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INNOVATION POLICY: EUROPEAN BENCHMARKING FOR UKRAINE

VOLUME 3

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Preface

The present document is a compilation of the main concepts and trends relating to innovation policy in Ukraine. The first five chapters summarise briefly the findings of our work under specific topics that innovation policy should be related to. These topics are the global positioning, the role of firms, the institutional structures, governance, and framework conditions. After four consultation rounds we have received a significant number of comments and suggestions that we included in this final version. We hope that we have treated the information effectively. The methodology that has been followed is similar to the one applied by the European Commission for the preparation of the Green paper on innovation in Europe and the Trend Chart for innovation in Europe.

Chapter 6 provides a set of policy suggestions and recommendations for action. These are grouped under specific policy action lines that we consider as important for policy intervention in the country. We also made an attempt to prioritise the proposed measures. We hope that this final document will go on triggering policy discussions and decision-making on how to further lead the country towards a knowledge-based competitive economy.

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The authors also embraced the views of innovation projects in Ukraine (in alphabetic order): Development of financial schemes and infrastructure to support innovation in Ukraine - Harmonisation of Competition and Public Procurement Systems in Ukraine with EU Standards - Joint Support Office for enhancing Ukraine's integration in EU research area - Science and Technology Centre in Ukraine - Support to knowledge based and innovative enterprises and technology transfer to business in Ukraine - Technical Assistance to Ukrainian Quality Infrastructure

We apologise if any names of contributors or stakeholders are missing. It is unintentional. Please inform us and we will correct it. We would like to thank you all for the invaluable contributions to our work.

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Abbreviations

BERD	Business Expenditures on Research and Development
CIP	Competitiveness and Innovation Programme
CIS	Community Innovation Survey
CSII	Centers of Science, Innovation and Informatization
CTCO	Chief Technology Commercialisation Officer
DSTU	Derzhavni Standarty Ukrainy (GOST according to Ukrainian laws on standards)
EEN	Enterprise Europe Network
EBN	European Business & Innovation Centre (BIC) Network
EU	European Union
FDI	Foreign Direct Investment
FP7	Seventh Framework Programme for Research and Technological Development
GBAORD	Government budget appropriations or outlays on R&D
GDP	Gross Domestic Product
GERD	Government Expenditures on Research and Development
GNI	Gross National Income
GOST	Gosudarstvennyy Standart
HEI	Higher Education Institutions
ICT	Information and communications technology
IFC	International Finance Corporation
INCO	International Scientific Cooperation Activities
IP	Intellectual Property
IPR	Intellectual Property Rights
KPI	Kyiv Polytechnics Institute
LIP	Local Information Point
MEDT	Ministry of Economic Development and Trade
MESYS	Ministry of Education, Science, Youth and Sports
n/a	Not available
NASU	National Academy of Science of Ukraine
NCP	National Contact Point
OECD	Organisation for Economic Co-operation and Development
PROs	Public Research Organisations
R&D	Research and Development
RTDI	Research, Technology Development and Innovation
S&E	Science and Engineering
S&T	Science & Technology
SASII	State Agency of Ukraine on Science, Innovation and Information
SAUII	State Agency of Ukraine for Investments and Innovations
SCURPE	State Committee of Ukraine on Regulatory Policy and Entrepreneurship
SII	Science Innovation Indicators
SMEs	Small-Medium Enterprises
SSC	State Statistics Committee
SSH	Social Sciences and Humanities
STCU	Science and Technology Centre in Ukraine
STI	Science Technology Innovation
STM	Specialist technology management
TT	Technology Transfer
UA	Ukraine
UAH	Ukrainian grivnas
UBICA	Ukrainian Association of Investment Business Association
UFES	Ukrainian Entrepreneurship Support Fund
UkrISTEI	Ukrainian Institute of Scientific, Technical and Economic Information
UNI4INNO	Boosting the Knowledge Triangle by Establishing Innovation Offices in Ukrainian Higher Education Institutions
USD	United States Dollar
VAT	Value Added Tax
VC	Venture Capital

Chapter 1: Globally innovative?

Innovative Economy

Despite the heterogeneity between countries, the variants of the European social models, and the overwhelming number of policy initiatives to support technology development and innovation, the European experience emphasises the role of innovation for growth and development.

Innovation in this context is not seen as an end in itself but as an instrument to stimulate growth and development. “Sustainable growth» adds yet another twist to this topic: if growth is to be sustained over long periods of time growth policies must pay sufficient attention to the limits of growth: the environment, the depletion of raw materials, energy, people, etc. Europe has striven to couple the existing growth orientation with the “new” challenges emanating from climate change and the depletion of natural resources in Europe in order to create and develop truly **‘innovation-driven sustainable growth models’**. The challenges ahead are substantial but they lack alternatives.

The technological frontier: Policies to support front-running or catching-up

Economic and innovation policies take place in a complex and dynamic environment. Consequently, analysing the sources of growth is a demanding exercise, which nevertheless identifies some generic growth drivers but emphasises at the same time the context specificity of growth policy measures. A concept to bring this into perspective is the **“technological frontier”** which draws a line between countries that work on or close to the technology frontier and those who are in a catching-up mode. In the first place, the policy mix needs to aim at an outward shift of the technology frontier through radical innovations while for the second group of countries it has to support a catching-up process where imitation is a major component.

The policy mix (i.e. the measures) but not the policy headlines have to be different in each of the two cases. Radical innovations¹ are the major instrument to shift the technological frontier outwards and – if you are already working on the frontier – the only option to differentiate yourself from your competitors and to create potential for future growth. Of course, radical innovation also happens in catching-up mode but it is most likely not the most prominent form of innovation. Even in front-running mode most innovation activities need to be incremental.

There is no single policy measure to support either front-running or catching-up activities but a bundle of measures across horizontal policy fields. **Catching-up mode** countries (i.e. the companies and individuals) strive to build up capabilities and competencies in order to reduce the gap with the leading countries. This process is often supported by limited competition in the product markets; large firms take the lead in modernising process and may have close ties to banks that finance their operations, government subsidies to gain momentum, educational systems emphasizing primary, secondary, and specialised undergraduate education; and rigid labour markets that favour the accumulation of experience within firms. The **front-running mode** is just the opposite and stresses radical innovation, strong competition on markets for products and services and an educational system that requires the acquisition of a broad skill basis and tertiary education.

In both modes of operation formulation, **triangle policies, i.e. research, education and innovation**, are crucial for the realisation of the growth potential of an economy as these policy areas are mutually reinforcing or – if not developed in a coordinated way – creating bottlenecks which limit growth opportunities.

Innovation, Growth and Competitiveness

The European Commission defines competitiveness “...as a sustained rise in the standards of living of a nation or region and as low a level of involuntary unemployment as possible” (European Commission, 2007). While the definitions vary it is generally acknowledged that competitiveness can be – at least in the long run – equated by the productivity level and productivity development of a nation, sector or firm.

It is reasonable to say that almost all components of a society do have an impact on the growth and productivity potential – and thus on the competitiveness - of a country. While this is obvious, it is far less obvious how big the influence of the various components has been at present and will be in the future. Some advantages, like access to raw materials, may be advantageous only at a certain point in the development process but may create reliance on these resources and may reduce the willingness to invest in other industries or education and thus may curtail future growth potential. For example, early adoption of regulation to safeguard the environment may stimulate innovation in products and processes that create first-mover advantage once other countries follow suit rather than just adding costs for the companies, which are affected by the regulation that would deteriorate competitiveness.

¹ Radical innovations can be thought as completely replacing an existing product or line of products. In a more applied approach, radical innovations would be those products, processes and service that are new to global markets. Incremental innovation represents improvement to existing products, processes and services, which could be new to the local market or to the company.

Growth is a dynamic process, which is hard to predict in a medium to long-term time horizon. Consequently, policies that worked at a specific moment in time may be ineffective or even detrimental to growth at another point in time. Studying growth processes means studying complex systems with tentative rather than absolute answers, which are context (i.e. country) specific. The same holds true for policy interventions aiming at increasing innovation, growth and competitiveness. *Policy measures are always taken under insecurity and may trigger unexpected impacts.*

Another consequence of this position is the adoption of a **system perspective** that explicitly takes the interaction between policy fields and between measures into consideration. In innovation policy for example, this would entail to jointly plan policy interventions in the education system, the research system and in the innovation system in order not to create bottlenecks in various areas. For example, ambitious innovation strategies may be hampered by shortages of well-educated researchers when policies were not coordinated with developments in the education systems. This approach – usually referred by the European Union as **triangle policies**– helps to stimulate innovation, which may then help to grow the economy by increasing competitiveness on the international markets.

Systems perspective, clusters and triangle policy

With the same mindset, sectoral and thematic issues are increasingly viewed as innovation systems or clusters. Policies take the particular situation in terms of development level, economic environment, supply and demand of labour, educational issues, promotion schemes, regulatory issues into consideration when designing and implementing policy measures.

Triangle policies are at the heart of policy intervention to increase competitiveness and productivity but their efficiency and effectiveness depends on the level of coordination within these policy fields and complimentary actions in the other mentioned fields. There is plenty of evidence on the impact of these policy fields on competitiveness or productivity growth. However, it is interesting to see some ‘awkward’ examples:

- **Education system** and tertiary education in particular are in strong demand if R&D expenditures are to be increased. A simple calculation, using the present ratio between R&D spending and the number of R&D employees, yields an additional demand for 700.000 researchers if the 3% target is to be achieved (European Commission 2007). Without increased output of people with tertiary education attempts to raise R&D expenditure would simply increase wages for the existing researchers.
- There are estimations that some 60% of the difference in growth between European countries and the USA can be attributed to the fact that European education systems are strongly geared towards **vocational or secondary** education.
- A \$1000 per person increase of **higher education** spending would boost the annual growth rate in a country at the technological cutting edge by some 0.27 percentage points, whereas investing this amount in a country that is lagging behind in this area increases the growth rate by only 0.1 percentage points.

