenia, which reports only 1 park, while Turkey reports the highest number of technoparks, a total number of 8 for 2010. The number of tenants amounts to 1,407 firms, while employment amounts to 18,694 persons. (Table 2). The lowest number of tenant firms in technoparks is reported by Armenia with only 13 tenants while the highest number of tenants is reported for Turkey with a total number of 849 tenant firms. As regards the number of employees, the lowest number is reported for Greece with 384 employees and the highest number of employees is reported for Turkey with a total number of 9,650 employees (Table 2).

**Table 2. Distribution of technoparks, tenants and employees in Black Sea member countries**

<i>Country</i>	<i>Technoparks</i>	<i>Tenants</i>	<i>Employees</i>
Greece	5	83	384
Turkey	8	849	9,650
Ukraine	3	342	3,210
Armenia	1	13	450
Russia	5	120	5,000
<i>Descriptive statistics</i>			
<i>Total</i>	<i>22.0</i>	<i>1,407.0</i>	<i>18,694.0</i>
<i>Average</i>	<i>4.4</i>	<i>281,4</i>	<i>3,738.8</i>
<i>Minimum</i>	<i>1.0</i>	<i>13,0</i>	<i>384,0</i>
<i>Maximum</i>	<i>8,0</i>	<i>8,0</i>	<i>8,0</i>
<i>St.deviation</i>	<i>2,6</i>	<i>340,3</i>	<i>3,836.8</i>

## 4. The potential outcome of incubation activity in the Black Sea

This part is devoted to an exploratory analysis of incubation activity in the Black Sea member countries in an attempt to identify differences in the ability of regions to generate multiplier effects by the operation of incubators. To that extent, we utilize a three-dimensional context in order to approximate potential differences in the ability of regions to benefit from incubators. These dimensions refer to the type of incubators supported, the intensity of incubation activity and the spatial context.

The type of incubators, i.e. first versus third generation incubators can provide us with information on both the type of start-ups supported and the organizational forms assumed by the incubators. Business incubators fall into the first generation of incubators while technoparks represent the third generation of incubators. An analysis of countries supporting one or the other type of incubators can provide us with information on the country's catching up level with evolution in the field.

The second dimension involving the intensity of incubation activity can provide us with information regarding the volume of output that is anticipated by the operation of incubators. In that sense, the higher the number of employees per tenant, the higher the number of jobs created whereas the higher the number of tenants, the higher the probability of firms graduating from an incubator. Three such intensity indicators are estimated and used here based on available data.

The third dimension involves the spatial context in which incubators are embedded and in accordance with the relevant literature, it refers to the role of favorable environments as opposed to less favorable ones. While acknowledging the regional differences existing at the national level, here we are interested in the differences between Black Sea member countries. Thus, at an aggregate level, we approximate the wider socio-economic development of each member country by its wealth, i.e. by its per capita GDP which can give us a more informative view on the ability of regions to benefit from incubation activity in their context.

Data on the different types of incubators, i.e. information on the first dimension of the analysis undertaken here, are directly available by the SPICA category and summarized in tables 1 and 2 presented above. Information on the intensity of incubation activity, i.e. information on the second dimension of our analysis, is derived here through the estimation of three indicators. Based on available data, three intensity indicators are estimated for each Black Sea member country using the following ratios {1} – {3}:

**Intensity indicators:**

$\frac{\text{Number of tenant firms}}{\text{Number of incubators}}$	(1)
$\frac{\text{Number of employees in tenant firms}}{\text{Number of incubators}}$	(2)
$\frac{\text{Number of employees in tenant firms}}{\text{Number of tenant firms}}$	(3)

The above ratios can be used to illustrate differences in the scale of incubators' operation and can better capture variations among countries. In order to analyze the potential performance of business incubators as capable of generating regional multiplier effects, given the environment within which they operate, i.e. in order to provide information on the third dimension of the analysis undertaken here, we have, at a second stage, weighted these intensity indicators using per capita GDP as a proxy for a country's ability to benefit in the long-run by the presence and operation of business incubators. Intensity indicators are weighted by a 1.3 factor in the case of countries with a per capita GDP that is higher than the Black Sea average while a 0.7 factor is used in the case of countries with a per capita GDP that is lower than the Black Sea average<sup>19</sup>. These weighting factors are somewhat arbitrary chosen but the aim here is to illustrate the role of the wider developmental level of countries, without imposing weighting factors that would completely alter their categorization, especially since these factors can not be drawn by information on the relative performance of business incubators among the Black Sea member countries<sup>20</sup>. Thus, assuming that an impact factor of 1 can be attributed to the operation of business incubators in general, a higher than 1 impact is to be expected in the case of most developed countries and a smaller than 1 impact is to be expected in the case of the less developed Black Sea member countries. The development 'distance' between the two groups of member countries might be proxied by the distance in their weighted impact factors.

Table 3 reports the intensity indicators estimated for the Black Sea member countries using the ratios (1) to (3). The last rows of this table present some descriptive statistics

<sup>19</sup> The intensity scores of the Greece, Turkey, Russia, Bulgaria and Romania are weighted by the 1.3 factor while the 0.7 factor is used in the case of all other member countries.

<sup>20</sup> It is important to note that the same factors could have been used in the case of other equally important proxies such as human capital, the level of R&D expenditures, etc.

of the observed intensity of incubation activity. As shown, an average of around 20 tenant firms corresponds to each business incubator in the Black Sea member countries. High variation in terms of this intensity indicator, is manifested as Albania holds the last position among the Black Sea member countries with an average of only 4 tenants per business incubator whereas Bulgaria presents an average of 53.3 tenants per business incubator. It is important that a number of countries report scores that are either much higher or much lower to the average value of this intensity indicator for the Black Sea as a whole (Table 3).

**Table 3. Intensity indicators of business incubators' activity in the Black Sea, 2010**

<i>Country</i>	<i>Tenants/ Incubator</i>	<i>Employees/ Incubator</i>	<i>Employees/ Tenants</i>
Albania	4	25	6.25
Armenia	16.5	325	19.70
Azerbaijan	10	12	1.2
Bulgaria	53.3	454	8.51
Georgia	4.6	41.6	8.92
Greece	8.8	28	3.18
Moldova	10.5	49	4.66
Romania	6.65	23.7	3.56
Turkey	36.57	259.07	7.08
Ukraine	24.6	245.7	9.98
Russia	43.19	118.13	2.73
<i>Descriptive statistics</i>			
<i>Average</i>	19.88	143.74	6.89
<i>Minimum</i>	4	12	1.2
<i>Maximum</i>	53.3	454	19.70
<i>St.deviation</i>	17.15	152.36	5.10

*Source: Author's calculations*

As regards the employees per business incubator ratio, on average 143.74 employees correspond to each business incubator in the Black Sea member countries (Table 3).

Azerbaijan and Bulgaria hold the lowest and highest values respectively. Azerbaijan holds the last position among the Black Sea member countries with only 12 employees per business incubator whereas Bulgaria holds the leading position with an average of 454 employees per business incubator. Few countries are close to the average value of this intensity indicator.

The last intensity indicator estimated refers to the ratio of employees per tenant firm. As regards this ratio, on average 6.89 employees correspond to each tenant firm hosted in the business incubators of the Black Sea member countries (Table 3). The lowest value in terms of this indicator is reported for Azerbaijan with an average of 1.20 employees per tenant firm while Armenia holds by far the highest position with an average of 19.70 employees per tenant firm. It is important that many countries are close to the average score of this intensity indicator (Table 3).

Using the relationships (1) – (3) the three intensity indicators have also been estimated in the case of technological parks. Results are reported in Table 4, showing the relative intensity of the activity of technoparks in the five Black Sea member countries. As regards the tenants per technopark ratio, on average 54.75 tenant firms correspond to each technopark in the five Black Sea member countries. High variation in terms of this intensity indicator is manifested, as Armenia holds the last position among the five Black Sea member countries with an average of only 13 tenants per technopark whereas Ukraine presents an average of 114 tenants per technopark.

As regards the employees per technopark ratio, on average 761 employees correspond to each technopark in the Black Sea member countries (Table 4). Greece shows the lowest average value with 77 employees per technopark whereas Turkey shows the highest average value with 1206 employees per technopark. Estimated scores for this intensity indicator vary considerably. From the other countries, no one is close to the average value of this intensity indicator.

The last intensity indicator refers to the ratio of employees per tenant firm. As regards this ratio, on average 20.33 employees correspond to each tenant firm hosted in the technoparks of the Black Sea member countries (Table 4). The lowest value in terms of this indicator is reported for Greece with an average of 4.64 employees per tenant firm while Russia holds by far the highest position with an average of 41.67 employees per tenant firm.

**Table 4. Intensity indicators of business incubators' activity  
in the Black Sea, 2010**

<i>Country</i>	<i>Tenants/ tecnopark</i>	<i>Employees/ technopark</i>	<i>Employees/ Tenants</i>
Greece	16.60	76.80	4.63
Turkey	106.13	1,206.25	11.37
Ukraine	114.00	1,070.00	9.39
Armenia	13.00	450,00	34.62
Russia	24.00	1,000.00	41.67
<i>Descriptive statistics</i>			
<i>Average</i>	54.75	760.61	20.33
<i>Minimum</i>	13.00	76.80	4.63
<i>Maximum</i>	114.00	1,206,25	41.67
<i>St.deviation</i>	50.73	478.46	16.63

*Source: Author's calculations*

Tables 5 and 6 bring together the second and third dimension of the analysis undertaken here for the business incubators and technoparks activity, respectively. Based on the intensity scores, the uniform rank position of the Black Sea member countries is drawn and is reported under the uniform score column per each intensity indicator (uniform rank position columns, Tables 5 and 6). The rank position of countries based on the weighted intensity indicators is drawn then and is presented under the weighted column per each intensity indicator (weighted rank position columns, Tables 5 and 6). The last two columns show the total ranking of uniform and weighted calculations. Lower numbers represent rankings.

