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STATUS OF PROGRAMME IMPLEMENTATION

**CREATING A SUPPORTIVE ENVIRONMENT FOR INNOVATIVE DEVELOPMENT AND
KNOWLEDGE-BASED COMPETITIVENESS**

**SYNOPSIS OF POLICY OPTIONS FOR CREATING A SUPPORTIVE
ENVIRONMENT FOR INNOVATIVE DEVELOPMENT**

Note by the secretariat

Summary

This Synopsis is compiled in accordance with the Programme of Work of the UNECE Committee for Economic Cooperation and Integration (CECI) for 2006-2008. In accordance with the Implementation plan for 2008, it focuses on innovation at the firm level and the policy options for establishing a conducive environment for enhancing the innovative performance of firms. The Synopsis provides a summary of good practices and policy options in several areas: creating supportive framework conditions for enhancing the innovative capacity of firms; strengthening industry-science-education linkages; raising the efficiency of innovation support institutions such as business incubators, science and technology parks and innovation clusters.

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INTRODUCTION

1. In accordance with the Programme of Work of the UNECE Committee for Economic Cooperation and Integration (CECI) for 2006-2008 in focus area “Creating a supportive environment for innovative development and knowledge-based competitiveness” and the related Implementation plan adopted by the Team of Specialists on Innovation and Competitiveness Policies (TOS-ICP) at its second session held Geneva from 14 to 15 February 2008, the Team agreed on its main outputs in 2008:

- (a) Comparative review “Enhancing the Innovative Performance of Firms: Policy Options and Practical Instruments”; and
- (b) “Synopsis of Policy Options for Creating a Supportive Environment for Innovative Development”.

2. In accordance with the conclusions of the second session of the TOS-ICP, its work in 2008 is mainly focused on innovation at the firm level and the policy options for establishing a conducive environment for enhancing the innovative performance of firms.

3. The Comparative review was compiled on the basis of policy documents and other materials submitted to the UNECE by members of the TOS-ICP, as well as other publicly available documents and materials. The text of the Comparative review is being prepared to be published as an official UNECE publication.

4. This Synopsis largely draws on the findings of the Comparative review with the aim to provide policy-relevant conclusions on good practices in creating a supportive environment for innovative development in the UNECE region, with a special focus on innovative performance at the firm level. In view of the nature of the document, the Synopsis only provides a summary of good practices and policy options and the related country experiences. More detailed information can be found in the Comparative review.

5. The UNECE region includes countries at very different levels of their innovative capability. In accordance with the CECI mandate, this Synopsis is largely focused on good practices applicable in the catching-up UNECE economies.¹ Nevertheless, it has a broader focus on transnational learning, that is to say the transfer of good experiences and best practices across the whole UNECE region. It thus aims to facilitate further this process and contribute to improved level of policymaking in policies for promoting technology and technology-based catching up.

¹ The term “catching-up economies” is used in this document to define the following group of countries: the ten new EU Member States (Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia), the countries of South-East Europe (Albania, Bosnia and Herzegovina, Croatia, Montenegro, Serbia and the former Yugoslav Republic of Macedonia) as well as the countries of Eastern Europe, Caucasus, and Central Asia (Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Republic of Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine and Uzbekistan).

I. OVERVIEW OF POLICY OPTIONS AND INSTRUMENTS TO SUPPORT FIRMS' INNOVATION PERFORMANCE

6. A broadly accepted definition of innovation is the successful commercial or social exploitation of new ideas, where the idea is successfully brought to the market by offering a more effective alternative to existing arrangements. Firms and other business entities are the main agents of innovation in the modern economy.

7. Innovation in the commercial sector provides a competitive advantage over others in their market place. In today's economy, it is necessary for all companies to connect knowledge to the market successfully in order to remain competitive. At the macro level, dynamic innovation activity by firms raises the competitiveness of the national economy. Policies enhancing the innovation performance of firms therefore also help boost national exports and economic growth.

8. In order to innovate, firms need to gain a good understanding of their markets in order to appreciate the market pull for commercial benefits and to connect relevant knowledge that may be new to the market. Consequently, they need to look at related technology push and to develop internal management systems that bring them together and combine them with business opportunities.