Cutting through these concepts points to the following policy principles that support innovation-driven sustainable growth path:

- Growth and innovation policies have to be horizontal in nature. i.e. being anchored in all policy areas that impact on innovation but still unfolding in a coordinated way. There are a number of policies for innovation rather than a single innovation policy.
- The system perspective and the network characteristics of innovation systems and clusters have to be emphasised. Neglecting this issue would result in the omission of important building blocks for an innovation driven and sustainable growth policy (e.g. education, research, regulation)
- Policies have to be in line with the development level of the country and adapted to the specificities of the country. Simply copying successful policies of other countries will most certainly result in an inefficient use of resources. The ability to learn from advanced countries and the courage to develop and implement policy strategies that fit the development level are to be supported in policy-making circles.

Ukraine in the European innovation canvas

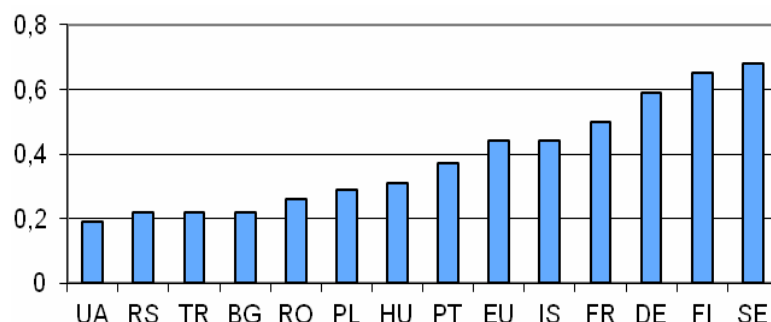
The indicators of the European Innovation Scoreboard provide a first comparison in terms of innovation performance between the European Union and the Ukraine. Vis a vis the European Union, Ukraine does particularly well in the level of information and communications technologies (ICT) expenditures and youth education where it surpasses the European average. The share of S&T graduates and of new-to-market innovations is close to the European average.

Ukraine is at about half or two thirds of the European Union in terms of public R&D expenditures, innovation expenditures, employment in medium to high-tech manufacturing and high-tech services. The positive or at least moderate performance in these indicators is in stark contrast to the level of broadband penetration, business R&D expenditures, public funding of innovations and high-tech exports.

Overall the picture of Ukraine is rather mixed and somewhat contradictory: a well educated labour force, a substantial number of S&T graduates, moderate innovation expenditures despite missing public support but remarkable new to market product sales. The later obviously is not translated into high-tech exports.

In terms of innovation indicators, Ukraine can be compared somewhat to Romania and Bulgaria at the time of their EU accession and Turkey. Thus Ukraine is clearly a country in catching-up mode that can build on its structures in science and the relevant resources.

Figure 1.1 Ukraine according to the value of Science Innovation Indicators (SII) (in comparison with selected EU countries), 2008-2009

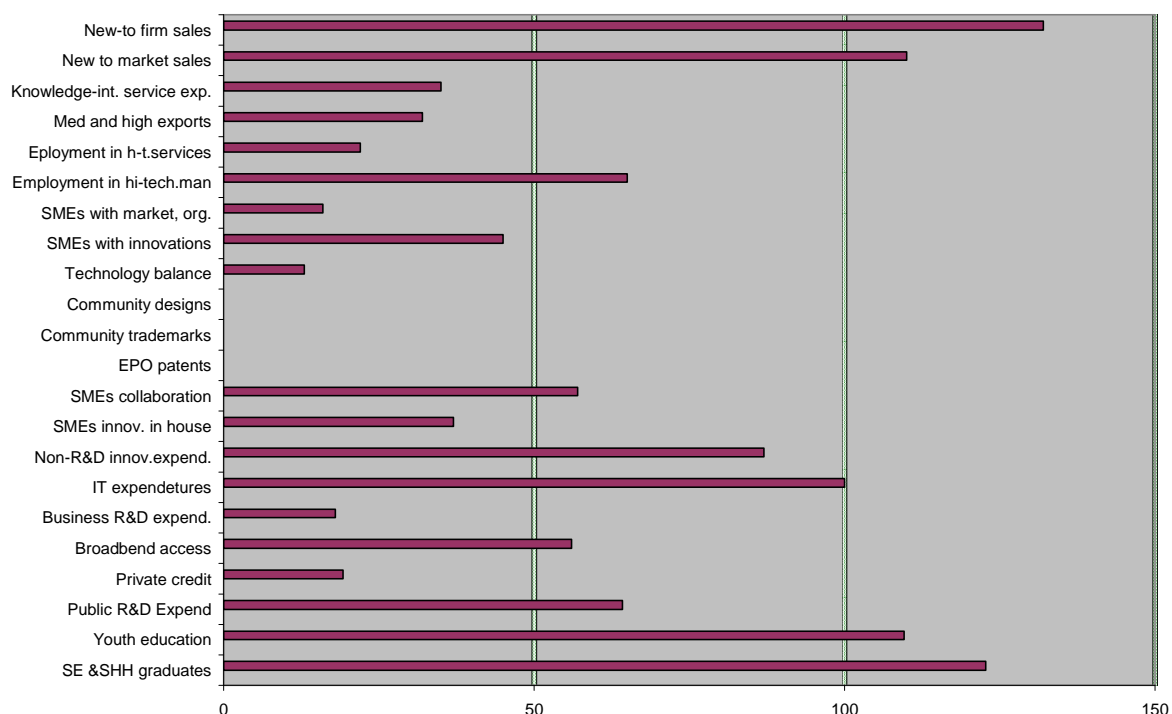


Source: European innovation scoreboard: data for Ukraine, 2009

UA – Ukraine, RS- Russia, TR-Turkey, BG- Bulgaria, RO- Romania, PL- Poland, HU- Hungary, PT- Portugal, EU- average figure for the EU countries, IS- Spain, FR- France, DE- Germany, FI- Finland, SE- Sweden

Data show that Ukraine has relatively strong positions in indicators representing the level of education, new-to-firm sales, and expenditures on ICT as a share of GDP. These figures have corresponding explanations. Educational system is relatively strong since the Soviet times. Ukraine preserves high enrolment of technical departments in the Universities. The shares of sales of new products are in par with the average figures for the EU countries, as total volumes of production are relatively low. Similar situation is with share of ICT expenditures as part of GDP. Absolute figures are modest, if compared with similar EU countries, but the volume of GDP (around 5000 Euros per person) is also not impressive.

Figure 1.2 European innovation scoreboard: data for Ukraine, 2009



Source: European Innovation Scoreboard, 2009
With horizontal axis % of EU average

Table 1.1 European Innovation Scoreboard: country pages for Ukraine

Indicator /Year	2004	2005	2006	2007	2008	2009
S&E and SSH graduates per 1000 population aged 20-29 (first stage of tertiary education)	41,2	44,1	45,6	46,5	48,1	49,7
S&E and SSH doctorate graduates per 1000 population aged 25-34 (second stage of tertiary education)	-	-	-	-	-	-
Population with tertiary education per 100 population aged 25-64	-	-	-	-	-	-
Participation in life-long learning per 100 population aged 25-64	-	-	-	-	-	-
Youth education attainment level	85	86	84	84	85	86
Public R&D expenditures (% of GDP)	0,42	0,39	0,37	0,39	0,41	0,43
Venture capital (% of GDP)	-	-	-	-	0	0
Private credit (relative to GDP)	-	0,3	-	-	0,8	0,3
Broadband access by firms (% of firms)	-	-	-	-	37	56
Business R&D expenditures (% of GDP)	0,34	0,31	0,24	0,2	0,25	0,22
IT expenditures (% of GDP)	-	-	2,6	2,5	2,6	2,7
Non-R&D innovation expenditures (% of turnover)	0,98	1,05	0,91	1,33	1,32	0,9
Linkages & entrepreneurship						
SMEs innovating in-house (% of SMEs)	-	-	-	-	10,43	11,2
Innovative SMEs collaborating with others (% of SMEs)	-	-	-	-	5,43	5,43
Firm renewal (SMEs entries + exits) (% of SMEs)	-	-	-	-	-	-
Public-private co-publications per million population	-	-	-	-	-	-
Throughputs						
EPO patents per million population	0,02	0,06	0,08	0,06	0,11	0,11
Community trademarks per million population	0,02	0,11	0,24	0,3	0,2	0,24
Community designs per million population	0,11	0,02	0,05	0,08	0,37	0,07
Technology Balance of Payments flows (% of GDP)	-	-	0,12	0,14	0,16	0,13
Technological (product/service/process) innovators (% of SMEs)	-	-	-	-	15,2	15,2
Non-technological (marketing/organisational) innovators (% of SMEs)	-	-	-	-	6,4	6,4
Resource efficiency innovators (% of firms)	-	-	-	-	-	-
Employment in medium-high & high-tech manufacturing (% of workforce)	4,78	4,61	4,73	4,81	4,56	4,31
Employment in knowledge-intensive services (% of workforce)	4,78	4,61	4,73	4,81	4,56	4,31
Medium and high-tech exports (% of total exports)	14,37	13,33	14,2	15,32	15,21	14,93
Knowledge-intensive services exports (% of total services exports)	-	-	-	-	15,1	16,9
New-to-market sales (% of turnover)	5,8	6,5	6,7	6,7	9,5	9,5
New-to-firm sales (% of turnover)	-	-	-	-	6,3	6,3

Source: European Innovation Scoreboard

Existing instruments of R&D support (private foundations, technoparks, business-incubators, and leasing centres) are not equipped properly, personnel are not trained adequately and, most importantly, financial resources are scarce. The state plays an important role in financing of R&D but the bulk of state funds are used for the support of the state-sponsored academies of sciences, including National Academy of Sciences of Ukraine. The role of the business sector tends to decrease regarding both financing and implementation of R&D, especially in the period of economic crisis. Higher education and private non-profit sector do not play a significant role in the R&D financing (their shares varied insignificantly with tendency to reduction). On the other hand, more than two thirds of specialists with scientific degrees are working in the higher education sector. According to the national statistics, they produce almost 77% of research papers. Similar is the situation with different national documents on IPR protection, including patents. The share of HES is almost 67%, while the share in foreign patents is more modest – only 15.2%. Traditionally, universities play a subordinate role in the national research system in Ukraine.