We see that high level intensity of the business incubators' activity in terms of all the three indicators analyzed here can be reported for three countries namely Bulgaria, Armenia, Ukraine and Turkey. In all these countries total ranking is less or equal to 11. Medium level intensity might be assumed in the case of countries with a total ranking which is greater than 11 and less or equal to 20, e.g. Russia, Moldova, Georgia. Finally, low-level intensity is observed in the case of countries, which report total ranking greater than 20. Most of these countries show low intensity in two out of the three or

in all three of the indicators, e.g. Greece, Albania, Romania (Table 5). Under this uniform categorization, it seems that three Black Sea member countries hold leading positions while some other member countries are ranked quite low in terms of the intensity of operation in business incubators (Table 5).

This picture however changes when the weighted indicators are considered. Interestingly when the country's level of development is brought into the analysis the resulting categorization of countries significantly changes (Table 5). This is more evident when we compare the last two columns of Table 5. Bulgaria and Turkey improve their position, while Ukraine worsens it. Greece also improves its position being in the second group, while Albania, Georgia and Azerbaijan worsen theirs.

**Table 5. Ranked position of Black Sea member countries-business incubators; intensity indicators**

	Tenants/ incubator		Employees/ incubator		Employees/ tenants		Total	
	Uniform	Weighted	Uniform	Weighted	Uniform	Weighted	Uniform	Weighted
Bulgaria	1	1	1	1	4	2	6	4
Russia	2	2	5	5	10	9	17	16
Turkey	3	3	3	2	5	3	11	8
Ukraine	4	4	4	4	2	4	10	12
Armenia	5	5	2	3	1	1	8	9
Moldova	6	8	6	7	7	10	19	25
Azerbaijan	7	9	11	11	11	11	29	31
Greece	8	6	8	6	9	8	25	20
Romania	9	7	10	8	8	6	27	21
Georgia	10	10	7	9	3	5	20	24
Albania	11	11	9	10	6	7	26	28

*Source: Author's calculations*

The rank position of the Black Sea member countries with respect to the activity of technoparks has also been estimated using the intensity scores, and is shown in Table 6. Under the uniform intensity indicators, the rank position of countries is rather

smooth, as it does not significantly change when considering the three indicators, the only exception being Armenia. The leading position of Turkey, Ukraine and Russia is shown in terms of all the three intensity indicators considered. It is important to note that when we use the weights Turkey and Russia take the lead compared to Ukraine (Table 6).

**Table 6. Ranked position of Black Sea member countries-technoparks, intensity indicators**

	Tenants/ technopark		Empl/technopark		Empl/technopark		Total	
	Uniform	Weighted	Uniform	Weighted	Uniform	Weighted	Uniform	Weighted
Ukraine	1	2	2	3	4	4	7	9
Turkey	2	1	1	1	3	3	6	5
Russia	3	3	3	2	1	1	7	6
Greece	4	4	5	5	5	5	14	14
Armenia	5	5	4	4	2	2	11	11

*Source: Author's calculations*

Bringing together the above, a major conclusion is that the most developed countries are the ones expected to benefit the most by the activity of incubators. This conclusion draws even beyond the obvious gap between the more developed Black Sea members that are faster in moving into the third generation of incubators, and admittedly those that might produce more qualitative outcomes in the long run, to hold even for the less advanced types of incubation activity as shown for the anticipated effects of business incubators in more favorable environments.

## 5. Conclusion

The EU acknowledges incubators as a very cost-effective instrument for the promotion of public policy objectives judging from findings regarding the relatively low cost per job and other less easily quantifiable benefits that they demonstrate (EC 2002).

While acknowledging that available data can only be indicative of the wider context pertaining the development of incubators in each of the Black Sea member countries, some illustrative conclusions might be drawn. The first one regards Black Sea countries,



which seem to place emphasis on the development of business incubators, in contrast to technoparks. The second one relates to the differential ability of countries to generate multiplier effects. The exploratory analysis undertaken here reveals that the intensity of incubation activity might be further accelerated within more favorable environments whereas in less favorable environments more effort might be needed. Thus, the relative position of countries is indeed subject to their position with regard to their existing base of endowments.

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## Abstract

This paper provides the feasibility study of the development of a virtual structure for the BSEC in order to foster their innovation process. Taking into consideration a qualitative and quantitative research that we conducted via desk research of the national contact persons, individual and group interviews with researchers and persons active in the RTD systems of the countries (policy makers, intermediaries), and through the completion of a structured questionnaire especially designed for this purpose, we argued that the idea for a Black Sea Innovation Centre in a physical structure is highly costly and thus not economically feasible. Therefore, the development of a virtual network is proposed, the virtual Black Sea Innovation Centre, which will be flexible and efficient, in order to make policy recommendations, promote similar activities throughout the transition economies and share lessons learned and experiences gained within the member States of BSEC, foster the exchange of experience by similar organizations, and lessons drawn, and be a gateway-platform for knowledge and innovation to the region. Moreover, with regards to policy making, recommendations will be provided for addressing existing problems associated with the lack of support structures and for adapting relevant actions to enhance the role of intermediaries in the National Innovation Systems of the Black Sea countries.

Well known experts agree that innovation has a central role in the advancement of national economies. (Schumpeter, 1942; Solow, 1956; Abramovitz, 1956 and 1986; Romer, 1990). The national environment plays a crucial role to instigate, facilitate, or prevent innovative activities of the actors related to the innovation process. Therefore, the concept of National Innovation Systems is particularly suitable as a starting point for the analysis of the research conducted in this paper. The NIS approach stresses that understanding the linkages among the actors involved in the innovation process is the key to improve innovative performance of a country (Lundvall, 1992; Nelson, 1993). Under this perspective, the innovation process is the result of a complex set of relationships among actors which are producing, distributing and applying various types of knowledge that is why NIS concepts have emphasised the importance of systemic co-operation in innovation processes. Therefore, a major concern in this paper is how an effective national setting of major innovation actors can be formulated and how to motivate information flows among them in order to generate and appropriate innovation effectively.

## Keywords

Innovation Centres, BSCE initiatives, Policy making.

# A virtual Black Sea Innovation Center

Dr. Ioannis Bakouros and Dr. Elpida Samara

## 1. Introduction

This paper provides a pre-feasibility study for the development of a virtual structure in the Black Sea Area in order to foster their innovation process. Taking into consideration a report which was conducted for the program "Research Potential of the Black Sea countries" (International Centre for Black Sea Studies -ICBSS, 2006), it is argued that the idea for a Black Sea Innovation Centre in a physical structure is highly costly and thus not economically feasible. Even more the expected results, are foreseen very poor especially in todays age of such a development of Information and Telecommunication Technologies (ICTs). Therefore, the development of a virtual network is proposed here, the "Virtual Black Sea Innovation Centre" (VBSIC), which will be flexible and efficient, in order to make policy recommendations, promote similar activities throughout the transition economies and share lessons learned and experiences gained within the member States of Black Sea Economic Cooperation (BSEC), foster the exchange of experience by similar organizations, and lessons drawn, and be a gateway-platform for knowledge and innovation to the region. Moreover, with regards to policy making, recommendations will be provided for addressing existing problems associated with the lack of support structures and for adapting relevant actions to enhance the role of intermediates in the National Innovation Systems of the Black Sea countries.

As it has been very clearly explained in a number of researches (Samara, 2010) Innovation Centres always play a deceive role in the development of National Innovation Systems and they are major parameters for the sustainability of such systems. The challenge we are facing in BSEC region, as explained in the following paragraphs, is that there are a lot of fragmental approaches and initiatives towards the development of such Innovation System in the area. A holistic approach should be adopted and networks of such Innovation Centres could support to the better understanding of NIS and facilitate the elaboration of such Systems by learning from each other. The cooperation in between them will have multiply positive results towards the development of comprehensive NIS in each country.

In the next sections a theoretical overview of the concepts of innovation and National Innovation Systems (NIS) is provided and indicates their importance within

a national context for BSEC Countries. Then a discussion on intermediate structures and particularly Innovation Centres (IC) follows in Section 3, and their role in a NIS is analysed. Innovation Centers could support the better understanding of NIS and facilitate the elaboration of such Systems by learning from each other. Section 4 presents the pre-feasibility study that was assigned with the purpose of investigating the possibility of establishing a Virtual Black Sea Innovation Centre (VBSIC). Actually a network of IC is proposed and that because the cooperation in between them will have multiply positive results towards the development of a comprehensive NIS in each country. The paper concludes with a discussion on the findings and a comment on the pre-feasibility study for the Virtual Black Sea Innovation Centre (VBSIC).

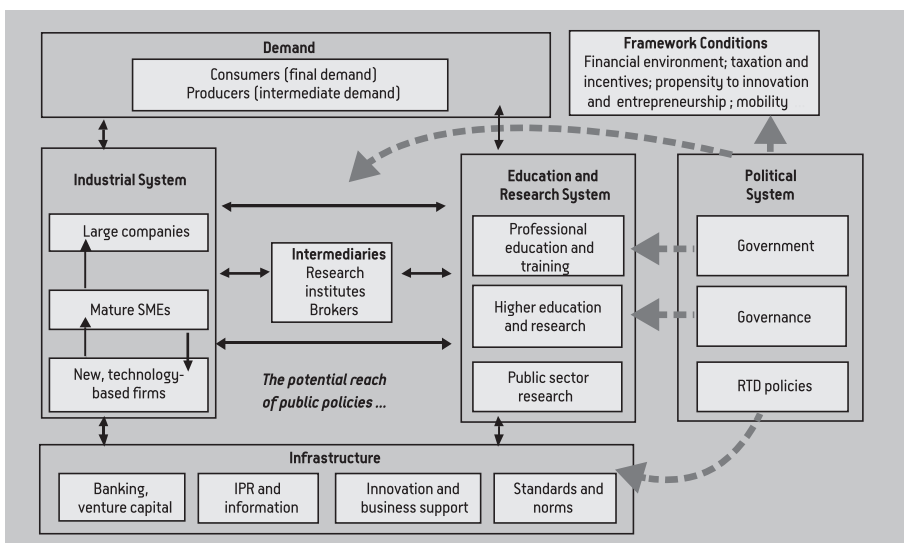
## **2. The role of Innovation and National Innovation Systems**

Innovation through the creation, dissemination and use of knowledge has become the heart of modern economies [OECD, 1995]. Nevertheless, the determinants of innovation performance have changed in the knowledge-based economy internationally, partly because of recent developments in information technology and communication [OECD, 2000]. The characteristic of innovation is the fact that, while competition is its driver, it cannot develop without cooperation, sometimes even between competing firms [Porter, 1990]. Innovation no longer depends on the performance of companies, universities, research organizations and governments. Innovation comes from strong interactions at local, national and global level between the above bodies.