9. Innovation relies on the production, diffusion, absorption and utilization of knowledge. For this process to reach its potential, each stage has to be understood and managed in relation to the other components and has to be driven by incentives. The recognition that there may be shortcomings in the performance of the operational units in this chain of activities has led to the development of policies and institutions which attempt to coordinate supply and demand for knowledge and set in place the capacity that builds the potential to diffuse and absorb ideas.

10. In the modern economy, innovation emerges from a continuous interaction between firms, their suppliers and buyers and external actors like universities or research and development (R&D) organizations. Firms are not isolated in their innovation activities but rather perform them in networks; these activities are highly dependent on the external environment at the sectoral, regional and national levels. The term "national innovation system" (NIS) characterizes the systemic interdependencies within a given country, which influence the processes of generation and diffusion of innovation in that economy.

11. The new models of innovation emphasize the collaborative relations between firms as a source of competitive advantage. This requires from firms the ability to develop specific skills and put in place strategies aiming to achieve superior innovation performance by explicitly incorporating the interactions with other innovation stakeholders.

12. Small and medium-sized enterprises (SMEs) are important stakeholders in the innovation process. They enjoy greater flexibility and can therefore take more risks than larger companies in experimenting with new processes or technologies. Thus SMEs are well placed to capture ideas from the research base of universities, other public sector institutions and commercial laboratories and drive them to the market place.

13. Commercializing an innovation can be an extremely difficult and cumbersome process, especially for start-up innovating entrepreneurs who need to overcome a myriad of barriers in the financing, technological, managerial, regulatory, administrative and other spheres. The main role of public policy in this regard is to establish a conducive environment that supports innovating entrepreneurs in bringing their innovation to the market. This includes both direct and indirect support through various public agencies, but also public support for the establishment of private innovation support institutions.

14. Effective implementation of innovation policy therefore requires the presence of an efficient institutional system. The horizontal nature of innovation policy and the variety of entities involved in innovation performance at both central and regional levels demands appropriate coordinating mechanisms.

15. To strengthen the technology environment, there needs to be support from innovation networks that link a number of national and regional institutions and programmes. These include research and innovation funding, networks that link demand and supply of technology, programmes of individual ministries that support the national innovation strategy, physical infrastructure, technology transfer organizations, business support, discussion fora, standards organizations, finance structures, research activities, national and learned societies and industry, etc.

16. Governments themselves can innovate by adopting new and better ways to create a supportive institutional and policy environment and by exploiting new ideas applicable to highly competitive markets.

II. CREATING SUPPORTIVE FRAMEWORK CONDITIONS FOR ENHANCING THE INNOVATIVE CAPACITY OF FIRMS

17. The activities that are the foundation of the NIS include knowledge creation and its demand, the way this knowledge is diffused through institutions, including businesses operating in the market, the way knowledge is absorbed by business and the influence exerted on these activities by government, business and other stakeholders. Taken together these elements shapes innovation governance.

18. The role of policy is to establish a business, social and technology environment as supportive as possible for businesses to innovate and to raise awareness in the corporate sector of what other parts of the system offer by way of support to stimulate the market for innovative goods.

19. Policy interventions aimed at strengthening the operational units and linkages that make up the NIS also support firms' innovation activities. Examples include public investment in knowledge creation and its management, measures seeking to increase demand for innovation (for example, stimulating markets for technology products and services), public support to the links between the operational units in the innovation process and to the development of the "soft infrastructure" in the NIS (the ingredients that support collaborative relations), as well as establishing other incentives for companies to cooperate in their innovative efforts.

20. Diffusion of innovation necessitates intermediary organizations that establish effective networks between suppliers and customers, between sources and users of innovation, between R&D organizations and industry.

21. Options exist for policymakers to increase the demand for innovation by offering the opportunity for SMEs to bid for R&D contracts associated with procurement by government or by creating new markets for technology-based products. In addition, supporting the development of supply chains by increasing networking across regions helps customers and suppliers to work together to their common benefit.