Chapter 2: Enterprises vs. Innovation

In the modern market economy it is **the role of companies to find solutions to the basic economic problems**, i.e. how can products and services needed by society be produced in a way that is economically sustainable? An important task of governments is to ensure that markets and the national innovation system function as efficiently as possible. Governments help to create favourable conditions for innovation by managing the economy responsibly, regulating effectively and facilitating free flow of investment, people and ideas. Financial support mechanisms such as direct funding, tax incentives, subsidies and loans are the main instruments that have been used to stimulate industrial R&D. Economic research indicates that while some of the public funds used to stimulate business R&D simply replace private expenditures, there are significant net benefits as well.

Over 20 million enterprises are operating in Europe (Table 2.1) of which over 99% are SMEs (i.e. employing less than 250 persons), which are socially and economically important. Within the SME sector, the vast majority (92%) are micro enterprises, having less than 10 employees. The new Member States show higher birth and death rates of enterprises than the old Member States. Most new firms are created in the service sector and are micro enterprises. About two-third of total employment in the private sector is found in SMEs. SMEs contribute a considerably lower share to value added (58%) than to employment (67%). SMEs exhibit lower profitability and employee compensation than large enterprises. In a globalising economy, with large incumbent firms outsourcing and off-shoring production and jobs to low cost locations, SMEs are an important source of job creation. SMEs also serve as the key mechanism facilitating knowledge spill-over². SMEs are considered a key pillar of the **new industrial policy**. The main policy issues relevant for a modern industrial policy are to a large extent covered by the Small Business Act and its "Think Small First" approach.

Table 2.1: Number of enterprises by size, EU-27, 2002-2007

	Number of enterprises, 2002	Change 2002-2007	Number of enterprises, 2007
SME	18,348,000	2,062,000	20,409,000
Large	41,000	2,000	43,000
Total	18,389,000	2,063,000	20,452,000

Source: EIM on the basis of Eurostat.

Small enterprises are considered to be potentially more innovative because of the lack of entrenched bureaucracy, more competitive markets, and stronger incentives (such as personal rewards). At the same time, both small and large firms make significant innovations and are critical to the success of today's economy. Innovative entrepreneurs come in all shapes and forms. However, according to statistics larger companies demonstrate on average higher level of innovation; indeed, the percentage of companies with innovation among large enterprises in Europe amounts to 70.1%, while the same indicator for medium-sized enterprises is 52.3% and innovative companies among small enterprises comprise 33.4%. The same tendency is observed in individual European countries (Table 2.2)

Innovation is no longer seen as the exclusive domain of technological leaders. The latter remain crucial for international competitiveness, but at the same time sustainable economic growth requires innovative approaches in all spheres – knowledge-based services, organisation of business, marketing and so on. In a knowledge-based economy, innovation in low and medium technology firms is not less important than the innovation in high-technology enterprises for the sake of a better balance in industrial policy.

One feature of well functioning markets is that both small and large firms operate on it, and that there is a lot of collaboration and interaction between large, medium sized and small companies in different forms. In addition, firms collaborate among themselves but more and more also with universities, research institutes and other external producers of knowledge in a variety of formal and informal organisational forms (R&D consortia, research and technology programs, technology platforms, innovation forums, living labs etc.). **On all levels of European governance, collaboration arrangements between private and public sectors (public-private-partnerships) have been established to foster technological development.** The partnerships bring together scientific and technological resources of public and private sectors in long-term arrangements. Especially at national level, R&D-related public-private partnerships have been established in various forms in all EU countries in recent years.

In supporting innovative SMEs, **regional mechanisms** are an integral part of innovation policies in the EU Member States. Support for innovative activities of regional SMEs can be obtained from multiple levels of governance. Cities,

² Audretsch, D., R. van der Horst, T. Kwaak and R. Thurik (2009) First section of the annual report on EU small and medium enterprises. EC, DG Enterprise and Industry, Zoetermeer: EIM Business and Policy Research.

administrative regions, networks of regional decision-making bodies or networks of technology centres and similar bodies can provide such support. Moreover, assistance is available from the national and the EU level as well. In overall innovation policy regional aspects have gained enhanced importance over the recent years.

The absorptive capacity of firms is crucial for translating innovative ideas into productivity gains. Consequently, the **provision of business services to innovators is an important component of national or regional small business policies**, which seek to meet the needs of firms at various stages of the innovation process. Proximity helps to bind these various dimensions into an innovation system. As a result, support of innovation is often the result of initiatives by local or regional governments which have more knowledge and better information about local firms with high potential and can better assess the risks linked with local or regional innovation. The public sector makes certain business services available to companies in return for payment. To a certain extent the services can be considered (partially) public goods.

Table 2.2: Share of innovative enterprises by size-class, EU-27 and selected countries

	Total	10-49 employees	50-249 employees	More than 250 employees
EU-27	38.9	34.4	52.3	70.1
BE Belgium	52.2	48.6	62.3	81.5
BG Bulgaria	20.2	17.0	26.4	52.7
CZ Czech Republic	35.0	28.9	48.6	70.4
DK Denmark	46.9	42.3	59.7	81.2
DE Germany	62.6	57.3	71.9	87.4
EE Estonia	48.2	43.0	64.4	85.2
IE Ireland	47.2	42.7	62.5	74.9
EL Greece	40.9	37.3	55.7	73.6
ES Spain	33.6	30.0	48.6	72.0
FR France	:	:	:	:
IT Italy	34.6	31.3	54.2	69.2
CY Cyprus	39.5	35.0	56.6	82.1
LV Latvia	16.2	13.1	23.7	48.4
LT Lithuania	22.3	18.3	39.1	58.8
LU Luxembourg	48.5	43.6	56.1	83.3
HU Hungary	20.1	15.6	31.6	55.5
MT Malta	28.0	22.3	45.7	77.8
NL Netherlands	35.5	31.3	49.2	65.5
AT Austria	50.6	44.0	71.1	82.8
PL Poland	23.0	15.5	37.7	64.1
PT Portugal	41.3	37.3	56.7	78.5
RO Romania	20.7	17.2	26.6	41.6
SI Slovenia	35.1	27.7	51.3	76.9
SK Slovakia	24.9	19.1	33.7	56.2
FI Finland	51.4	46.9	61.2	83.0
SE Sweden	44.6	40.5	56.9	74.2
UK United Kingdom	38.1	36.0	45.0	52.3

Note: EU-27 excluding FR; statistics cover enterprises with 10 and more employees.
Source: Eurostat (inn_cis5_prod)

In the EU countries there is a shift in rationale and in broad orientations for innovation policy, addressing SMEs in their regional context. The main role for innovation policy, which aims to increase the capacity of a region and the capabilities of its SMEs to innovate, is to foster interactive learning within the firms and within the regions. This calls for an interactive mode of policy intervention. Regional differences in innovation capabilities call for a tailored mix of policy instruments.

Situation in Ukraine

Ukrainian enterprises sector is developing in the complicated conditions of a transition economy, facing the inevitable constraints imposed by deficiencies in legislation and market failures. The following **problem areas in Ukrainian business environment** are identified by the International Finance Corporation as those impeding SME development: financing; taxation; inspections; permits; registration; licensing; certification and standards.

Recent decades have shown that in a dynamic innovative development large enterprises cannot operate successfully without a complementary system of SMEs. A system with insufficient diversity loses flexibility, the ability to quickly adapt to changes, and thus, reducing its effectiveness. Modern structures of the economies assume a rational correlation between the number of large, medium and small enterprises, which perform certain functions in the development of national and regional economies. SMEs and large enterprises are both critical to the success of Ukrainian economy and contribute to the employment and the volume of products and services sold (Table 2.3).

Table 2.3: Main indicators of Ukrainian enterprises* by size, 2009

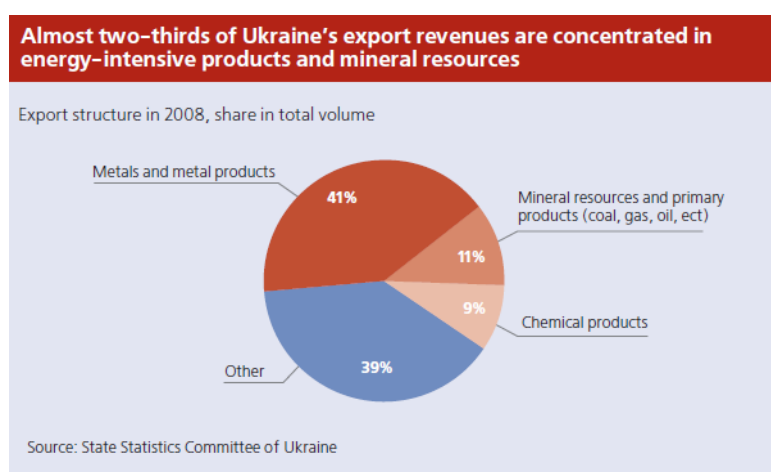
Indicators	Large enterprises	Medium enterprises	Small enterprises
No of enterprises per 10 000 people	NA	5	75
Share of enterprises on total number, %	0.5	5.8	93.7
No of employees including owners, '000 people	3278.7	2860.9	2152.0
In % to total employment	39.5	34.5	26.0
No of hired employees, '000 people	3278.6	2859.9	2067.8
In % to total hired employment	40.0	34.8	25.2
Monthly salary (wage) of hired employees, UAH	2476.95	1477.14	1117.20
Pay-roll fund, million UAH	97451.9	50693.4	27721.7
Volume of products (services) sold, million UAH	1249361.4	1037727.9	455431.2
In % to total volume of products (services) sold	45.6	37.8	16.6

*Banks, farms and budget organisations excluded.