Innovation is not only an individual act of learning on the part of one company or another entity, but it is situated within a larger system that both allows and causes the innovation process. Thus, an innovation system includes all main actors and institutions that contribute to the creation, development, dissemination and use of innovations, as well as the interfaces and the interactions of all these actors and institutions [Claire Nauwelaers & René Wintjes, 2000].

The process in which innovations are developed does not follow a linear path [Kline/ Rosenberg, 1986, Edquist 1997 and 1999], but is characterized by complicated feedback mechanisms and relations involving science, technology, learning, production, agencies, institutes, policy makers and demand [Edquist, 1999]. The 'National Innovation Systems' is the most common approach used in the past decade in understanding the complex relationships which constitute the innovation process (see for example in Andersen et al., 2000; Lundvall, 1997:73; McKelvey, 1991: 117; Niosi, 2002:300).

As shown in Figure 1, a National Research and Innovation System comprises not only a set of different actors, but also linkages that influence the performance of the system. Experts agree that economic well being is founded on well-functioning National Research and Innovation Systems in which both the actors and the linkages between them perform well.



**Figure 1: Mapping National Research and Innovation Systems**  
**(Source: Stefan Kuhlmann and Erik Arnold, 2001)**

Generally, the idea of NIS is a guideline for economic success in today's information age, which is mainly based on the fact that innovation is a dynamic process with interactions, where institutions and organizations communicate, collaborate and interact (Lundvall, 1992). *Therefore, the understanding of the interconnections between the institutions and organizations involved in innovation is the key to improving innovative performance (Freeman, 1987).* Indeed, such interactions regarding technological development are as important as investment in R&D.

## 2.1 The Bridging Institutions within an NIS

Bridging institutions, which are also known as "intermediates", act as intermediaries between governments and the performers of research in an NIS (Lundvall, 2000). They are organizations with intent to help in the transfer of knowledge, know-how

and technology, by implementing the appropriate managerial practices (for example organization methods, financing and marketing) to all of those who have developed or plan to develop innovations. Such structures may include interconnected networks (clusters) of enterprises and R&D organizations, Innovation Centres, scientific and technological parks, Business Innovation Centres, Incubators, spin-offs, sector specific companies, etc. These mechanisms may differ because of the sector or the geographical region, the specific necessities or the shaped conditions (for example the climate, the local demand, the existence or not of a research centre, the availability of human resources, etc).

A well-developed, efficient and effective infrastructure of bridging institutions may greatly enhance the national innovative capacity of an economy (Furman et al., 2002). Furman et al., (2002) motivated by the observed differences in innovation intensity across advanced economies, present an empirical examination of the determinants of country-level production of international patents. They introduce a novel framework based on the concept of national innovative capacity. National innovative capacity is therefore defined as the ability of a country to produce and commercialize a flow of innovative technology over the long term. Figure 2 presents the national innovative capacity framework.

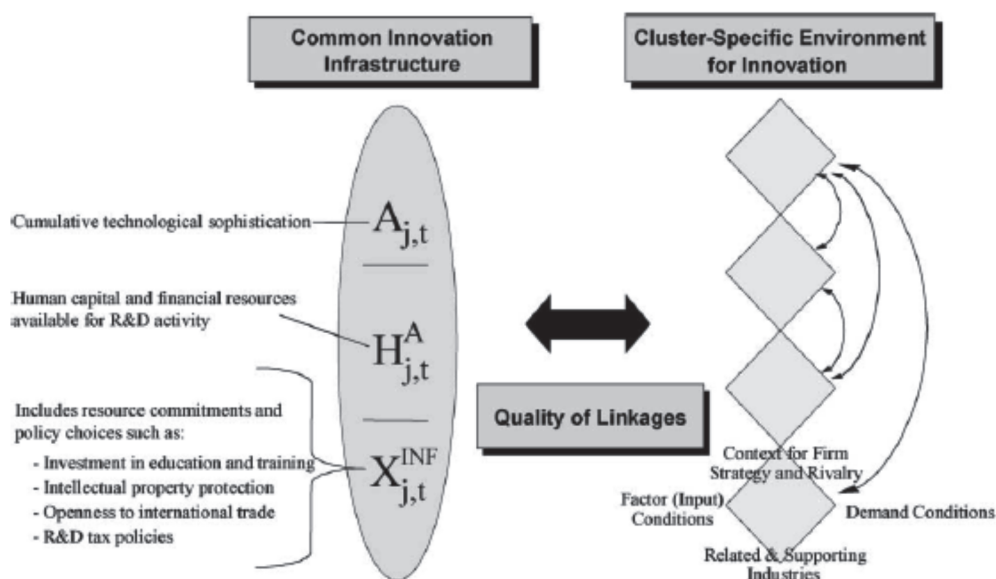


Figure 2: National Innovation System Framework (Furman et al., 2002)

## **2.2 National Innovation System in the Black Sea Region**

Innovation plays a central role in the evolution of the national S&T systems and the economic advancement of the BSEC region. Furthermore, research and innovation need a favourable and stable regulatory environment to attract private investment and to carry new ideas to the market. Most of the BSEC countries have developed or are in the process of developing innovation structures such as technology parks, incubators etc. At the same time they are putting significant efforts to improve the regulatory environment and to build the institutional infrastructure for the proper functioning of national innovation systems. Although many regulatory and administrative practices affecting research and innovation rest largely on the responsibility of each BSEC Member State, there is still room for the exchange of good practices among the BSEC countries (ICBSS, 2006).

Taking into consideration the study of Furman et al., (2002) analyzed above three basic determinants has to be in place for a national innovative environment to develop. These determinants have to be an integral part of the socioeconomic environment and cannot be easily manipulated by policy in the short run. They are a short of prerequisites related to dynamic economic and social conditions and promoting growth and job creation. Such determinants and their presence in the BSEC area countries are discussed below:

### **2.2.1 Common Innovation infrastructure**

Most of the BSEC countries have developed or are in the process of developing innovation structures such as technology parks, incubators etc. At the same time they are putting significant efforts to improve the regulatory environment and to build the institutional infrastructure for the proper functioning of national innovation systems. Although many regulatory and administrative practices affecting research and innovation rest largely on the responsibility of each BSEC Member State, there is still room for the exchange of good practices among the BSEC countries.

The establishment of a research infrastructure that is up-to-date and accessible to all interested parties has been a challenge for a number of nations. Government funding is the most common source for research infrastructure, even though there is a number of private organizations that do invest substantial amounts in infrastructure (in this case their resources are not available to everyone). BSEC could exploit the specialization of different regions in different research areas that occurred during the central planning years in some of the countries in order to create centers of excellence and further develop the infrastructure available there.



It is easily understood that technological innovation is dependent upon primary research. What is maybe not obvious is that to foster innovation a history of research is necessary. It has been shown many times at the national as well as regional level that universities with long standing traditions in research excellence have lead the way to innovation and growth in the region. The same effect can be seen in the economies of regions that have one or more large research centers or private companies that focus on research and development. The reason is that such nucleus of research creates a multiplier effect with a) spillover of technology and know-how, b) the attraction of knowledgeable employees and researchers c) synergies that are promoted by the cooperation and circulation of knowledge. All these create the foundation of the innovative culture that has proven to be one of the driving forces of development. It is important to note that country members of the BSEC have a long-standing tradition in education and research excellence. This research tradition, even in situations where it has been dormant for the past decade, gives these regions a competitive edge that can help the efforts of promoting a dynamic and innovative environment.

Related to the quality of the research in a region is the quality of the human capital. Skilled and experienced researchers with a proven record on innovation can be found in many research institutions in the BSEC countries. The level of this human capital is often unsurpassed and even though in some cases it is not employed to its full potential at the moment, it provides a valuable resource to foster innovation. Improving the human capital of a region has been a main concern for policy makers. A series of measures have been employed to achieve this. Some involve linking universities to businesses and promoting internships and research grants for cooperation, gearing education to the themes of research in the region, facilitating retraining and continual education etc.

Finally, concentration of resources and specialization in research is another element of the innovation process. Regions have been much more effective in promoting research in industries that are relevant to their cultural particularities, traditions, available natural and other resources. This concentration of knowledge allows for cooperation and dissemination of knowledge and has often created a snowball effect that propelled the region to innovation hothouse status. The most pronounced examples of this are the region of the Silicon Valley and Boston in the US. Among the BSEC countries there are regions with tradition in research in specific fields and even though they are not all countries at the same level of research, the concentration and specialization gives regions a competitive advantage.

### 2.2.2 Industrial clusters

Clusters are groups of inter-related industries that drive wealth creation in a region, primarily through export of goods and services. In another words (Porter, 1998) "Geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (for example universities, standards agencies, and trade associations) in particular fields that compete but also co-operate."

The use of clusters as a descriptive tool for regional economic relationships provides a richer, more meaningful representation of industry drivers and regional dynamics than do traditional methods. An industry cluster is different from the classic definition of industry sectors because it represents the entire value chain of a broadly defined industry from suppliers to end products, including supporting services and specialized infrastructure. Cluster industries are geographically concentrated and inter-connected by the flow of goods and services, which is stronger than the flow linking them to the rest of the economy. Clusters include both high and low-value added employment.

The aggregation of small and medium enterprises (the vast majority of the enterprises in the BSEC region) engaged in related activities into industrial clusters is a phenomenon found in both industrialized and developing economies. There is plenty of evidence, going back a century or more, to suggest that clustering generates static advantages for the participating agents. More interesting, is the claim that industrial clusters are conducive to innovative change and sustainable growth. An understanding of the mechanisms and features that make some clusters successful would be valuable for the promotion of small-firm industrial development in the Black Sea Region.