22. The influence of the business environment is particularly important in encouraging innovation. This includes a transparent, accessible and simply organized business infrastructure that facilitates business formation and operation and allows those in universities to create companies for the exploitation of innovation. The business environment has to be conducive to investment in R&D and should not overburden business with regulations.

23. There are ways of structuring government R&D spending so that to address industrial relations that drive innovation. Examples include funding of knowledge transfer partnerships and, on a more generic basis, knowledge transfer networks. These knowledge transfer networks link broad groups of organizations that have a common interest in a particular technology.

24. In addition to supporting investment in R&D through grants for early stage ideas and matched funding programmes for technologies, there needs to be effective fiscal structures encouraging firm investment in innovation.

25. Some countries have applied policies aimed at improving their technological environment by attracting foreign direct investment (FDI). Strategies to do this include importing technology, attracting investment to “greenfield” sites or establishing new companies through merger or acquisition to build the innovation capacity in a region. Driving this process requires capacity-building in terms of skills (supply chains), adequate physical infrastructure and access to markets.

26. Pursuing policies to develop a culture of innovation and to increase the demand for innovation requires well functioning markets for technology products. Public support to market development represents an important strategy in trying to build capacity in a region. Ways of achieving this include public competition policy, removing existing administrative barriers to business activity and public procurement for technology-based goods and services.

27. A well understood long-term constraint on the development of innovative companies is the lack of funding that fills the gap between the point where R&D grants end and private equity finance shows an interest. The market failure that creates this funding gap needs to be addressed effectively if companies are to be supported through their early stage of growth. Many countries have established programmes to bridge this funding gap and have enacted legislation to encourage the business angel sector to take an active role in supporting this process.²

² See document ECE/CECI/2008/4.

28. In working through this process, there may be a need to supplement general innovation governance with government-sponsored groups that take special responsibility for dealing with SMEs to ensure that legislation does not have a detrimental effect on the sector. This is necessary as the resources available to SMEs are limited, especially while they are in the early stages of development and vulnerable to cash flow problems.

29. Innovation activity has a regional aspect as an important part of the innovation capacity is provided by a region's skills base, including adequate supply of the right skills and the cost of these skills. Addressing these issues requires cooperation between local authorities and employers. This process helps to identify skills gaps in the regions which can be filled through the provision of relevant training or by targeted investments related to these needs.

30. One of several strategies for building a skills base is to provide external direct advice, mentoring and coaching to companies. One example is the creation of an innovation advisory service encouraging companies to develop the necessary internal structures to support innovation. Such a service can also be instrumental in promoting an innovation network across the region by attracting other companies that may contribute to the joint innovation programme.

31. A related policy is the support to the selective development of courses in universities aimed at meeting specific local needs.

32. With the increasing pace of change, many larger companies try to develop specific innovation strategies. These include internal restructuring to create innovation teams to which a company delegates the innovation role, including the coordination of R&D efforts, managing relations with national innovation funds, adopting open innovation programmes and targeting innovation by mergers and acquisitions.

33. The organizational change in large companies centered on the establishing of targeted innovation teams may include the following main aspects:

- (a) The level of authority delegated to the innovation team not only reduces delays but also helps to attract high-level executives to participate in the activity. The extent to which these teams are permanent and dedicated to this role varies across organizations;
- (b) The need for both technology push and market pull to be part of the process means that both these activities need to be integrated into this team's responsibilities. This integration helps collaboration and also speeds up the process. In some cases, companies reorganize their R&D laboratories along business division or product structure lines in order to foster greater understanding of the process, better collaboration and speed of delivery;
- (c) Closer proximity of all the parts of an innovation team by co-location assists integration and facilitates communications;
- (d) In some cases, broad-based central innovation teams are focused on radical innovation. The reporting structure for these is important to ensure that such innovations are developed effectively;
- (e) The process of innovation needs to be funded in such a way that any investment decisions are seen against business development opportunities;

- (f) The need to extend innovation options has also been pioneered under the term “open innovation”. This wider search within the business and research community can also be a prerogative of the firm’s innovation team; and
- (g) Many large corporations are now looking to secure innovation through the acquisition of small innovative companies. This route is part of achieving “high speed” innovation.