Source: State Statistic Committee of Ukraine

The **weak role of the business sector in the financing and carrying out R&D** distinguishes countries such as Ukraine, Poland and Russia from more advanced economies. In economies where business R&D is at a low level, a vast majority of firms have both low propensities to innovate and insufficient levels of innovativeness. The absorption of foreign technology and the integration of foreign investments within limits of the existing infrastructure also seem very low not only by global standards, but also in comparison with similar countries. The low technology update is interconnected to Ukraine's unfavourable investment climate, which lowers the potential return and raises the costs of fascinating new technology. Only a small portion of firms has put the development of new products and processes at the centre of their competitive strategies. Most firms focus instead on adopting imported technologies and know-how.

According to IFC report (2010), economic recovery after the steep decline of the 1990s was limited by minimal improvements of the regulatory environment, low productivity increases, and incomplete structural economic reforms. The Ukrainian economy was growing mostly due to favourable external factors, such as a boom in global demand and prices, in particular for steel, a world credit bubble and a strong inflow of foreign capital combined with energy prices that remained below world levels. This last point was significant, since Ukraine's export revenues were highly concentrated in energy-intensive heavy industries (in particular in ferrous metallurgy and chemical industry) with very limited innovation performance (Fig. 2.1).

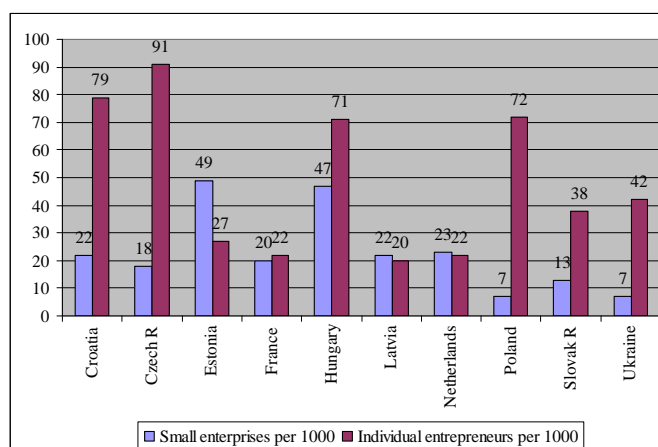
Figure 2.1 Export revenues, IFC report (2010)

Source: IFC report (2010)

Developing innovation is still one of the challenges for Ukrainian enterprises in both the high-tech- and low-tech sectors. Recently SMEs are looked upon as a means to enlarge the assortment of domestic products and services, to create an effective competitive environment, to stimulate innovation, to revive the entrepreneurial initiative of the

population, to create new jobs, to increase flexibility in the employment system, and to strengthen regional economies. The qualitative characteristics of Ukrainian small enterprises – and hence their contribution to economic growth, regional development, employment and innovation – are still far behind those of the world's best examples. Ukraine is lagging behind other transition countries in the number of small enterprises and individual entrepreneurs per 1000 people (Fig. 2.2), in particular, countries such as Czech Republic, Croatia, Hungary and Poland. In 2009 the number of small enterprises per 1000 inhabitants amounted to 7.5 entities (not accounting for agricultural sector).

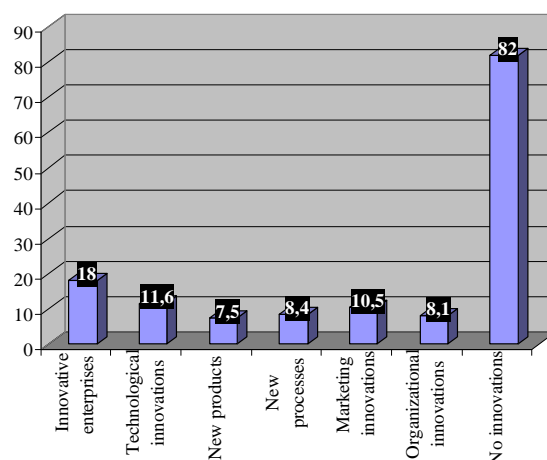
Figure 2.2 Number of small enterprises and individual entrepreneurs per 1000 people, 2006



Source: Eurostat and Ukrstat 2006

In 2009 the total **expenditures on innovation** by industrial enterprises amounted to 7.9 billion UAH with the share of industrial enterprises with innovations being 12.8% and the share of innovation products in total volume of industrial products – 4.8%. In 2009, the most frequently mentioned type of innovation was purchase of equipment and software, comprising 75% of all types of innovation and 68.9% of innovation costs in industrial enterprises. The share of innovative enterprises is higher among large enterprises compared to SMEs. According to the Survey of innovation activity of enterprises in 2006-2008 based on CIS methodology, only 18% of all Ukrainian enterprises were innovative (Fig. 2.3), including marketing and organisational innovations (38.9% in EU 27). The perceived obstacles for innovation faced by industrial enterprises in Ukraine include finance, high risk, information on markets and technologies, qualified labour and low demand for innovation. This evidence calls for the need to improve business environment for enterprises aiming to pursue innovation and a positive change in government innovation policy.

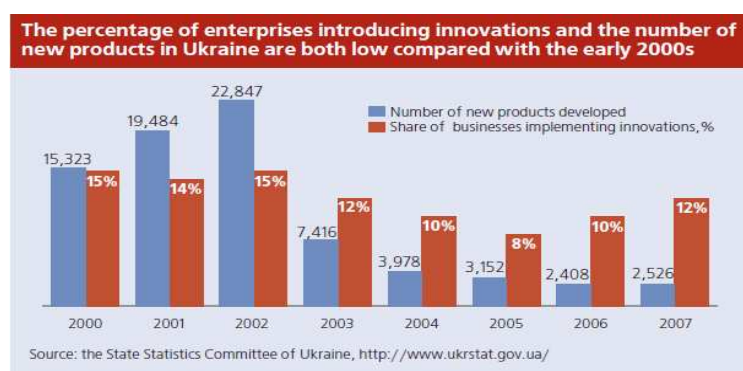
Figure 2.3 Types of innovation in Ukrainian enterprises 2006-2008 based on CIS survey 2009



Source: CIS Survey 2009

The '**Innovation Triangle**' concept states that a rapid and successful introduction of disruptive innovations in industry requires the collaboration of three different entities: a customer, a developer and an inventor. TEMPUS project "Boosting the Knowledge Triangle by Establishing Innovation Offices in Ukrainian Higher Education Institutions" (UNI4INNO), was initiated in February 2010 aiming to develop innovation management, promoting the formation of entrepreneurial culture and ultimately fostering links between education, R&D and business. This and similar initiatives are needed in Ukraine to increase innovativeness of SMEs, as the national innovation system is not only lacking in efficiency, productivity and successful implementation of research results, but is lacking links between innovation producers – R&D institutes and innovation users – enterprises, thus failing to create innovative milieus in the regions to facilitate innovation among SMEs. Domestic R&D institutions are an important, but by no means the exclusive source of innovation for SME; companies should be encouraged to be more active in seeking co-operation with different actors, including enterprises in neighbouring countries. At present innovative enterprises are more inclined to cooperate with suppliers and clients, while universities, research institutes and consulting companies are less typical innovation co-operation partners.

Figure 2.4 Innovations in enterprises



Source: State Statistic Committee of Ukraine

A lack of effective economic incentives for enterprises to carry out technological modernization based on new knowledge is cited in the "The Programme of Economic Reforms in 2010-2014" as one of the reasons of drawbacks in innovation.

With regard to fostering innovation in SMEs and large enterprises, the Programme foresees:

- Targeting Ukrainian science and technology capabilities to meet the needs of innovation development of economy and organisation of manufacturing of high-tech products, by means of introduction of public-private partnerships in science and technology and development of instruments and principles of public support for innovation;
- Strengthening the national innovation system and innovation infrastructure on the account of development of infrastructure to support small enterprises in innovation (business incubators, **technology transfer centres** and so on); harmonization of the Ukrainian legislation in the field of intellectual property in accordance with that of EU; and improvement of government regulation and economic incentives for enterprises in the area of **technology transfer**.

An increase in the share of industrial enterprises with innovation from 10.7% (2008) to 25 % (2014) is one of the indicators of success of the Programme of reforms with regard to innovation in SMEs. At present the recently established Agency of Ukraine in the Issues of Science, Innovation and Information held responsible for innovation policy. It is difficult to forecast the future, but, **for sure, Ukraine needs an integration of SME policy and innovation policy whichever ministry** will take the responsibility for this task. In Ukraine the **regional SME policy** formation is a top-down process: implementation of the state programme of small entrepreneurship support is carried out through activities of oblast administrations and local self-governments in the framework of regional programmes. The regional programmes of small entrepreneurship support focus on the issues related to creation of favourable conditions for private business development, including improvement of legal base, reduction of tax pressure, finance, credit and resource support for small businesses, and development of support infrastructure for small enterprises. The lack of finance is cited to be the main deficiency of regional policies to support small entrepreneurship. This may be the reason why regional programmes do not play a significant role in entrepreneurship development in the regions and majority of entrepreneurs are not beneficiaries of these programmes, which is confirmed by interviews with small business owners in different Ukrainian cities.