### 2.2.3 Strength of linkages

The real challenge for the policy makers is to use the best from each country and establish a culture of cooperation between institutions for the promotion of innovation in the entire region. There are a number of measures that have attempted to achieve this goal. Supporting mechanisms that facilitate innovation and the passing from research to products include the establishment of Innovation Centres, technology transfer offices, technology parks and incubators as well as allowing for alternative ways of financing. The establishment of a Black Sea Innovation Centre (BSIC) that would support, coordinate and encourage innovation within the BSEC region, was an idea introduced along this line of thinking. The rationale behind this idea was that such a Centre could contribute to developing research and technological cooperation among

BSEC Member States and countries of the West, and promote the commercial utilization of domestic innovations. It was envisaged as an instrument to help reduce the brain drain phenomenon of the BSEC region by creating a unified research space in the region. In order to examine the feasibility of such an endeavour a study was commissioned to a consultant company. After providing an analysis of the external environment of the region, the study would propose the alternative financing scenarios and indicate funding options for each scenario.

### **2.3 The need for bridging institutions in the BSEC countries**

From the above analysis we can see that the economic, geo-political and business environment of the BSEC regions is at present experiencing a pressing need for well-developed and diverse support mechanisms and initiatives, both as a whole as well as in terms of individual states and regions therein. These initiatives will allow and facilitate the restructuring and reorientation of the enormous potential of these regions and will support their business, technology and human resources by adopting and exploiting the services they offer.

The International practice has indicated that the establishment of Innovation Centers, as support mechanisms, in both the trans-national and trans-regional levels, not only stimulates business activity in general, but also fosters the development of closer trans-regional and trans-national business relations, which in turn, brings multiple benefits to the region where such centers are operating (Edquist, 1997). Therefore, the establishment of a Virtual Black Sea Innovation Centre (VBSIC) that would support coordinate and encourage innovative factors within the BSEC region, is an idea introduced along this line of thinking. More precisely, in order to eliminate difficulties and to support promising business ideas that are based on innovations, special-supporting mechanisms should be developed through various instruments under the umbrella of a regional innovation center, like the proposed VBSIC.

The BSEC countries have a wealth of human capital, know-how, and technological innovation that remains untapped. This is largely due to the lack of a coordination mechanism that would:

- a. educate the local governments and policy makers on the benefits of Innovation
- c. group, chart and organize the knowledge and skill inventory of the region and the specialization in certain areas and
- d. maybe most importantly, match the region's potential and know-how with interested

parties (foreign investors, governments, international organizations, research institutions) in a “one-stop-shop” in order to achieve cooperation, financing, research, business joint ventures and/or foreign direct investment.

### **3. The “Virtual Black Sea Innovation Centre” (VBSIC)**

#### **3.1 The mandate**

The Virtual Black Sea Innovation Center will be a flexible structure with the mandate to promote growth in the BSEC region through Innovation and Technology Transfer. It will employ all international best practices in the area of innovation management and high technology and will assume a leading role on the promotion of innovation in these countries. It will take advantage of state-of-the art communication and Internet technologies to expand its presence in a cost-effective way requiring small initial investment. The Black Sea Innovation Center will be a Virtual Center. More over, adapting modern managerial practices, it will outsource most of its services to external experts of the country members.

At full development, VBSIC will be the “one-stop-shop” for innovation offering its services to governments and policy makers, foreign investors, scientists form within and outside the BSEC area. VBSIC will also be the focal policy advisory mechanism providing services to governments and the BSEC Board of Directors on Technology Forecasting, studies, negotiation assistance with EU etc.

#### **3.2 A phase-in process**

Establishing an innovation centre under the wings of a regional organization is a difficult undertaking. International experience has shown that phasing-in such an organization is a more appropriate way to establish it. For that, we propose that the establishment of the VBSIC has at least 2 phases.

During phase I VBSIC will be established under the auspices of the ICBSS and will exploit the benefits and cooperation of it in its first steps. In this first face the Centre will take advantage of telecommunication technology to become known and established within the international community (through the Internet) and to provide its services in a virtual manner. During this time the focus of the Centre will be in the policy and development of infrastructure areas while the rest of its services will be contracted out to outside experts and consultants. In phase II, VBSIC will have the resources to sustain

in-house expertise for its activities. Phase II requires for the Centre to have achieved a critical mass that will allow it to co-finance its operations. In addition, funding from the countries-members will be secured for the services that do not generate revenue.

This two-phase approach has a number of advantages, namely that it would allow for a) a swift start with no large capital investment necessary, b) the learning curve to be completed sooner c) time to become known and therefore secure financing.

Taking the above into consideration and trying to minimize the initial investment required the following plan is proposed.

### **3.3 The Structure**

As mentioned above, the VBSIC will be established under the auspices of ICBSS with its head office located in Athens, Greece. This is due to a number of reasons such as proximity to the ICBSS, access to ICBSS resources and network of associates, advantages of being established in an EU country etc. It is preferable to have the head office of VBSIC located in close physical proximity to the ICBSS to promote cooperation and synergy of resources.

The proposed administrative structure was designed to achieve a two fold purpose, namely, to be autonomous and flexible enough able to make decisions swiftly and timely actioning in a competitive way, employing innovative ways of working and yet maintaining close links to the BSEC mandate, its Board of Directors and the goals of the ICBSS. To achieve the above goals a lean structure (at least for Phase I of the project) with the following characteristics is proposed.

Since the project approval the BSEC Board of Directors will elect a VBSIC Project Committee. The committee could consist of four (4) members of the board of BSEC, up to two (2) external experts and a representative of ICBSS. The VBSIC Project Committee will have the sole responsibility of undertaking all necessary actions for the establishment and development of the VBSIC. The VBSIC Project Committee should have reasonable regional representation.

The manager of the VBSIC will be appointed based on his/ her qualifications. She/He will be responsible for the day-to-day operation of the IC, the implementation of the Board's decisions, project management, cooperation with all committees and experts, selection of experts and cooperator (subject to board approval), as well as all finances, reporting etc. The manager will report to and be assisted by the Steering Committee. The committee will consist of experts in the field of innovation and technology transfer.

President of the Steering Committee will be the Director General of IBCSS.

The Head Office of the BSEC-IC will be located, as discussed in Athens, in Greece. In order to move swiftly, the possibility of an office to be established within the premises of the ICBSS office should be looked at favorably. This would allow for economies not only in space and equipment but also for closer cooperation and guidance in the first steps of the project. With the completion of phase I, and the securing of further financing from government sources as well as revenue from own activities the IC office might be expanded and therefore be moved to a different location.

### 3.3.1 The *Network of Antenna* Offices

One of the most important elements of the proposed structure is the establishment of offices, antennas in all BSEC countries as well as cooperators in other EU or non-EU countries. The antennas will be existed offices, institutions, organizations, etc. that are part of the existing technology transfer infrastructure. The analysis in the first sections of this report has shown that in all BSEC countries there is some infrastructure in the form of Innovation Centers, Technology Parks and Technopoles, University liaison offices or private technology transfer companies etc. More over, in most countries there are associations of consultants, chambers of commerce, world organization offices and representatives, and investor's scouts. A listing of such institutions can be easily accessible to everyone.

VBSIC will seek cooperation with at least one such institution in every country. The selection will be based on the activities, experience, and scope of each institution. In regions (within countries) that have specializes research facilities or tradition in a sector, or that are deemed important for some for the purposes of VBSIC a second or third antenna office will be selected.

The main office, in Athens will provide them with privileged information on all activities of the network and through it the antennas will expend their cooperation within all the BSEC countries. In return the antenna offices will have the obligation of performing certain tasks as representatives of the VBSIC in their country/region. They will have the obligation to represent VBSIC in their countries and disseminate its scope and activities, cooperate with the members of the Steering Committee and the Manager in projects, provide information and other research resources available to them, search and match technology projects with the technology projects of other cooperating antennas etc.

### 3.3.2 VBSIC initiatives

The initiatives that the VBSIC will provide will be gradually developed as the IC matures and the introduction of new services will be based on strategic goals and decisions of ICBSS. Some of the services proposed for the first 2 years of the VBSIC could fall into 4 basic categories:

#### *General studies*

VBSIC will commission studies that are in accordance to its priorities in each country, fall into its mandate, and could be of strategic use for the Centre or BSEC. Studies could also be assigned to VBSIC by international organizations or governments. The promotion of this service that, will generate revenue for the Centre, will be the responsibility of the Manager and the Steering Committee.

#### *Policy advice*

A Policy Advice Group (PAG) will be formed with policy makers and experts from the entire region. The Group will meet regularly and discuss issues relating to innovation in the BSEC region. PAG will be in position to advise local governments, suggest policy to the Board of Directors of BSEC and issue policy guidelines on issues relating to innovation. The main issues that would be addressed will involve the standardization of licensing and patenting legislation among countries and between BSEC and EU, the protection of intellectual property and the establishment of innovation infrastructure and entrepreneurship culture in the BSEC area.

#### *Innovation and technology transfer*

Services on Innovation and technology transfer will be in the heart of the activities of VBSIC. These services will include, among other, Technology and innovation databases, Technology Evaluation, Technology Due Diligence, and Technology Matching.

#### *Improving Human Capital*

Recording the Human capital by the way of a series of studies should be a priority for the Center. This can complement the technology database (as described above) and add one more piece to the puzzle of promotion of innovation and attraction of FDI in the region. VBSIC should have high visibility in the international community and the BSEC region. This will multiply its capability to attract funding from government and private resources. A series of international conferences should be organized in cooperation with ICBSS. The subjects can range from high level policy to technology events. Technology events are of particular importance since they will give a chance to participants from all over the world to familiarize themselves with the technologies and

skills that are available in the BSEC area.

It has been widely reported in the literature that one of the skills missing in the area is that of managerial and entrepreneurial skills. These should receive special attention in cooperation with existing organizations that already provide this sort of training at the local level. Yet another area that needs attention, is training the human capital of the region in innovation management techniques.

### **3.4 The beneficiaries of the services and cooperators**

VBSIC intends to be an innovation centre for all the BSEC countries. This implies that it has to be flexible and diversify enough to meet a host of different needs represented by the different levels of development and the national diversity of the people in the country-members. The envisioned Innovation Centre will benefit all people by promoting innovation and modernization of the economies, exploiting untapped resources, providing employment, promoting cooperation and mobility to other areas, creating wealth and promoting the region and its human capital to investors and co-operators. Apart from this, certain groups are direct beneficiaries of its activities:

- BSEC Governments will benefit from the Center's activities and their cooperation and assistance will be sought.
- International organizations such as the EU, World Bank, IMF, and the UN could find the services of the Center very useful and its goals similar to theirs. Negotiations will have to be conducted at high level with these organizations in order to secure cooperation, and the co-financing of projects with the best terms.
- Other International financing institutions that have interest in the BSEC area can be cooperators in and beneficiaries of the Centers actions. Organizations like the European Bank of Reconstruction and Development and/or aid and cooperation promotion agencies.
- Private organizations that should also be targeted for cooperation include large international Financing institutions looking for investment opportunities, Venture Capital funds (which have seen tremendous growth the last decade).
- Private companies in all fields of activities that would be interested in the technologies and innovations of the regions. These companies would be approached through the search for technology receptors, the Antenna offices and via the international networks of technology transfer.