34. The process of innovation-related organizational change in firms needs to be driven by appropriate incentives and can be enhanced by targeted policy interventions.

35. The goal of open innovation is to draw in ideas that have commercial potential from a wider catchment than just within their own company. However, to make this process successful, there needs to be rafts of SMEs operating at different levels that can eventually develop new radical innovation. This also implies the existence of an infrastructure conducive to business development.

36. Establishing supportive framework conditions for enhancing the innovative capacity of firms therefore requires placing immediate policy-based actions into a longer-term strategic policy framework.

37. Short-term policies that support business development may include funding support to technology which has commercial potential, creating support services for business, running business awareness courses on how to create an innovative environment in a company, stimulating innovation by business through relevant procurement programmes and focusing on skills that would enhance the market potential of existing industrial activities.

38. Strategic policies need to build long-term innovative capacity by more widely promoting the processes that drive innovation, building relevant skills and investing in R&D that has long-term commercial potential. There is a number of dimensions to this which include altering the courses on offer in universities, long-term research funding in strategic technologies, building infrastructure such as science and technology parks, as well as putting in place legislation to allow mobility between the private, public and commercial sectors.

III. STRENGTHENING INDUSTRY-SCIENCE LINKAGES

39. The innovation process requires a connection between the institutions generation knowledge and those organizations that address the market, that is, between education/science and business. For these linkages to be effective, the knowledge needs to be relevant and business needs to know how to use the knowledge.

40. Effective management of the links between the production of knowledge and skills and their utilization and commercialization is essential for the development of a sustainable knowledge and innovation base in any economic system. Sustainable education – science – industry linkages are essential for delivering skills and technology to the market place.

41. These linkages are weak in many countries, especially in some of the catching-up economies. Among the causes of poor linkages are the inadequate institutional infrastructure of

the NIS, legacies of the “linear” model of innovation, old-fashioned courses taught in universities that lack relevance in the commercial domain, and traditional weaknesses of the NIS in the catching-up economies inherited from the period of centrally planned economy. It is essential that such gaps are closed which may require targeted policy interventions.

42. Closing the gap between the needs of business and the educational/R&D output of the NIS requires close collaboration and dialogue between the relevant stakeholders. Policy interventions may also enhance connectivity and cooperation among stakeholders.

43. Various publicly funded programmes have been developed to assist in this process in different UNECE countries. On the one hand, such programmes generally target enhancing the exposure of academics and students to the commercial sector including staff exchange, as well as technology and knowledge transfer. On the other hand, policy measures aim at reducing obstacles and barriers that may discourage the business sector from drawing on the intellectual resources of academic centres.

44. In addition, policy may support strategy groups in aligning public programmes with the needs of industry. Examples of such strategy groups include science and industry councils and technology strategy boards. To be effective, representation on these committees need to cover the interests of business, education and the organizations that deliver the services from one side to the other.

45. At the regional level, some regions establish learning and skills councils that actively engage with the problem of increasing the number and strength of linkages between education and industry.

46. Example of public programmes targeting to strengthen industry-science linkages include:

- (a) Programmes for SMEs and microcompanies to employ undergraduates for short project based placements;
- (b) Industrial professional year programmes for undergraduates in which students work in a placement in a company as a formal part of their course;
- (c) Project work programmes, particularly associated with those universities that have science and technology parks, in which students undertake specific projects for tenant companies. These range from projects involved with technical problems to ones that are concerned with solving business management issues;
- (d) Competitions for funding. An example is the Young Entrepreneurs Scheme (YES) in the United Kingdom which provides young scientists with an opportunity to develop entrepreneurship awareness and develop business plans founded on science which are then scrutinized and exposed to the business world;
- (e) Establishing knowledge transfer partnerships among interested stakeholders, some of which may function as public-private partnerships; and
- (f) Research councils which fund research in universities providing a foundation for future innovation. Their efficient work requires access to external expertise to better define future trends, in particular fields of science and technology.