Innovation in SMEs is not in the focus of regional small entrepreneurship support programmes. **The main objective of the regional programmes** of small entrepreneurship support is to direct actions and efforts of regional and local authorities, small business, associations of entrepreneurs and organisations of business support infrastructure

towards accumulating financial and other resources for creation of a favourable business environment for small entrepreneurship, for support and protection of small enterprises. It is recommended that the regional programmes should use a wide range of financial sources, including the state budget funding from the Ukrainian Fund for Entrepreneurship Support, regional funds for entrepreneurship support, other funds, budgets of the regional employment centres, privatization funds, foreign financial support, funds of associations of entrepreneurs, donations and other. With regard to innovation, it was recommended by SCURPE the regional programmes on small entrepreneurship support had a section on "Innovation projects and pilot programmes", but there is no emphasis on innovation activity of small enterprises or any suggestions on instruments to foster innovation. The other context, in which the term **"innovation" is used in these documents, is related to business infrastructure formation**. This may be one of the explanations why regional programmes for small entrepreneurship support do not consider "innovation in small enterprises" as one of their priorities. On the other hand, **'innovation in SMEs' was not a priority for regional innovation instruments** either, administered, for instance, by the State Agency of Ukraine for Investments and Innovations (SAUII), which was a government organisation responsible for innovation policy in Ukraine (December 2005 – May 2010) with a network of regional centres of investment and innovation. In this context, the new Agency of Ukraine in the Issues of Science, Innovation and Information could be advised to strengthen its representation in the regions with experts both in innovation and in SME development and foresee elaboration and implementation of regional policy instruments to foster innovation in SMEs.

Intensification of the economic reform and establishment of the market economy can be most effectively attained by **formation of competitive environment**, by developing entrepreneurship and creating conditions for growth of small and medium-sized businesses. There have been limited improvements in the overall business environment in Ukraine: few policy initiatives have been launched over the last years which would make doing business easier. The country is relatively weak in the key areas of supporting SME competitiveness, technological capacity and export promotion. Ukraine is still in a phase of completing the basic institutional, legal and regulatory requirements underpinning SME policy. Relative weakness of SME policy lies specifically in the areas most relevant for high-growth enterprises, such as the provision of sophisticated business services, and the launching of programmes enhancing the technological capacity of SMEs. The good intentions to a great extent remained unimplemented due to a number of reasons, including low commitment of Verhovna Rada to improve legislation; scarce budget resources; **unwillingness and incompetence of local authorities to promote private entrepreneurship**. A wide network of entrepreneurship support organisations is operating in Ukraine: according to the data provided by some ministries and committees there are several hundreds of them. However, most of such organisations are only nominally on the list while the quality of their services for small business remains low.

The State Committee of Ukraine in the Issues of Regulatory Policies and Entrepreneurship (SCURPE) was responsible for the overall enterprise support and regulatory policy in 1998-2010 with the **National Small Entrepreneurship Support Programme** as the main instrument of policy implementation and the Ukrainian Fund for Entrepreneurship Support and regional funds for entrepreneurship support to provide funding for implementation of the programmes tasks. SCURPE initiated and carried out the deregulation policy by enforcement of the law of Ukraine "On principles of state regulation policy in the sphere of economic activity (September 2003); the law of Ukraine "On state registration of legal entities and individual entrepreneurs (25.05.2003 N 755); the law of Ukraine "On permit system in the sphere of economic activity (5 January 2006); the law of Ukraine "On main principles of state supervision (control) in the sphere of economic activity (05.04.2007 N 877). **The introduction of simplified modes of taxation for small enterprises and individual entrepreneurs** in 1998 had also a positive influence on the increase in number of small businesses. Legal and institutional framework for innovation is also developed. The main laws on innovation are the Law of Ukraine "On innovation activity" (4 July 2002; last modification 3 June 2010); the Law of Ukraine "On priority directions of innovation activity in Ukraine" (16 January 2003); the Resolution of Verhovna Rada "Conception of scientific and technological and innovation development of Ukraine (13 July 1999); the Resolution of Verhovna Rada "On recommendations of Parliament hearings on the issue of 'Strategy of innovation development of Ukraine in 2010-2020 in the conditions of globalization challenges'" (21 October 2010).

However, there were also negative sides. **State innovation policy in Ukraine is not SMEs-centred**, which does not accord with the general world and European trends. Ukrainian state innovation policy does not provide conditions for enterprises to perform their role as the main innovators in the national innovation system. SMEs and large enterprises have no incentives to transform R&D results into new products and services, and pursue own R&D. In addition, there is a low level of innovation cooperation between enterprises and R&D institutions. So there is a need to integrate innovation and SME policy in Ukraine. State and regional programmes could include for example a section on innovation in small enterprises with support measures and incentives for innovation. Finally, **conflict of laws is another weakness** of innovation in Ukraine especially in cases where the state financial support is suspended by the law on state budget.

Chapter 3: Institutional structures

3.1 Innovation & R&D System: Main observations

It needs quite a lot of analysis in order to assess if all main components of a typical national innovation system exist in Ukraine. However, some important preconditions for the effective development of innovation activities are certainly in place. The key existing elements of the national innovation system of Ukraine were formed during the Soviet era. It encompassed numerous research institutes, higher educational establishments, design bureaus, scientific and engineering departments of enterprises, association of inventors and innovators and industrial enterprises. However, during the first years of independence, the Ukrainian government did not pay adequate attention to innovation development. Despite this, some important legislative acts were passed in the 1990s and early 2000s.

A calamitous reduction of funding for scientific research occurred during the period of market transformation including a cutting down of funds for research equipment. The economic crisis led to a sharp reduction in orders for S&T results from the industrial sector. In addition, structural changes in the Ukrainian industry led to the **domination of mining, energy and ferrous metallurgy sectors** in the national economy. These sectors are not very active in innovation, as their technologies are relatively stable and products are not diverse. In the mid-1990s, Ukraine's official GDP decreased by more than 60%. Whole hi tech industries disappeared (for example, electronics). The size of domestic demand for numerous products, and especially high-tech ones, fell dramatically.

Ukraine has officially 1340 research organisations and more than 76 thousand researchers (2009). Low private R&D expenditures are an outcome of the specific structure of the Ukrainian economy. Particularly, two thirds of BERD are spent on R&D in machine-building, while its industry share declined by 3 times during the years of independence (1991-2010) and to date accounts for approximately 10 % of total industrial production of Ukraine. Heavy industries with low R&D intensity (ferrous metallurgy, production of basic chemicals, coal-mining) form the core of the national economy in recent years. Research policy focuses on supporting public research sector and the training of skilled researchers but it has relatively weak impact on economic development. Key financial indicators of R&D are in the table below.

The Ukrainian research system is not outstanding both concerning scientific and technological outputs, as shown by international indicators relating to scientific production (publications and impact factors) and technological production (patents). Some knowledge is preserved in 'tacit' forms in research institutes and industrial companies, which belong to aviation, space and military-related sectors.

Table 3.1: Ukraine: Key indicators on R&D³

Indicator	2006	2007	2008	2009
GERD (€ million)	774.2	796.3	736.2	680.1
R&D intensity (GERD as % of GDP)	0.94	0.86	0.84	0.86
GERD per capita	16.6	17.2	16.0	14.9
GBAORD (€ million)	311.1	392.8	365.8	301.7
GBAORD as % of GDP	0.38	0.42	0.42	0.38
BERD (€ million)	303.5	309.1	244.5	217.4
Business sector R&D intensity (BERD as % of GDP)	0.37	0.39	0.42	0.32
GERD financed by abroad as % of total GERD	19.4	15.9	15.6	22.3
R&D performed by HEIs (%)	5.9	6.9	7.0	6.5
R&D performed by PROs	0.0	0.0	0.0	0.1
R&D performed by private sector	59.3	55.3	54.6	54.6

Source: calculated on the basis of data from Scientific and innovation activities in Ukraine, Yearbook. – State Committee of Statistics of Ukraine, 2010. – 347 pages (in Ukrainian)

The cooperation between the research sector and industry is not strong, and it is based on bilateral formal and informal contacts at the level of research units. Ukrainian universities train large numbers of students in technical and natural sciences, but the demand for them is not high from the side of industry, which is dominated by traditional sectors. Utilization of research capabilities in the national economy remains a serious problem for the country.

³ Exchange rate is taken from the official site of the National Bank of Ukraine for December of corresponding year (http://www.bank.gov.ua/kurs/last_kurs1.htm)

R&D did not play an active role for the transition towards an innovation-based economy. The level of R&D expenses still remains low, especially in business sector. The role of the business sector tends to decrease regarding both financing and implementation of R&D. **This stable reduction of expenditures on R&D in business sector during 2003-2009 causes serious concerns** (in fixed prices it has shrunk by a record-breaking 54.4% among large sectors).

In addition, the higher education sector and the private non-profit sector also do not play a significant role in R&D financing both retrospectively and in the current period (in the 2000s their share varied within the range respectively by 0.06%-0.11% and by 0.07%-0.44% from the total volume of R&D expenditures with the negative trend). The higher education sector as an executing agent of R&D is still extremely dependent from the state financing (the range of the state funds share was 68.7% - 74.7% in 2000s). In general, the role of the higher education sector tends to grow; however, during the whole period under consideration it has not exceeded the level of 7% from the total volume of expenditures. The private non-profit sector showed a significant growth from 0% up to 0.71%, however, the reasons of such changes have to be specified.

In 2008 the outflow of foreign capital intended for R&D financing was stopped in Ukraine (in 2006-2007 both the relative and absolute reduction of volume of foreign R&D financing occurred, despite a stable economic growth). In 2009 foreign financing increased by 22.4% in fixed prices.

3.2 Innovation support instruments

3.2.1 Innovation support infrastructures

Recent academic analysis of empirical evidence on the innovation process has shown no mechanical relationship between investment in R&D and innovation; rather, new products and processes appear to be the result of the involvement of many companies and institutions in a common endeavour. As a result, governments have directed resources to stimulate the emergence and strengthening of clusters of firms, links with research institutions and universities, and knowledge diffusion. Innovation and business support infrastructure such as Science Centres, Technology Parks, Innovation Centers, or Business Incubators are particular features of these new policies. They are a structured community dedicated to the development of innovation. They usually bring together in one location (or spread across a region) the components necessary for making innovation happen: academics, research institutions, and enterprises.