- Universities, research institutions, and the scientific community everywhere where there is research and innovation.

## 4. Conclusions

From the literature review and international practice it is becoming apparent that a kind of network of innovation supporters and providers such as a Virtual Innovation Center is a needed institution for the BSEC region. The main purpose of the VBSIC will be the promotion of all forms of Innovation in the region through the exploitation of the research and technology infrastructure that is present in the area and remains underused. The impetus of such an IC is clearly indicated by the wealth of human capital in the region, the unexplored innovation potential, and the international trends that point to an ever-increasing role of innovation and technology in the development of nations and regions.

Accelerated growth for convergence with the rest of Europe can only be achieved through constant innovation, cooperation, and promotion of entrepreneurship and investment in the region. A VBSIC would be an infrastructure that could promote the BSEC ideals and bring employment, technology, know-how, and wealth in the region.

Further, mobilization of resources is thus needed. As far as the successful development of strong innovation infrastructures, both studies agree that coordination between the public and private sector, the creation of a sustainable institutional environment and the enhancement of international collaboration through joint research project are the key success factors. Support initiatives might need to focus on market driven innovations, possibly of less radical and technology intensive nature, in order to initialize a needs-driven view of innovation where private actors, riding on the economic growth, play a central role and pave the way for R&D growth in the longer term. Also, priority must be given to creating reasonably attractive research perspectives and career paths for young researchers and also put in place some kind of knowledge sharing and transfer mechanisms in order to capture knowledge that might be lost with older researchers leaving their activities.

Finally, as scientific specialization is important in order to develop comparative advantage and also develop the attractiveness of a nation or region as a research and exchange partner of scientific knowledge, support initiatives should focus on determining specific priority areas for reinforced Science and Technology development and innovation activity within the different nations and regions in the BSEC.

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## Abstract

Diversity and attitudinal differences in the various Black Sea member states makes it difficult to identify issues that could provide answers to global challenges for the Black Sea region as a whole. The questions of competitiveness and productivity are key reforms for many countries of the region. Despite the progress made in structural reforms in key sectors, the competitiveness gap between the North-Western European regions, with high agglomeration research and industrial resources (blue banana zone), and the periphery of Europe including the Black Sea region remains significant. The regions in the periphery of Europe seem to be observers and in some cases followers in the innovation arena. Thus it is important to define new development models, which may well manifest Black Sea Member states in ways that will accelerate the decrement of this competitiveness gap.

The 2006 OECD study "Competitive Cities in the Global Economy", is clearly an important contribution to understand that cities are facing global challenges at local level and they sensibly shape the terrain for new globalisation strategies. The global-local inference of broadband economy, as passageway for smart urban environments, creates favorable conditions for local innovation hubs in a global active space. Smart urban planning, referred to smart cities, is a phenomenon for new and uprising economies. Since successful smart city initiatives have been launched worldwide in countries not among the champions in innovation, like India, Malta, Spain, Portugal, UAE, China, Korea, Russian Federation, they define a playground for breakthrough innovation policies.

The evolutionary study of smart urban environments revealed different conceptions of what is often called "smart city". Following the traditional regional and neoclassical theories of urban growth and development, the Smart Cities European Union working group identified smart cities along six main axes or dimensions. These axes are: a smart economy; smart mobility; smart environment; smart people; smart living; and, finally, smart governance. The paper uses the Optima Smart City Reference Model to devise smart city development models for the Black Sea terrain. It prioritizes the favorable geographical and demographic conditional elements in the Black Sea region for the development of urban innovation ecosystems as:

- New smart cities initiatives, like Skolkovo in the Russian federation
- New urbanism for quality of life in the region's resort cities
- Smart energy cities

- Smart city transport initiatives in heavily trafficked cities

The paper concludes an opportunity typology Black Sea map for smart urban investments as an alternative innovation breakthrough policy that could advance the dynamics of the region's competitive position.

## **Keywords**

Arab spring, Black Sea area, climate change, food crisis, human security, high strategy, soaring prices.

# Urban Planning for Smart Cities: Policy Recommendations for Sustainable Innovation Ecosystems across the Black Sea region

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## 1. Introduction

Developed urban agglomerations worldwide are leading the way towards the creation of local innovation ecosystems, with the emergence of smart cities. This is an opportunity area for economic growth in the Black Sea region, as well. However, diversity and attitudinal differences in the various Black Sea member-states make it difficult to identify answers to the global challenges for the Black Sea region as a whole. Even so, it is commonly accepted that competitiveness and productivity are substantial to most countries of the region.

The evolutionary study of smart urban environments revealed different conceptions of what is often called “smart city”. This paper investigates the opportunities for local innovation that could be raised across the Black Sea cities due to the implementation of urban policies for smart city planning. It investigates successful cases of planning for smart cities, that could be adapted to the geo-economical characteristics of the region. Conclusions from the examination of these cases will be drawn as policy recommendations for enhancing Black Sea cities’ readiness for smart city planning implementation.

## 2. The Black Sea region in a smart cities context

### 2.1 SMART CITIES explained

Cities are not only the “real” centres of sustainability, but also hubs of economic growth and perhaps most importantly drivers of innovation, thus fostering continuous economic growth. Today, more than ever, the traditional drivers of economic growth are giving way to an economy based on brains and creativity.

In this direction, following the traditional regional and neoclassical theories of urban growth and development, the Smart Cities European Union working group<sup>21</sup>

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<sup>21</sup> Rudolf Giffinger et al., “Smart cities – Ranking of European medium-sized cities”, Vienna: Centre of

identified six main axes of smart cities. These are: smart economy, smart mobility, smart environment, smart people, smart living and finally, smart governance. Growth theories and the relationship between a city's growth and human capital<sup>22</sup> add another bit to the smart city puzzle. The "creative class", a socioeconomic knowledge intensive structure, was identified by R. Florida<sup>23</sup>, as a key constituent of the economic development in post-industrial cities.

Although no unified approach to urban planning for smart cities exists, even in apparently similar subjects (such as water, energy, environmental degradation), the conglomeration of diverse notions and interpretations for smart cities is beginning to form a comprehensive structural framework for their conceptualization. The pathway of infusing sustainability to conventional urban planning optimally passes from green, inter-connected, instrumented, intelligent, open and innovating development stages<sup>24 25</sup>. The literature review and empirical evidence revealed certain parameters that comprehensively characterize smart cities. These parameters provide distinct characteristics to green, interconnected-instrumented-intelligent, open, and innovating cities. Each one of these parameters could be conceived as a layer of activities, which in turn upgrades the smart city concept. Figure 1 represents a holistic reference model of a smart city, called Smart City Optima.

The smart city strategy is enriching the urban planning scenarios of the conventional city (layer 0), sets green city policy actions (layer 1), formulates policies for interconnected, instrumented, open and intelligent city (layers 2,3,4 and 5) and advances measures to mobilize the city's innovation ecosystem, by capitalizing on the generated opportunities for new business models offered in smart environments<sup>26</sup>. The Smart City Optima conceptual reference model follows a layered approach to describe smart urban environment conceptions along with their structural components.

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Regional Science, 2007, <http://www.smart-cities.eu/>

<sup>22</sup> Jesse Shapiro, *Smart cities: explaining the relationship between city growth and human capital* (Harvard University, 2003).

<sup>23</sup> Richard Florida, *The rise of the creative class and how it's transforming work, leisure, community and everyday life* (Perseus Books Group, 2003).

<sup>24</sup> Bill Adams, "The future of sustainability, re-thinking environment and development in the twenty-first century" (Report of the IUCN Renowned Thinkers Meeting, World Conservation Union, 29-31 January 2006)

<sup>25</sup> John Blewitt, *Understanding sustainable development* (London: Earthscan, 2008), 21-24.

<sup>26</sup> Shapiro, 2003

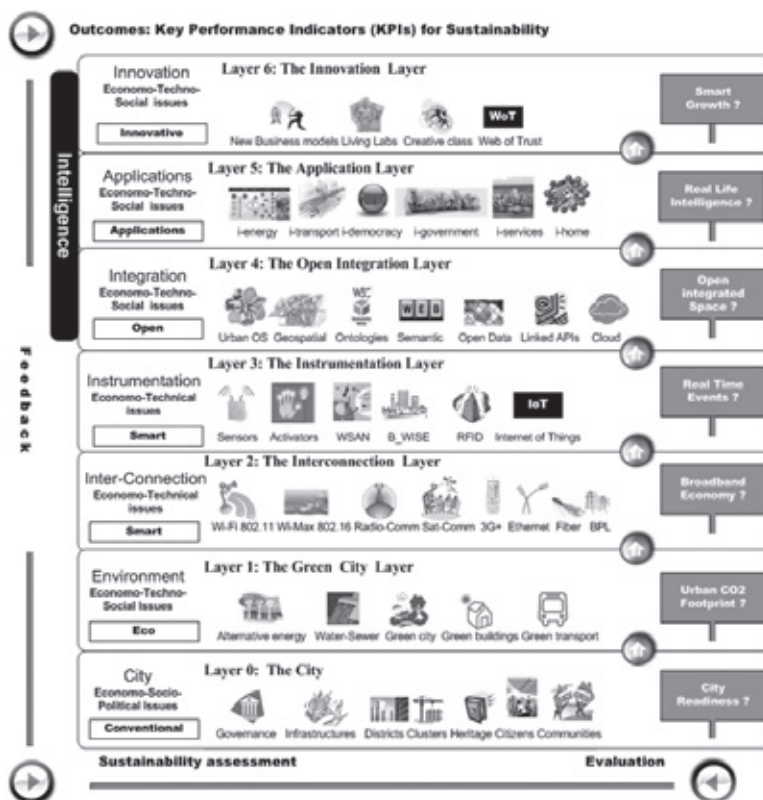


Figure 1. Smart City Optima conceptual reference model (Source: Sotiris Zygiaris "Smart City Optima: A Holistic Approach to Conceptual Smart City Planning", Journal of Knowledge Economy, Special Issue on Smart Cities, 2011)

The 2006 OECD study, *Competitive Cities in the Global Economy*<sup>27</sup>, is an important contribution to our understanding of the urbanisation process taking place alongside globalisation and the distinct tendency towards "glocalisation". Global-local inference<sup>28</sup> in a globalized world can provide a stable and integrated place, while it also protects

<sup>27</sup> Organisation for Economic Co-operation and Development, *OECD territorial reviews: competitive cities in the global economy*, Directorate for Public Governance and Territorial Development, 2006

<sup>28</sup> Habibul Haque Khondker, "Glocalization as globalization: evolution of a sociological concept", *Bangladesh e-Journal of Sociology*, Vol. 1. No. 2. 2004.



the cultural heritage and social values of local areas. Since cities are facing global challenges at a local level, they shape the terrain for new glocalisation strategies<sup>29</sup>.