47. Universities may be encouraged to adapt management and education structures to sustain

links with the business sector. Examples of these include:

- (a) Assisting academics to apply for consultancy contracts from industrial and commercial partners;
- (b) Providing project management and other resources for complex research programmes and other initiatives involving partners from universities and industry;
- (c) Providing expertise and support in the management of intellectual property such as patents, legal contracts, business start-ups, venture capital and business incubation;
- (d) Assistance to universities in developing educational modules on business as part of their main undergraduate courses;
- (e) Helping to foster a spirit of entrepreneurship within the university for staff, students and alumni; supporting and developing entrepreneurial skills within the local and regional business community; and
- (f) Running pre-incubators (business accelerator units) to help staff and students build finance-ready business plans.

48. More generally, the role of universities is now changing as there is an increasing expectation on them not only to contribute to developing and passing on new knowledge but also to take an active role in developing their communities and local business. This new role has two dimensions: first, providing an outreach programme that supports local business and, second, providing resources to commercialize their own technology and other intellectual property.

49. Management structures in universities to support these programmes may include units, such as:

- (a) Legal services which provide legal advice to academics in negotiating contracts on behalf of the university;
- (b) Technology transfer services which manage the university's intellectual property portfolio to enable the profitable transfer of technology from the university to industry;
- (c) Research and business services to provide advice and support in generating income for the university through research collaborations with industry, consultancy and expert services;
- (d) Projects teams to assist with project management services and cooperation with a variety of industry partners; and
- (e) Liaison offices which assist with commercial research funding by linking with business.

50. Other outreach programmes that are aimed at strengthening the links between education and industry include establishing innovation clubs and bodies offering research advice services. These programmes target establishing direct links among potential stakeholders from both the academic and business communities.

IV. RAISING THE EFFICIENCY OF INNOVATION SUPPORT INSTITUTIONS

51. Innovation support institutions are public, private, or public-private institutions that provide support to start-up innovating entrepreneurs in commercializing their innovations and bringing them to the market.

52. Some institutions provide public financial and/or in-kind support to start-up ventures. However, this support is of one-off nature: at a certain point of time firms are expected to “grow up” and take care of themselves; those that fail to achieve financial viability within the established time limits will exit the market. All innovation support institutions provide business services, such as coaching, consulting, managerial and administrative services, etc. to innovating entrepreneurs.

53. Another important role of these institutions is in facilitating linkages between the potential key stakeholders of a project. They help in connectivity and networking both within the institution and also with the outside environment.

A. BUSINESS INCUBATORS

54. A business incubator is a company or facility that provides physical space and a number of services to new businesses, helping them through the earlier stages of their development. Incubators provide access to business support, finance, management coaching as well as other business and administrative services to assist in the formation and growth of companies. The expected outcome is to reach a stage of developing a revenue-generating company or one that is ready to attract investment for development.

55. There is a number of models for incubation. Full incubation offers a wide package of services that are aimed at increasing the chance of success of developing a company. The package may cover not only ordinary business services but support strategies that are tailored to developing the companies with the greatest potential.

56. The incubator’s own business model is defined by the main support and service functions provided:

- (a) Strategic counselling or provision of strategic guidance to tenant enterprises;
- (b) Financing, namely the ability to mobilize support funds or venture capital and organize strategic cooperation in raising the necessary funds to support tenant companies;
- (c) Monitoring, that is the capacity to monitor the technical and financial development, and the ability to impose sanctions if certain goals are not met;
- (d) Outreach or the extent to which an incubator is actively involved in scanning and evaluating potential business ideas that fit its overall goals;
- (e) Cooperation with knowledge institutions or with other institutions that are focused on the incubator’s area of specialization;
- (f) Networking, that is the scope of external partners that offer guidance or other services to tenant companies; and

- (g) Degree of specialization or the extent to which an incubator constrains its activities within specific technologies.

57. The main steps in business incubator formation include the following:

- (a) Specification of incubator goals. These should be coordinated with the objectives of the community and the sponsor;
- (b) Establishment of a local working group to take responsibility for initial work in incubator formation;
- (c) Assessment of local business support, in terms of training, experience, and technical expertise;
- (d) Analysis of local economic activity, including both entrepreneurial activity and market potential;
- (e) Site identification;
- (f) Identification of financing sources for both the facility and its tenants;
- (g) Creation of a start-up plan for the incubator;
- (h) Marketing and publicizing of the incubator; and
- (i) Evaluation and redefinition of goals.