Support policies increasingly depend on the capacity of innovation and business support infrastructure to contribute to the development of entrepreneurship, to participate in cluster initiatives, to generate spillover effects, and more generally to enhance the regional culture of innovation. For policy makers, innovation and business support infrastructure is not to be developed for their own sake but must contribute to the building of learning regions and knowledge-based territorial economies.

The first business incubators were established in the 1960s in the United States, United Kingdom and France, but nowadays they can be found in most industrialised countries and, for instance, in China. Science and technology parks provide a favourable environment for such enterprises. The parks offer low-cost premises, make available some capital equipment and give access to services required by newly established firms. Some incubators are supported by the central and local government and many are sponsored also by for-profit or non-profit private organisations. It has been estimated that in Europe alone there are about 900 business incubators and that each year thousands of new companies are established at the incubators.

In the last two decades cluster initiatives have developed in all market economies. They have become an increasingly efficient model of organisation, combining the advantages of competitions and cooperation in groups of firms located in a relatively limited physical space. Directing policy toward groups of firms lowers transaction cost and facilitates learning.

Governments worldwide have set up functioning mechanisms to commercialize research results. In most universities and public research organisations Technology Transfer Liaison offices help researchers evaluate the commercial potential of their research results, patent these, find partners, license or sell IP, or establish spin offs. Over 4000 technology brokers in the Enterprise Europe spanning 45 countries enable technology deals among hundreds of thousands of enterprise and research institutes.

All EU Member States and many third countries have set up region wide support structures of National Contact Points (NCPs) divided by technology sectors to assist research organisations and companies to identify suitable opportunities of the 7th European Framework Programme for Research and Technological Development (FP7), to find partners, and to submit FP7 proposals. Without the assistance of NCPs many client organisations would not be able to participate in FP7 research work.

In Ukraine, however, there is no comprehensive provision of innovation and business support services.⁴ Innovation and business support infrastructure actors in Ukraine are underfunded and not equipped with tools, methodologies and knowledge to provide state of the art support services. Start ups and SMEs (whose potential customers are increasingly demanding and globalised) are most affected by this lack as they often cannot develop international networking on their own hereby often not being able to tap into knowledge needed to innovate and to develop commercially viable products and services at the speed and quality imposed by increasingly competitive and complex markets.

Table 3.2 : Business support infrastructure organizations, SCURPE:

Business support infrastructure organizations	Number
Business centres	440
Business incubators	70
Technoparks	41
Leasing centres	795
Investment and innovation centres	3168
Information and consulting organizations	3157
Entrepreneurship support funds 252 (including 98 regional centres, of which 34 funds established with participation of the Ukrainian Entrepreneurship Support Fund, UFES).	252

Source: SCUPRE, 2010

The Programme is heavily underfunded: Between 2007 and 2008 it only received 1 % of the budget needed for its implementation. It is largely acknowledged that the reported centres are mostly nominal and do not provide solid business and innovation support services to client organisations.

In 2009 the Ministry of Education, Science, Youth and Sports reported on much less infrastructure organisations (see table 3.3)

Table 3.3 Business support infrastructure organizations, MESYS:

Innovation infrastructure components	Quantity
Techno parks	16
Innovation business incubators	24
Innovation centers	15
Centers of IP commercialization	14
Innovation and TT Centers	4
Centers of science, engineering and economic information	14
Science educational centers	3
Education-research-production centers	4
Investment (innovation) venture fund	1
Non-bank finance and credit organizations	15
Research implementation enterprises	21
Consultancy centers	2
Innovation research centers	4
Total	147

Source: Ministry of Education, Science, Youth and Sports 2009

These numbers are also heavily overrated. According to the Ukrainian Association of Investment Business Association (UBICA) only 8 Techno parks (out of 16 registered ones) are operating. According to experts the most (and to some: the only!) successful measure in stimulation innovation was the creation of techno parks. Despite tax privileges, techno parks contributed almost 905 million Hryvnas of different taxes to the central and local budgets in 2000-2008. They also created more than 3000 new jobs. They worked well until beginning 2005 privileges granted to Techno Parks were abolished. Today only 2 – 3 Techno parks are performing well.

Furthermore, according to UBICA, to date there are only 10 active business incubators in Ukraine. Moreover, for being commercially viable themselves they focus on purely commercial activity leaving no resources to dedicate efforts to innovative companies, let alone start ups. While start ups are vulnerable firms everywhere in the world they face particular challenges in an economy of transition like in Ukraine.

⁴G.Rumpf (2011) Networking Innovation and Business Support Infrastructure, Science and Science of Science.

In Ukraine the systematic support to clusters is still largely unheard of. It may be worth investigating to link industry leaders (e.g. in agribusiness or ICT) to successfully operating cluster initiatives.

There are too few technology transfer brokerage mechanisms and structures that assess, audit and match technology needs and surplus of technology providers and consumers. Since 2007 the Science and Technology Centre in Ukraine (STCU) helped create ten technology transfer offices at NASU institutes and it created a technology transfer training course in order to train and implement a new position called the Chief Technology Commercialisation Officer (CTCO) at the NASU institutes. The National Technical University Kyiv Polytechnic Institute (KPI) is currently developing a new 2-year Master's program for a diploma in Specialist in Technology Management (STM). However, most institutes and universities do not offer state of the art technology marketing services. The technology gap of already innovation adverse Ukrainian firms compared to international players is widening as a result.

The national authorities do not ensure the funding of the NCP system. The national coordinator NCP in Ukraine is hosted by the Ukrainian Institute for Scientific, Technical and Economic Information (UkrISTEI) and also holds the legal and financial and INCO NCPs. In addition there are thirteen thematic NCPs hosted by NAS Institutes, the State Space Agency, a Technopark in Kharkiv, and the Lviv CSII. NCP staff provides NCP services on a part time basis and is predominantly offering support to its host institutions. Also there is no systematic training of NCP staff. Overall Ukrainian researchers are not provided with comprehensive FP7 consulting services spanning all regions. There is no focused support to participate in FP7 projects like in EU countries. Researchers only seldom engage in international FP7 consortia and projects.

3.2.2 Networks for Innovation

National economies are increasingly interlinked. Innovation and business support infrastructure should be, too. Policy initiatives support the formation of networks of innovation and business support infrastructure.

The overall intention of all these networks is similar: to come together to share knowledge and resources and to improve outcomes. Networks usually organize information exchange mechanisms: meetings, conferences, training, access to experts, websites, databases, and newsletters. They establish benchmarks of best practice, against which members can rate their performance against their local or international peers. They support professionalization of organisations and individuals within their sphere of interest. The networks themselves become learning organisations that promulgate good practice.

Ukrainian innovation and business support infrastructure is "under-networked" when compared to their Western counterparts both bilaterally and within networks. Having in mind the chronic under-funding of most business support organisations missing international links might seem as a minor problem. However, being cut out from accumulated international learning experiences, best practices, methodologies and a tool ignites a virtuous circle. The downward spiral of professionalism of provided innovation and business support services makes it increasingly losing their *raison d'être* for assisting Ukrainian business in becoming more competitive. Likewise the gap to state of the art business support infrastructure widens and its actors are less and less able to provide state of the art business support services designed to help client organisations become more competitive in the globalised economy.

Ukrainian innovation and business support infrastructure must be equipped with appropriate resources and with international state of the art business support services methodology and tools to help minimize and close this gap.

3.3 Financing Innovation

Ukrainian development over the last two decades has followed more of the transition of the post Soviet countries than that of the EU and its Member States (EU12-EU25). The over all development of European countries' investment into STI has been steadier, with slight increases in the long term. Innovation Financing plays an important role within all dynamic economies, which have chosen to follow the knowledge economy path to growth and competitiveness. The general trends suggest as a good policy to set up long-term objectives and to follow a steady and incrementally increasing investments into the innovation systems. The European Union target of reaching 3% R&D investments of the GDP is one rough, but concrete example of such.

The overall level of R&D financing in Ukraine, as a proportion of GDP has declined over the last years and has reached its lowest ever record since the country gained its independence. For a number of years, the foreign R&D funding played a relatively significant role, while is now settled to around 16%. Furthermore, a great majority of government expenditure in R&D is institutional funding (i.e. more than 90% of state financing to R&D is institutional funding), which only indirectly contributes to innovation. Institutional funding represents less than 25% of the total R&D funding at the business enterprise sector.

The direct statistical comparison between Ukraine and Europe is difficult. Not all innovation financing related data is available from Ukraine, or it is sometimes not fully comparable with those of EU Member States & OECD. Innovation performance comparisons have been made a few years ago (e.g. European Innovation Scoreboard 2006), which reveals a number of issues that are likely to be still reasonably relevant.

Structural analysis of the innovation financing appear to support the statistical findings, however, a more precise analysis of the effectiveness of various funding instruments is still needed. Ukraine faces several challenges related to innovation financing, namely:

- Increasing the overall volume of investment into innovation, both from the public and private sources
- Improving the governance of the innovation system, with consequences to innovation financing
- Filling in the 'gaps' in the innovation financing, such as development of effective innovation support instruments for the business sector, particularly for SMEs and encouragement of seed and venture capital
- Driving the overall balance of R&D and innovation financing from state institutional financing more towards competitive and transparent, project-based funding with clear innovation objectives.

Innovation financing in Ukraine is strongly focused on strong state institutions and their strategic programmes. It is therefore not surprising that innovation in the business sector is mainly financed from companies' own funds, which tends to reflect to the lack of availability of other sources of innovation funding. This is a structural challenge particularly to the small and medium-sized companies.