## 2.2 The Black Sea PORT CITIES

The Black Sea Region emerged as a geopolitical hub. Due to the strategic geopolitical location of the Black Sea, an important agglomeration of port cities developed across the region, as commerce, transport and tourist centers. Some of these cities are:

**Burgas**, the second-largest city and seaside resort on the Bulgarian Black Sea Coast, and an important industrial, transport, cultural and tourist centre, with a population of 197.301 inhabitants. It has the largest and most important Bulgarian port.

**Constanța**, the oldest extant city in Romania, and the largest city in the region, with 446.595 inhabitants. The Port of Constanța is the largest port on the Black Sea, and one of the largest ports in Europe.

**Mangalia**, another Romanian city port. The municipality of Mangalia administers several other summer seaside resorts: Cap Aurora, Jupiter, Neptun, Olimp, Saturn and Venus.

**Novorossiysk**, Russia's main port on the Black Sea and the leading port of the country for importing grain.

**Odessa**, a major seaport located on the northwest shore of the Black Sea and the fourth largest city in Ukraine.

**Ordu**, a port city on the Black Sea coast of Turkey and capital of Ordu Province.

**Poti**, a major port city and industrial centre since the early 20th century. It is also home to a main naval base and the headquarters of the Georgian navy. The Poti port area is planned to become a free economic zone within the framework of a Georgian- United Arab Emirates project inaugurated in April 2008.

**Samsun**, a city of about half a million people at the north coast of Turkey. It is the provincial capital of Samsun Province and a major Black Sea port.

**Sochi**, which runs for 145 km (90 mi) along the shores of the Black Sea near the Caucasus Mountains, making for Russia's largest resort city.

**Sukhumi**, located on a wide bay of the eastern coast, serving as a port, rail junction and a holiday resort.

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<sup>29</sup> Ali A. Alraouf, "Dubalization vs. glocalization: Arab cities transformed" (paper presented at the Gulf First Urban Planning and Development Conference, Kuwait, 12-14, Dec 2005).

**Varna**, commonly referred to as the marine (or summer) capital of Bulgaria, a major tourist destination, business and university centre and seaport.

Since there are many different types and sizes of cities in the area (industrial, resorts, commercial, agricultural), there is a wide set of urban planning options for each city type.

The growth of port cities under globalization<sup>30</sup> and the success of urban development depend on the creation of favorable market opportunities and port cities' market strategy. Brand<sup>31</sup> argues that increased urbanisation and the foregrounding of the coastal condition make the association between cities and the sea one of the most important environmental juxtapositions of the 21st century. In her research, "Bluespace: a typological matrix for port cities", she defines a matrix with nine instances of how urban space and sea space combine to produce distinct public space types in port cities. The public realm of the port city, therefore, needs to make reference to spaces, functions, technologies and activities from both urban and maritime traditions, to properly encompass the complexity of smart planning strategies<sup>32</sup>. The redefinition of "bluespace" conditions in the terms of the optima reference model<sup>33</sup> could stimulate the region's vision for becoming "smart".

The Commission on The Black Sea created a new overarching concept and policy, under the name "2020 Vision – A Black Sea Dimension", by the actors and countries in the region, focusing on the year 2020. Urban planning for Smart Cities could provide a context in tactical terms and relations following the 2020 vision action lines.

### 2.3 Smart city empirical paradigms compatible to Black Sea Region

The transformation of a conventional port city to a smart city initiates a long term smart city strategy, that undoubtedly must lead to environmental and social sustainability, including funding mechanisms, urban growth determinants and attractive investment returns<sup>34</sup>.

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<sup>30</sup> Yefang Huang, "The growth of port cities under globalization", *International development planning review*, Vol 31. Issue 4 (2009)

<sup>31</sup> Diane Brand, "Bluespace: a typological matrix for port cities", *Urban Design International* 12 (2007): 69–85

<sup>32</sup> Gayle Berens, ed. *Remaking the Urban Waterfront* (Washington, DC: Urban Land Institute, 2004)

<sup>33</sup> Sotiris Zygiaris "Smart City Optima: A Holistic Approach to Conceptual Smart City Planning", *Journal of Knowledge Economy*, Special Issue on Smart Cities (2011)

Several port cities have smart policy actions in their urban planning mix. Barcelona is a port city, where urban planning for smart cities was applied in an integrated manner, covering all seven layers of the Optima Reference Model. The Barcelona city council is the orchestrator for sustainable economic, environmental and social changes, in which urban planning provides high-quality opportunities for people to live and work. In 2009, the Barcelona City Council presented its “Smart City” model to improve its residents’ quality of life and ensure a more efficient and sustainable future. The initiative aims to achieve Barcelona’s 2020 vision of becoming a global reference model for sustainable urban development. These aims respond to future challenges, since the city is facing a wave of urbanization and may be beginning to show lag-time between its dazzling, international image and socio-economic change. Furthermore, development saturation is decreasing accessibility within the city.

Furthermore, the port city of Manchester implements smart actions to attract new investment and jobs from high-tech companies, as the city becomes a ‘Living Lab’ test bed for new future internet services. Projects like “Smart-IP” are leading the way towards the layer (2), “interconnection”, and layer (6), “innovation”, only. This type of strategy implies a partial integration of urban planning for smart cities.

Yokohama, the second largest city in Japan, is another port city, with an economy of the size of small-sized countries, and diverse geographical features. The recently set in action Yokohama Smart City Plan (YSCP) includes local city centres, such as Minato Mirai 21, Kannai and Kangai districts, a leading port area in Japan, large-scale development districts, such as Kohoku New Town, and residential areas rich in water and vegetation in the suburbs. Yokohama city’s urban planning disciplines are also a paradigm for the development of the Black Sea port cities. The mixture of “bluespace”, port-based urban policies, with the smart city optimal reference model composes a development framework that could be adapted to the cities in the region. While the Black Sea port cities come in all shapes and sizes, the case of Yokohama provides urban planning orientations, which could enhance the cities’ readiness to achieve their vision for becoming “smart”.

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<sup>34</sup> Una McGeough, Doug Newman and Jay Wrobel, *Model for sustainable urban design with expanded sections on distributed energy resources*, Sustainable Energy Planning Office Gas Technology Institute for the Oak Ridge National Laboratory (2004)

### 3. Strengthening the Port Cities readiness in the Black Sea Region in institutional terms

Belissent<sup>35</sup> denotes that smart cities must start with the “city”, not the “smart”, emphasizing that smart city notions must be grounded to the context of a city. This layer conveys the traditional components, often present in every city. It is an important denominator of the readiness of cities to absorb smart features. For every port city in the Black Sea region, in its conventional terms, there are certain operations and processes that must be synchronized towards obtaining their smart city vision.

#### 3.1 Identity matters – Building a City Branding

In today’s knowledge economy and culture, image making has become a central basis for successful competition<sup>36</sup>. It is essential for a city to have a strong identity to promote, so as for smart city planning to build upon. In order for a Black Sea port city to build a good brand, it must possess defining and distinctive characteristics that can be readily identified. A city brand is its promise of value, a promise that needs to be kept. In this notion, outstanding identity value needs to be constantly nourished, managed and promoted in Black Sea port cities. Special requirements should come into force to ensure that the values of the place will be protected and conserved for future generations.

The characteristics that define a city brand include the city appearance, people’s experience of the city, people’s belief in the city, what the city stands for, and what kind of people inhabit the city<sup>37</sup>. Brands and distinguishing identities can derive from natural/cultural heritage, a tradition, expertise in a field, lifestyle. Cities lacking prominent architectural heritage or tradition will face the challenge of creating and customizing their own points of reference. Several cities have done this successfully, ‘inventing’ their own brands, traditions or landmarks<sup>38</sup>.

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<sup>35</sup> Jennifer Belissent, “Getting clever about smart cities: new opportunities require new business models” Forrester blogs, posted 15 Oct 2010, [http://blogs.forrester.com/jennifer\\_belissent/10-10-15-taking\\_lessons\\_from\\_smart\\_cities](http://blogs.forrester.com/jennifer_belissent/10-10-15-taking_lessons_from_smart_cities)

<sup>36</sup> Tan Yigitcanlar, Koray Velibeyoglu and Cristina Martinez-Fernandez, “Rising knowledge cities: the role of urban knowledge precincts.” *Journal of Knowledge Management*, 12(5) (2008): 8-20.

<sup>37</sup> Julia Winfield-Pfefferkorn, “*The Branding of Cities; Exploring City Branding and the Importance of Brand Image*” (Master’s diss., Graduate School of Syracuse University, 2005)

<sup>38</sup> Charles Landry, *The Creative City. A Toolkit for urban innovators* (London: Earthscan Publications Ltd, 2000)

The 22@bcn district in Barcelona, for example, which has undergone major urban regeneration, utilized successfully the 22@ brand. 22@ is a symbol of the transition from the past industrial of 22a Poblenou to the knowledge-based 22@. This brand provides an effective marketing of the project and stands for a powerful coalition between professionals, technicians, land promoters, neighborhood associations, councilors of the municipality, and so forth. The 'Yokohama Smart City Project' brand aspires in standing out as an "Eco-Model City" and as an "Open City". It is clearly oriented towards tackling climate change and achieving a low carbon community, while conveying the open and free image of the City of Yokohama, offering hospitable environment to visitors, new opportunities to residents and favorable conditions to investors. It also aspires in excelling as a point of reference, as a city model that can be applied to cities in emerging Asian countries and to cities overseas<sup>39,40</sup>. Other well-known brands include "Amsterdam Smart City", "Singapore Intelligent Island" and "Dubai Internet City".