58. Any tenant start-up only spends a limited time in the incubator and after going through the incubation process the company should be prepared to leave the incubator and start self-sustained performance in the market:

- (a) Incubators usually have their specific graduation criteria which may include the reaching of certain size and profitability but also a maximum tenure at the incubator;
- (b) Graduation policy should be open and transparent and tenant start-ups should be fully aware of it;
- (c) Ideally, the timing of exit should be agreed upon between the incubator management and the tenant well in advance; and
- (d) Graduation policy may also include criteria for exit by unviable companies.

B. SCIENCE AND TECHNOLOGY PARKS

59. Science parks (sometimes called research parks, technology parks or technolopes) are property-based ventures providing R&D facilities to technology- and science-based companies. Compared to business incubators, science and technology parks tend to be much larger in size, often spanning across large territories and housing various entities from corporate, government, and university labs to big and small companies.

60. The park may be a not-for-profit or for-profit entity owned wholly or partially by a university or a university related entity. Alternatively, the park may be owned by a non-university entity but have a contractual or other formal relationship with a university, including joint or cooperative ventures between a privately developed research park and a university.

61. Science parks do not necessarily offer a full range of business support and services but some parks may host a business incubator focused on early-stage companies. Typically,

however, science and technology parks serve the post-incubator phase of company development or provide a launch pad for companies that are "spun out" from a university or company.

62. There is no universal model for science and technology parks; however, according to origins, two groups can be identified. The first are those that have been developed as local initiatives championed by local interests. The second are those that have been planned as part of delivering a national innovation system to a region (or as part of a regional innovation system). Experience has shown that science and technology parks are most effective where they are connected into wider business support programmes.

63. Typically, the main objectives and functions of science and technology parks are:

- (a) Promoting the generation and commercialization of innovative technologies and products;
- (b) Promoting knowledge sharing and networking among different innovation stakeholders;
- (c) Stimulating investment in new-technology-based firms;
- (d) Generating new employment opportunities through the commercial application of new technology; and
- (e) Contributing to wealth creation and rising welfare in the region through its activities.

64. Science and technology parks are important agents in industry-science linkages. Thanks to their nature, they can facilitate both the establishment of business relationships fostering the diffusion of innovation and the formation of partnership relationships with industry.

65. The key success factors that are commonly recognized in successful science and technology parks include:

- (a) Clarity of vision and purpose amongst all stakeholders, with a consistent emphasis over time;
- (b) The central involvement of at least one major research organization;
- (c) Research and innovation are central in branding the park and shaping its culture;
- (d) Strong interactions between the host academic/research campus and the park;
- (e) A project champion (an individual or a group) with a clear and practical understanding of the park's purpose and the benefits it will bring;
- (f) A park manager with strong leadership skills and preferably a background in R&D;
- (g) The effective economic and social integration of the park with the community and region;
- (h) The public sector (central or local government) playing a facilitating and enabling role;
- (i) Sufficient capitalization to ride out any adverse effects of the business and property cycles;
- (j) Financial self-sufficiency over time;
- (k) A multi-phased development period of 15 or more years; and

- (l) Absence of development constraints and an ongoing availability of substantial space.

C. INNOVATION CLUSTERS

66. An innovation cluster is a system of close links between firms and their suppliers and clients, and knowledge institutions, resulting in the generation of innovation. The cluster includes companies that both cooperate and compete among themselves. The links between firms are both vertical, through buying and selling chains, and horizontal, through having complementary products and services, and use similar specialized inputs, technologies or institutions, and other linkages.

67. Most of the linkages that shape a cluster involve social relationships or networks that produce benefits for the firms involved. Clusters become even more visible and attractive if they have strong linkages with related clusters in other regions and countries.

68. Clusters are based on relationships among firms. The relationships can be built on common or complementary products, production processes, core technologies, natural resource requirements, skill requirements, and/or distribution channels.