It is also necessary to note that the negative structural changes stemmed from the low level of innovation activities amongst the majority of Ukrainian enterprises. The values for indicators concerning basic innovation activities (e.g. number of new technologies, the number of inventions, etc.) went down 5-15 times between the 1990s and 2000s, although the country still has more than 120 thousand specialists, involved in R&D (in full time equivalent), and it spends almost one billion Euros per year on R&D⁵. The situation has changed in early 2000s, when the economic growth has started. It has led to the positive changes in innovation financing and to stabilization of some key R&D indicators, although the crisis of 2008-2009 had serious negative impact on R&D and innovation activities.

The volume of financing of innovative activity during 1998 – 2008 has grown in fixed prices 10.2 times but, if recalculated into fixed prices of 1995, the increase would be just 2 times. The historical maximum of spending has been fixed in 2007 (4856,83 million dollars in purchasing-power parity of national currency). It is important to note that the actual reduction of volume of spending after eight years of a stable increase has already started in 2008 (despite of annual formal growth by 10.8% in 2008 in current prices). Therefore, the crisis development in 2009 has only emphasised the negative trends of the previous year. As a result, the level of innovation financing shrunk in current prices by 26.5% in 2009 in comparison with 2007, it has also shrunk by 48.8% in fixed prices, recalculated into in PPP (in USD) by 47.4%.

During the last decade, the main sources of financing of innovation activities were and, still remain, the **companies' own funds**. The historical maximum of the self-financing share was marked in 2001 (83.90%) and a minimum in 2008 (60.56%). When analyzing absolute spending of enterprises in fixed prices, it is worth to mention their sustainable growth in 2002-2007. After the start of the crisis, the expenditures have shrunk by 29.3% and 56.5% in 2008 and 2009 respectively against the 2007 level.

In addition, at the end of 2000s, the **banking loans** have become an important source of financing. If in early 2000s their share has reached 6.26% of the total volume of innovation financing, in 2008 it exceeded a third of the total volume. The fact that from 2006 to 2008 the share of bank loans in the structure of financing has stepped up from 8.48% to 33.72% demonstrates the intensity of the credit boom. It is important to note that the hardships related to the global financial crisis and banking sector reforms in 2009, have led to a very sharp reduction of the indicator's value - by 79.5% in fixed prices. The intensity of the lending of innovative activity is directly connected with the rates of general economic development as the biggest structural shares of the banking loans were observed during 2003-2004 and 2007-2008.

Similar tendencies were observed in a budgetary financing of innovative activities. The share of the state was the second most important among all other sources (10%) at the beginning of the last decade. Afterwards, the share of budgetary spending has exceeded the level of 3% only once - in 2003. Similarly to the share of national investors, this share dropped down to insignificant 1.69% in 2009.

Over the last decade, the European Commission has systematically collected and analysed all innovation support measures and approaches within its member states. This experience and particularly applicable examples of successful measures should be taken stock of when further developing the Ukraine innovation financing measures. The key questions/challenges regarding the financing of innovation fall basically into the following major categories:

- 1) *Is there a political commitment to long-term growth and investment into innovation and can this be delivered into action?* This includes two main messages: 1) sustaining and increasing the overall level of state STI financing in the long-term, and 2) gearing the financing more towards SMEs and innovation. As institutional financing plays a

⁵ according to official exchange rate.

major role in Ukraine, triggering a shift in the focus of state R&D and innovation financing seems necessary, but may be politically hard to accomplish.

- 2) *Are the national set-up and structures that form the operational context for innovation financing, including regulatory, fiscal and in particular the institutional structures of the national innovation system in place?* Without deeper structural analysis of the Ukrainian innovation system financing instruments, it seems important to develop a range of government innovation funding instruments, apparently most urgently those that are targeted at SMEs, such as grant schemes, R&D and innovation loans and targeted programmes. State involvement in the development of venture capital markets seems also important (e.g. specific VC funds, funds of funds and provision of seed capital for start ups).
- 3) *What is the practical functionality and effectiveness of innovation support instruments in Ukraine?* The various parts and instruments of the Ukrainian national innovation system should smoothly and effectively work together. Providing innovation financing more on a competitive and collaborative basis is likely to dynamise the innovation system and to improve its performance. A performance and impact assessment of the Ukrainian innovation financing system could be beneficial.
- 4) *Is there enough experience and competence for the effective implementation of the innovation support instruments?* Developing innovation financing instruments and increasing investment levels is not enough, if not coupled expertise. Scientific competence within the financing organisations will need to be complemented with business and innovation experience. What is the awareness and competence of the research and business sector to make efficient use of the available instruments?

Chapter 4: Governing Innovation

4.1 Governing Innovation at State level

In today's globalised environment, due to the rapid technological change, innovation policy scope is enlarged and involves a broader set of actors. Moreover it runs across a wider number of governmental or policy areas, taking a more horizontal form by providing a strategic framework across ministerial and institutional boundaries (OECD2005). In this context of increased interactions the need for coordination has also increased, as innovation policy became a cornerstone of economic development.

Moreover, governments have become organisationally complex, made up of a multiplicity of ministries, comprising many sectors and units and decentralised bodies, as well as agencies, commissions, and international representations. Horizontal policy coordination is thus necessary because modern government and administration are complex organisations with complex tasks. To make diverse players coordinate their activities in and beyond their policy field ("horizontalisation") is a **complex and dynamic** process that must take into account both internal and external factors and influences. Thus, **coordination is treated as a process**, not as an outcome.

The above trends have necessitated a shift from managing public intervention by bureaucratic procedures towards more efficient public management techniques. The answer of most governments to this challenge has been pursued either by internal competence centres in ministries or by delegation to outside agencies ("agencification"). These agencies in most cases are free to choose instruments and are controlled according to pre-defined output criteria without micro-interventions. The "**agencification**" process was a gradual one, achieved by a systematic build up of competencies in these agencies so that they could actually manage and coordinate the intra-ministerial processes of policy development.

Most frequently such policies are not implemented in isolation, i.e. every country promotes its own policy mix through the implementation of several instruments simultaneously. This is a highly complicated task and requires advanced level of coordination between the various policy instruments. By the term 'policy instruments' we refer to *'the programmes, organisations, rules and regulations with an active involvement of the public sector, which intentionally or unintentionally affect R&D investments'*. This usually involves some public funding, but not always as, for example, regulatory changes affect R&D investments without the intervention of public funds. More analytically such instruments include subsidies, tax incentives, loans and regulations (e.g. environmental regulation can have a significant impact on innovation).

In other words the nature of coordination and governance is systemic. According to OECD *'the new role of the government is to secure framework conditions, remove barriers to innovation, enhancing technology diffusion, promoting networking and clustering and leveraging research and development'* (OECD, 1999: 10). Taking into consideration the above 'knowledge space', the policy objectives for policy coordination (Painter, 1981) can be summed up to the following:

1. Avoidance, or at least minimization, of duplication and overlap.
2. Avoidance of policy inconsistencies.
3. Minimisation of conflict, both bureaucratic and political.
4. Quest for coherence and cohesion and an agreed ordering of priorities.
5. Promotion of a comprehensive or 'whole government' perspective against the constant advocacy of narrow, particularistic or sectoral perspectives.

The first three objectives aim at achieving efficiency by reducing the costs of bureaucratic action, while the last two objectives refer to the coherence of decision-making process. *This highlights that two steps need to be taken in order to arrive at policies coordination. First, a common strategy must be developed, and then the cooperation of actors in the 'government' is needed in order to put common strategies into action.*

This increased level of co-ordination can be achieved through the promotion of '**policy packages**' rather than isolated instruments, increased policy intelligence, including monitoring and evaluation of policies, benchmarking practices and an inclusive policy design processes with regard to the various stakeholders of the national innovation system, as presented summarily in table 1.

Moreover, strategic multi-level policy, demands a better understanding of the roles of stakeholders, multi-protagonist policy, policy learning and a policy changing process for the national innovation systems. Processes that coordinate policy development activities across departments in order to avoid overlaps and conflicting assignments to the

agencies should be implemented. Furthermore, *broad tasks should be delegated to the agencies instead of narrowly defined programs and the delegated tasks should be monitored according to output goals whenever feasible.*

Table 4.1: Smart Governance

Level	Function	Actors responsible	Level of coordination	Areas / actors affected
Level 1	Vision	<ul style="list-style-type: none"> Parliament High-level government councils 	Interministerial co-ordination	Government and political bodies
	Strategy	<ul style="list-style-type: none"> Ministries with RTDI agendas Regions 	Ministry Strategic centered co-ordination	<ul style="list-style-type: none"> Regulation framework Innovation framework RTDI institutes promotion Fiscal measures
Level 2	Design	<ul style="list-style-type: none"> Ministries/ Department Agencies Regions 	Co-ordination of Agencies	<ul style="list-style-type: none"> Programmes Measures Consultation Dissemination of information Awareness raising
Level 3	Implementation	<ul style="list-style-type: none"> Agencies Regions 	Across agencies and functions	<ul style="list-style-type: none"> Funding Programming Monitoring Evaluation

Source: Adapted from the "Policy Mix Project", European Commission – DG Research

Governance and coordination of innovation in Ukraine

The main difficulties in co-ordination of the various structures of any national innovation system arise due to political reasons. Among these are issues such as the large number of agencies involved with different jurisdictions that are competing for scarce resources inhibiting the partnership and the natural reluctance of agencies to give up management and control of their operations. This is true for many EU countries as is true for Ukraine. The governance of the innovation system in Ukraine comprises a number of different ministries, agencies and committees but none of them is responsible for innovation policy as a single representative of the government. While the Ministry of Education, Science, Youth and Sports is charged with the responsibility to develop and implement state policy in science, technology and innovation, innovation policy is also one of the tasks of the Ministry of Economic Development and Trade. At the same time, the National Academy of Sciences, the so-called branch State Academies of Sciences, and Branch Ministries each have their own science, technology and innovation policies and are in a possession of institutional, (mostly state) financial, labour resources and material base. While good level of co-ordination is associated with countries with dense linkages and frequent discussions within department and bodies in which all stakeholders participate, in Ukraine formal linkages are scarce and ineffective. As in the case with other weakly governed and organized national innovations systems as those of Southern Europe (e.g. Greece), these linkages are informal, created only during projects implementation and are disrupted at the end of these projects.