### **3.2 Broadband economies advance interconnected, instrumented and intelligent cities**

Broadband economies advance interconnected, instrumented and intelligent cities. The Black Sea broadband economy, as the new global economic engine, could empower smart cities to face the challenges of digital dividend and augment the activities and functions taking place within the physical space of the city<sup>41 42</sup>.

Broadband economies also include smart city service enablement suites for smart media services, which enables city-wide open access to sensor and actuator services. An important smart city urban planning issue is the strategic orientation to endorse broadband coverage and assume policies of "connected life", along with technological ability to produce real time data streams, which in turn will provide input to intelligence applications. In a sense, the forthcoming evangelize the new era of technological breakthroughs that not only support socioeconomic changes, but in fact they are

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<sup>39</sup> City of Yokohama, *Master Plan of the Yokohama Smart City Project (YSCP)*, 2010, <http://www.city.yokohama.lg.jp/ondan/english/>

<sup>40</sup> City of Yokohama, *MinatoMirai 21 EcoInformation*, 2010, [www.city.yokohama.lg.jp/toshi/mm21/pdf/ecoinfo201009.pdf](http://www.city.yokohama.lg.jp/toshi/mm21/pdf/ecoinfo201009.pdf)

<sup>41</sup> Robert Bell, John Jung and Louis Zacharilla, *Broadband economies: creating the community of the 21st century* (Intelligent Community Forum, 2009)

<sup>42</sup> George Ford and Thomas Koutsy, "Broadband and economic development: a municipal case study from Florida." *Applied Economic Studies* (2005)

accountable for new business models and advanced social cooperative spaces<sup>43</sup>.

### 3.3 Citizen – driven and open Innovation Ecosystems

Smart cities in the Black Sea region could form a dense ecosystem with extensive social interactions in a bottom-up approach, deriving from a knowledge workforce that creates economic value through the acquisition, processing and use of information.

The articulation of smart city infrastructure through social networks and communities, legal and cultural systems, and various forms of social inclusive principles is endorsed by smart city policies for social sustainability. Traditional “top-down” urban planning is not responsive to rapidly changing technologies and evolving patterns of living, working, communication, recreation, and commerce. A bottom-up approach is required for user – driven and open Innovation Ecosystems creation. Cities with more educated populations experience more rapid growth<sup>44</sup>. This might occur because more educated individuals improve amenities in cities in which they reside, or because they seek out areas in which quality of life is rising<sup>45</sup>.

This incremental process can be best illustrated in the formation of Living Labs, which administer the city as an innovation space for research and development. The Amsterdam Living Lab (ALL)<sup>46</sup> is a joint effort to gather and share knowledge about user experience in order to develop new products and services. In this Living Lab consumers, knowledge institutions and companies work in close cooperation to develop new products and services. The Helsinki Smart City Living Lab is another successful paradigm. It was created in the context of Fireball, funded by the European Commission. Its objective is to understand and proactively promote Smart Cities, the Future Internet, the Internet of Things, and Living Labs, as creative ecosystems. The technologies, the services and the policies, as well as co-design and co-creation processes of user-driven innovation will help Helsinki become a Smart City<sup>47</sup>. The Yokohama Smart City project aims at producing new value and attractiveness for the city, through leveraging the unique history and cultural resources around the port and to give free rein to the creativity of art and culture. This has led to a new vision for the

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<sup>43</sup> Belisent, 2010

<sup>44</sup> Shapiro, 2003

<sup>45</sup> Florida, 2003

<sup>46</sup> Amsterdam Living Lab, 2011, <http://www.amsterdamlivinglab.nl/>

<sup>47</sup> Helsinki Living Lab, 2011, <http://vimeo.com/16425674>

city that melds tangible and intangible measures to promote the development of arts, culture, and economy, and the formation of an attractive urban space that fittingly reflects Yokohama's creative character.

### 3.4 Orchestrated Urban Governance

The planning agenda for smart environments starts from the city's readiness to implement smart policies. Regardless to say a smart city master plan needs an orchestrator with executive and policy planning authority, such as the city's council. The city is consistent with a city's urban resources, infrastructures, utilities, services, stakeholders and innovation ecosystems including triple helix complexions. An orchestrated Urban Governance, with responsibilities, recourses and well trained people, can guarantee improved service delivery, greater efficiencies and lower costs. Collaborating across departments and with communities—to become more transparent and accountable, to manage resources more effectively, and to give citizens access to information about decisions that affect their lives, can obviously lead to Smarter Governance. A smart city requires a smart government, in particular one with economic development policies to attract and retain companies and start new ventures. Such a city needs to provide a rich variety of services, both physical ones, like transportation and communications that are absolutely required to do business in a globally integrated world, as well as human services like healthcare and education, which are essential to a well-functioning community<sup>48</sup>.

Some cities like Singapore and Barcelona instigate a comprehensive smart city master plan aiming to ensure sustainability, quality of life and smart growth. The integrated smart city urban plan of Barcelona is characterized by leadership in strategic decision making, solid financial planning, new urbanism initiatives for improving quality of life along with exercise of broadband economies and new business models for growth. Smart city master plans entail new forms of urban governance to plan, design and monitor the city's smart city vision. A master plan is a sense a roadmap to city smart future that must be result of open debate and participation of all actor involved in urban governance.

The Yokohama smart city plan (YSCP) organizational structure is supported by the establishment of an organizational structure for the implementation of the YSCP. The plan includes cooperation with other projects of the city, marketing and development

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<sup>48</sup> Organisation for Economic Co-operation and Development, 2006

of overseas markets and the promotion of the Yokohama smart city brand to India and China, participating in the Asian Pacific Economic Cooperation and various other international events. Moreover, new forms of governance are formulated to conduct overall management and operation of the project. Throughout the management and operation of the plan, studies on overseas cases will be conducted, indicators for follow-ups will be established. The management and operation body will conduct progress management for each activity, evaluations, coordination work, and monitor the equipment and systems which have been installed as shared assets for the whole area. The master plan will be updated every fiscal year.

## **4. Strengthening the port cities readiness in the Black Sea region in physical terms**

### **4.1 Straightened out and Green hard Infrastructure**

Smart Cities promise improved citizen services and more efficient use of scarce resources, as they integrate technology with critical infrastructure components and services to make urban development more intelligent, interconnected, and efficient<sup>49</sup>. The Smart Cities Initiative of the European Union's SET-Plan<sup>50</sup> proposes a 40% reduction of greenhouse gas emissions by 2020 through sustainable use and production of energy through smart city technologies. The moderation of these urban planning challenges of layer 0 into green city priorities demands new forms of green governance, policy integration and allocation of resources, to develop a suitable mix of green urban infrastructures, which could be applied to Black Sea cities through green city initiatives. Green and straightened out infrastructure yields indirect benefits through the supply chain, land values, small business growth, consumer sales, and social benefits of community development and access to opportunity.

Barcelona has been successful in this direction, as it is the city with the highest density of solar panels in Europe. During the last decade the entire water supply system in Barcelona has been adjusted to be powered by solar energy, aiming to provide all residents with warm water. Since 2000, the city's regulations require that all new buildings have solar energy sources installed. The green city concept is integral to

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<sup>49</sup> Usman Sindhu, *"Intelligent Information and Communications Technology Infrastructure in the Government, Buildings, Transport, and Utility Domains"*, [http://www.forrester.com/rb/Research/securing\\_smart\\_city\\_infrastructure/q/id/56678/t/2](http://www.forrester.com/rb/Research/securing_smart_city_infrastructure/q/id/56678/t/2) (2009)

<sup>50</sup> Strategic Energy Technology Plan 2009, [http://ec.europa.eu/energy/index\\_en.htm](http://ec.europa.eu/energy/index_en.htm)



the smart city concept referring not only to “infrastructural green islands” but also to citywide diffusion of green economies. Barcelona also promotes electric motorcycle use, by planning 15 free electricity charging stations.

In Yokohama, the railway network and other elements of the public transport infrastructure are being developed to make stations and surrounding facilities accessible to all. Plans are being studied to introduce a system of bike sharing as an environmentally-friendly means of transportation for the Minato Mirai 21 and Kannai districts<sup>51</sup>. A mobility management campaign is also underway to encourage people to become less dependent on their cars and make more use of other forms of transport, particularly walking, cycling, and public transport<sup>52</sup>. In the Minato Mirai 21 district area, a 3,600 member community managed District Heating and Cooling System (DHC) has already been installed. The overall aim is to develop low-carbon mobility infrastructure and establish a transport system with a low environmental impact, through promoting the introduction of business-purpose systems, the installation of charging stations and the introduction of electric buses<sup>53</sup>.

#### 4.2 Qualitative Public Space

Furthermore, a clean and polished city's public space is an equally important factor for enhancing attractiveness and thus facilitating smart city development. This is the only way for the Green, Interconnection, and Instrumentation Layers to overlay the City Layer smoothly, enabling the subsequent establishment of smart utilities, smart transport, smart buildings, and smart government. The cities of the Black Sea Region have an abundance of resources to work in this direction, since their extended waterfronts can become high-quality places of recreation, social interaction and tourist attraction.

Public space should be trimmed, clean, well maintained, starting from the micro-level; no disorderly, hazardous, arbitrary traffic/information/advertisement signs, bins, parked cars, etc., sufficient public lighting, well maintained pedestrian signs and crossings, etc. Public and private buildings with historical/architectural value should be restored and well maintained. Empty properties should present an acceptable and neat

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<sup>51</sup> City of Yokohama, *MinatoMirai 21 EcoInformation*, 2010

<sup>52</sup> City of Yokohama, *Policies of the City of Yokohama*, 2011, <http://www.city.yokohama.lg.jp/seisaku/senryaku/en/policies/>

<sup>53</sup> City of Yokohama, *MinatoMirai 21 EcoInformation*, 2010

image; they cannot look abandoned or dirty. Walkability is also a significant component of pleasurable public space and waterfronts in particular; well designed and maintained pedestrian and bicycle networks and facilities for people with disabilities enhance recreational opportunities for a city's residents; additionally they contribute to the reduction of mechanical vehicle circulation and air pollution and the facilitation of public transport.