69. Cluster initiatives are organized efforts to increase the growth and competitiveness of clusters within a region, involving cluster firms, government and/or the research community. A cluster initiative typically involves:

- (a) Different member organizations (these can include private industry, public organizations, academia, and public-private, typically non-profit, organizations);
- (b) The cluster organization with an office, cluster facilitator/manager, website, etc.;
- (c) Governance of the initiative (e.g. constellation of a board; facilitator, etc.); and
- (d) Financing of the initiative (national/regional/local public funding, member fees, consulting, etc.).

70. Clusters breed an environment conducive to innovation:

- (a) The cluster environment stimulates knowledge spillovers across institutional boundaries and encourages cooperation, both of which are essential for 'open innovation' generated in networks of cooperating companies and institutions;
- (b) Competitive pressure resulting from the presence of firms in related industries also fosters the innovative activity of individual firms;
- (c) Clusters stimulate the identification of new technology trends and potential innovation and lower the barriers for transforming new ideas into businesses and shorten start-up times;
- (d) The cluster environment is conducive to learning and developing new competencies essential for the generation and commercialization of innovation; and
- (e) Clusters provide opportunities for pooling innovation-related risk and a broad set of options to appropriate the benefit of investments in innovation.

71. The main ingredients of a well-functioning innovation cluster include the following:
- (a) The presence of functioning networks and partnerships that facilitate linkages;
 - (b) A strong innovation base with supporting R&D activities;
 - (c) Human capital endowment, in particular, a strong skills base;
 - (d) Well developed and functioning physical infrastructure and communications;
 - (e) Presence of large firms shaping the specialization of the cluster;
 - (f) Favourable business climate, competitive business environment and spirit of entrepreneurship;
 - (g) Access to finance, business support and specialist services; and
 - (h) Leadership and managerial skills.

V. MAIN POLICY CONCLUSIONS

72. Firm innovation activity is a key driver of competitiveness and economic growth. Although the process occurs at a company level through the skilful management of firms, firms' innovation performance can be enhanced by appropriate policy measures conducted in a business-friendly environment.

73. The provision of such a supportive business environment calls for a coordination of a number of policies and the related public investment that help in shaping the "soft" and physical infrastructure, as well as the legislative framework in which the private sector operates.

74. Developing national innovation systems provides a framework in which to embed policy, guide investment and bring together the stakeholder partners in the process:

- (a) The national innovation system provides an institutional and business environment that supports the creation and demand for knowledge as well as its diffusion and absorption into business activities; and
- (b) The creation of such a system is most effective if business benefits from this and increases its investment in the innovation process.

75. The most effective influence on business is market opportunity. Businesses will innovate when they see innovation as an important business opportunity. This implies that companies can both recognize and understand how to exploit the innovation-driven market. Policy can also provide support to businesses in identifying innovative business opportunities.

76. Innovation by companies also requires access to capital to commercialize innovative market opportunities. Capital needs to be channelled to innovating companies in an effective manner to make the innovation process self-sustained.

77. Among the key factors driving the innovative activities of firms are the following:

- (a) Investment in education that is relevant to business. Universities need to link with business and develop courses that are relevant to the operational units that make up national innovation systems.

- (b) Support to investment in R&D by both government and business. Governments can stimulate private R&D investment by ensuring the fiscal structures provide the necessary incentives to businesses.
- (c) Business investment in innovation strategies. It can be stimulated by both relevant education and incentives to influence companies so that they recognize the need to change. Appropriate management training programmes can support this process;
- (d) Specific policy measures to address the concerns of SMEs and to provide a conducive environment for such firms to engage in the commercialization of innovative business opportunities.
- (e) Establishing strong and self-sustained industry science linkages. Public policy is a key factor for stimulating the cooperative efforts of all the relevant stakeholders in the innovation process.
- (f) Policy needs to drive the development and support of the soft and hard infrastructure that breeds innovative companies. Careful consideration should be given to planning and developing innovation support institutions and the related business support programmes.
- (g) Joint efforts by public and private sector (public-private partnerships) are an efficient and effective way to develop innovation support institutions.

78. Governments in cooperation with other relevant stakeholders also need to improve the management structures to identify and protect intellectual property with commercial value in order to broaden the scope of the entrepreneurial approaches to appropriating the benefits of intellectual property and of the investment in innovation.

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