The Masdar smart city plan is oriented towards this notion. The streets and squares invite people to enjoy the outdoors, where they interact and engage with fellow students, residents, professionals and visitors. It is pedestrian focused, with narrow, shaded streets, and pleasant shaded walkways and other paths that encourage walking. The integrated nature of the city means it's not far to walk to many destinations. In the public space of Minato Mirai 21 in Yokohama, an extensive pedestrian network is being implemented, while keeping pedestrians completely separated from road traffic. Many of the buildings in the same areas are implementing rooftop greenery and similar measures, as a means of improving air quality and temperature in the public areas<sup>54</sup>.

#### **4.3 Urban Natural Habitats management and protection**

Likewise, a city that wants to be Smart needs to have a policy and a plan for developing and managing landscapes, ecosystems and green heritage, whether it be about small and large parks, beaches, lagoons, streams or woodlands. Again here, the cities of the Black Sea region have a competitive advantage, due to their waterfronts.

Relative actions introduce ecological management practices, ensure the integrity and sustainability of natural spaces and provide a legacy for present and future generations. People living in such cities enjoy recreational, athletic and creative activities, have the ability to make the most out of their free time, and fulfill their desire for high living standards, both for themselves and their families. A city's plan for Urban Natural Habitats management and protection needs to connect with its land use plan and regional plans, aiming to establish networks of open space and green belts, crossing boundaries and continuing for long distances.

Yokohama, while being a big city, has considerable greenery, including areas of woodland, farmland, and parks near residential areas and people's places of work. Funded by a special-purpose tax to preserve and create greenery, woodland and agricultural land are being preserved and expanded and parks are being developed

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54 City of Yokohama, *MinatoMirai 21 EcoInformation*, 2010

with the objective of maintaining and increasing the already existent 31% of the city's green areas. Yokohama's environmental campaigns feature regular and extensive involvement by ordinary volunteers<sup>55</sup>. The Minato Mirai 21 district showcases the special features of its waterside environment with 9 urban parks, existent or under currently under construction. With a goal of covering 25% of the entire district with parks and greenery, a water and green network over the whole of Minato Mirai 21 is taking shape<sup>56</sup>.

#### 4.4. Urban Regeneration/Renewal/Revitalization

A city that wants to be “smart” should work on restoring its dilapidated areas and neighborhoods, since, as properly regenerated urban districts, they can become hubs of sustainability, creativity, entrepreneurship and innovation. Regenerated areas create their own “image”. They acquire symbolic and design value, thus marking the name of the emerging SmartCity with a landmark development<sup>57</sup>. Furthermore, dilapidated areas do not account for an attractive urban environment, and thus they cannot satisfy the preferences of their knowledge workers. This applies fully to the cities of the Black Sea region, many of which are undergoing rapid development.

Urban Regeneration/Renewal/Revitalization plans aim at reinvigorating run-down urban areas, such as degraded neighborhoods and brownfields of formerly industrial, commercial and transport facilities. Urban renewal may involve relocation of businesses and people and the demolition of dilapidated structures. In many cases the government purchases private properties for city-initiated development projects, provides business and tax incentives. In other cases, a public-private partnership is formed, in a model that yields sufficient profitability for developers. In a majority of cases, urban regeneration projects integrate equally ambitious investments in sewer, water, drainage, transport, roads, as well as high-end services and amenities. Additional positive effects include replenished and improved housing stock, increase in density and sprawl reduction, economic benefits and enhancement of the economic competitiveness of a city's area, cultural and social amenity improvement, safety and surveillance enhancement.

Some well-known Urban Regeneration projects that were designed and succeed as “smart” zones are London Docklands, 22@ in Poblenou and Diagonal Mar in Barcelona,

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55 City of Yokohama, *Policies of the City of Yokohama*, 2011

56 City of Yokohama, *MinatoMirai 21 EcoInformation*, 2010

57 Tan Yigitcanlar, Koray Velibeyoglu and Cristina Martinez-Fernandez, 2008

Spain. The Western Harbour area in Malmö<sup>58</sup>, Sweden, with its 100 % locally produced renewable energy, compact built environment, green roofs and open storm-water system, is an international inspiration for climate-smart city planning. It comprises 600 dwellings, as well as offices, shops and other services. The city of Yokoma, in the context of becoming “smart”, aims at the regeneration and economic revitalization of three urban areas: the Kannai and Kangai districts, the Minato Mirai 21 district, and the area around Yokohama Station<sup>59</sup>.

## 5. Conclusions

This paper argues that Black Sea cities could shape their way into their sustainable future, as long as certain urban planning disciplines anchor smart investments. Since cities in the Black Sea region are facing global challenges at a local echelon, they could contribute towards a sustainable smart planet by advancing policies for progressive urban environments. To elaborate the case, the paper distinctively examines the implementation of smart city policies across various port cities worldwide, in relation to the maritime character agglomeration of Black Sea cities.

While \$8.1 billion was spent on smart city technologies in 2010, by 2016 that number is projected to reach \$39.5 billion. There are currently 102 smart city projects worldwide, with Europe leading the way at 38, North America at 35, Asia Pacific at 21, the Middle East and Africa at six, and Latin America with two<sup>60</sup>. The wide spread of smart city initiatives across the globe is an indication of decentralized development of innovation ecosystems, besides heavily resourced industrial and research regions. These developments open an opportunity window to regions with less agglomerated -in research and industrial terms- resources, such as the Black Sea region, to attract smart city investments and advance their local innovation ecosystems.

The paper uses the Smart City Optima reference model, in conjunction with “bluespace” port city urban policies, to provide a common understanding among smart city stakeholders of investment priorities. The investigation of a city’s critical resources, which will contribute to its readiness to support the smart city vision, is a crucial

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<sup>58</sup> Malmö stad, *Climate-smart Malmö: Making sustainability reality*, 2010, [www.malmo.se/download/18.58f28d93121ca033d5e800091/Klimatbroschyr\\_090409EN.pdf](http://www.malmo.se/download/18.58f28d93121ca033d5e800091/Klimatbroschyr_090409EN.pdf)

<sup>59</sup> City of Yokohama, 2011

<sup>60</sup> GreenBiz, *Investments in smart cities*, 2011, <http://www.greenbiz.com/news/2011/09/09/investment-smart-cities-verge-40b-boom>

preliminary planning step. The outcomes of this research could be utilized by smart city planners to prevent unsustainable investments and to build upon the socio-technical complementarities in the smart city course of action. The exercise, by smart city planners, of the Smart city Optima model, in the local context of the Black Sea region, includes important fact findings that could open a responsive public debate to the each of the following, layer-related, planning issues:

- To what extent a city's urban status can be enriched with smart city planning activities and what type of infrastructure interventions are planned to complement smart city actions?
- What type of governance or change in management measures can be taken to respond to smart city challenges, and what activities for social inclusion have been taken to create a common understanding of the smart city vision among citizens and communities?
- How efficient is the green city infrastructure regarding environmental protection and CO<sub>2</sub> emissions reduction, and how feasible are the financial viability plans for green infrastructure?
- What is the impact of smart resources in the creation of new business models and in the advancement of entrepreneurship, and how have local innovation ecosystems responded to the smart city opportunities for growth?

The responses to these questions can form the mosaic of a smart city master plan, adaptable to the size, characteristics and needs of each city in the Black Sea region. While the results of the public debate on these issues could lead to a future city roadmap and provide a common understanding among city actors and policy makers, there are important proactive urban planning actions that need to be taken to enhance the readiness of Black Sea cities for a smart policy uptake. The examination of existing smart urban planning priorities in several port cities, resulted in important findings, which could be utilized by the Black Sea port cities, in order to assist them in entering the smart urban development global innovation arena. Investments in green city infrastructures, improvement of public space and urban regeneration form an important switching of policies towards a sustainable future. These types of actions prepare the ground for smart energy investments and document scenarios for the full deployment of all seven layers of the reference model.

This paper can be used by city authorities, policy makers and local development agencies in the Black Sea region to trigger the opportunity for the development of smart city initiatives and the interaction among local actors, to position their role into the city's smart vision.

## Abbreviations

<b>ALL</b>	Amsterdam Living Lab
<b>BSEC</b>	Black Sea Economic Cooperation
<b>BSIC</b>	Black Sea Innovation Centre
<b>DHC</b>	District Heating and Cooling System
<b>EECA</b>	Eastern European and Central Asian countries
<b>EIS</b>	Environmental Impact Statement
<b>EurAsEC</b>	Eurasian Economic Community
<b>EU</b>	European Union
<b>CIS</b>	Commonwealth Independent States
<b>FDI</b>	Foreign Direct Investment
<b>GDP</b>	Gross domestic product
<b>GUUAM</b>	Georgia, Ukraine, Uzbekistan, Azerbaijan and Moldova
<b>IC</b>	Innovation Centers
<b>ICBSS</b>	International Centre for Black Sea Studies
<b>ICTs</b>	Information and Communication Technologies
<b>IMF</b>	International Monetary Fund
<b>INSEAD</b>	Institut Européen d'Administration des Affaires, European Institute of Business Administration
<b>IPR</b>	Intellectual Property Rights
<b>NCC</b>	National Contact Centers
<b>NGO</b>	Non Governmental Organization
<b>OECD</b>	Organization for Economic Co-operation and Development
<b>NIC</b>	National Innovation Systems
<b>PAG</b>	Policy Advice Group

<b>PIC</b>	Programme for Innovation Cooperation
<b>PPP</b>	Public- Private Partnership
<b>R&amp;D</b>	Research and Development
<b>S&amp;T</b>	Science & Technology
<b>SMEs</b>	Small and medium sized enterprises
<b>SPICA</b>	Science Park and Innovation Center Association
<b>STI</b>	Science, Technology & Innovation
<b>UN</b>	United Nations (
<b>US</b>	United States
<b>VBSIC</b>	Virtual Black Sea Innovation Centre
<b>WOC</b>	World Organization of Creditors
<b>WTO</b>	World Trade Organization
<b>YSCP</b>	Yokohama Smart City Plan



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