Moreover in Ukraine the system is characterized by **permanent change**, especially at the highest executive level. This is mainly the result of the transition from a centrally controlled system where no user – producer relationships existed, with the exception of the military sector and due to the fact that Ukraine has not yet restructured its national innovation system in an integrated manner related to the globalised economy and value chains.

Another strong tendency in EU countries is the use of agencies for overcoming rigidities, increasing efficiency, securing participation of all stakeholders and bottom-up measures. The tendency is reflected in Ukraine with the creation of the **State Agency of Ukraine for Investment and Innovations (SAUII)** – a government organisation responsible for innovation policy (responsible for innovation in the period of December 2005 – May 2010) with a network of regional centres of innovation development and the State Innovation Finance and Credit Organisation. At present research, development and innovation policy is the responsibility of the newly established **State Agency of Ukraine on Science, Innovation and Information (SASII)**. However, after Parliament decision all specialised state agencies fell under different ministries. This entails the risk of increased fragmentation and might produce difficulties in co-ordinating state research, development and innovation policy.

Different policy areas might apply diverse and conflicting instruments: for example, innovation policy might in some cases be in conflict with environmental policy even in the case of sustainable development projects, since innovation policy is usually promoted through incentives for growth while instruments for sustainable development are typically regulations that place limitations on economic behaviour. Such differences increase tensions among policy areas. This is witnessed in Ukraine in the case of the attempts to provide tax incentives to companies for innovative or R&D projects, where legislative reforms have been strongly resisted by the Ministry of Finance, despite

the fact that tax incentives could provide an alternative method to grants for financing innovation at the private sector, particularly in times of reduced liquidity.

Stability and simplicity are among the virtues of more developed innovation systems. In contrast in Ukraine during 1992-2009 the parliament passed approximately 85 new laws related directly or indirectly to innovation. Moreover, these legislative interventions do not contribute to a framework specific to a coherent innovation policy but aim to deal with stand alone issues of various ministries. State governance of entrepreneurship development and innovation are responsibilities of different ministries making the national innovation system in Ukraine not enterprise-centred, which might be one of the reasons Ukrainian enterprises exhibit a low level of innovation.

Despite the utmost importance and timeliness of the “**Strategy of Innovation Development of Ukraine for 2010-2020 in the Conditions of Globalization Challenges**” (approved by the Resolution of Verhovna Rada of Ukraine ‘On Recommendations of Parliamentary Hearings on the issue of ‘Strategy of Innovation Development of Ukraine for 2010-2010 in the Conditions of Globalization Challenges’, of 21.10.2010, N2632-VI) and the draft Law of Ukraine on the issue, the needs in co-ordination, coherence and integration of innovation policies pursued by different governing bodies (and the means/measures to be applied for that matter) are not sufficiently discussed in the document.

4.2 State S&T and Innovation Programmes

State programmes in the EU countries are a set of actions put in place to reach certain strategic objectives of government. Sometimes the actions constituting a programme are well predefined and detailed, but in other cases only general objectives are set, and actions left open (e.g., the so called umbrella programmes). Typically, with a state programme it is understood that:

- It has an overall, pre-defined **strategic objective** (i.e. to increase the competitive advantage of some specific industrial sector), with a clear rationale behind.
- It is an open or semi-open **platform for collaboration**. Typically among research, business and government.
- The main function of a programme is to **generate research and innovation projects and collaboration** in identified priority areas, with available **government funding** instruments (grants, loans, equity etc.).
- It includes a **set of actions**, such as work components and research and innovation projects that are implemented to reach the strategic objectives.
- The actions of the programme have **synergies and complementarities**. There are also often joint activities. The programme activities are **coordinated and managed**.
- Programmes are limited in time, having a clear start and end date, as well as a **budget**.

Usually, the progress of programme implementation is monitored continuously and its outcomes and impact are evaluated after the completion of the programme. Typically, state R&D and innovation programmes have duration of 3-5 years. Small programmes have a budget of several million Euros with a dozen of projects, while large programmes reach several hundred of millions and can include hundreds of R&D and innovation projects. State programmes are sometimes horizontally focused (generic) or vertically focused (thematic), depending on the policies of countries.

State financed technology programmes or research and development programmes targeted at industries, government research institutions and universities are the main type of programmes. The programmes take into account the innovation life-cycle by dividing time and resources between fundamental research, training of researchers, applied research, technology development and commercialisation stages. Some programmes are designed to provide public funding to specific technological fields (e.g., nanotechnologies, biomaterials etc.), which depend on the national innovation priorities and available competencies of targeted research institutions and groups of companies.

Effective **commercialisation of research results** and competence created in publicly funded research is challenging and benefits from public support activities. Hence, there are numerous programmes in the EU that are targeted to support academic spin-offs, new business creation or other means of commercial utilisation of research investments. The objectives of such mission-oriented, strategic programmes stem from national strategies and other top-level ambitions. The challenges can well be economic (such as revitalising certain national industries) or societal (national healthcare, security, climate change) or a combination of those. The key characteristic of these programmes is that they are a top-down policy instrument: first a (national innovation) challenge is identified and then solutions and competencies needed are developed.

National cluster programmes are widely applied in all EU countries. The European Cluster Observatory has identified 69 national cluster programmes in 31 countries studied. Majority of the countries have one or two programmes with public funding.

Programme monitoring is a continuous assessment of the activities carried out by the programme with regard to the planned objectives, achieved results and used means. Monitoring enables the stakeholders to review the progress achieved and propose actions required to reach the programmes’ objectives. The monitoring allows revealing current

and potential successes and failures, which enables adjustments to be made in the implementation. Programmes' objectives and resources should be well-defined in advance; information should be systematically documented during the implementation process for an efficient programme monitoring and evaluation. These are the prerequisites of a thorough and transparent evaluation at the later stages of programmes' implementation.

State S&T and innovation programmes in Ukraine

In Ukraine **the state target science and technology programmes** have been introduced with the objective to use public R&D funding more efficiently and to promote priority science and technology fields. This science policy instrument has its roots in the former Soviet Union' science system, but has undergone certain change to be adjusted to the needs of the transition to market economy. This policy instrument is functioning under the Law of Ukraine "**On State Target Programmes**" (N 1621-15, of 18.03.2004), which regulates initiation and performance of state target programmes in all spheres of economy and society (general state programmes, regional programmes, branch of industry programmes, economic, cultural, environmental, healthcare, defence programmes etc.), and the Law of Ukraine "**On Priority Directions of Development of Science and Technology**" (N 2519-VI of 09.09.2010), according to which the development of priority science and technology fields is carried out by the R&D projects (selected on a competitive basis) within the state target science and technology programmes. According to the latest version of the law, the following priority fields are set:

- Fundamental research of the most important problems of scientific, technological, socio-economic, societal and political, human potential for competitiveness of Ukraine in the world and sustainable development of society and state;
- Information and communication technologies;
- Energy and energy efficiency;
- Rational use of nature;
- Life sciences, new technologies for preventive measures and treatment of the most widespread diseases;
- New substances and materials.

When comparing current programme practices in Europe and Ukraine the following differences are observed:

Budget volume: The allocated budget in Europe is higher than in Ukraine: In the EU, projects of smaller programs can be around 90.000 € or in the case of bigger programmes around 2-3 Mio €. In Ukraine, even in the most funded programmes the financing of each project was between 15.-18.000 € (2007, 2009 data).

Budget security over programme lifecycle: In the EU, researchers and research institutes can plan with the allocated programme budgets. In Ukraine the Ministry of Economic Development and Trade and the Ministry of Finance do not jointly envisage annual funding in the state budget in accordance with the programs approved by the Parliament and Government. In Ukraine, it often happens that Programmes adopted and announced by Parliament still do not receive the foreseen budget. The Law of Ukraine "On State Budget" has superiority to laws related to the implementation of programmes. It can easily happen programmes only receive only 1 % of the promised budget.

Participation of enterprises: In the EU, the participation of enterprises in research and innovation programmes and projects is often a prerequisite of funding allocation. In Ukraine, enterprises participate in less than 1% of state science and technology programmes.

Public-private partnerships: In many EU countries public-private collaboration is promoted. Project's co-funding by the private sector is often a criterion for funding decisions. In Ukraine there are neither effective instruments nor mechanisms to install public-private-partnerships.

Internationalisation: In the EU, Framework Projects are only granted to international research consortia. Funding decisions in the Member States also increasingly depend on the degree of internationalisation of the R&D proposals. In Ukraine international research projects are rare phenomena.

Monitoring/evaluation: In the EU, the monitoring of programmes is foreseen in the programme design. Often programmes are monitored several years after programme completion as sometimes results might show after longer periods of time. In Ukraine, monitoring and evaluation is not a key element of programme implementation. There are no relevant indicators in state programmes (e.g. no parameters of new technologies, economic viability, or commercial usage of technology). In many cases, neither interim nor final programmes' results are monitored or evaluated with regard to budget spending, achievement of objectives, or quality.

Evaluators' selection and competences: Evaluators of Framework Programmes and projects are selected based on their experience in the subject matter. Also evaluators sign documents declaring they have not conflict of interest. In many Member States evaluators are from foreign countries. In Ukraine evaluators receive no training on how to carry out evaluations. Often evaluators can be participants in another project of the same programme. As a result, evaluations are often carried out are not objective. As a rule, foreign experts do not take part in the evaluation process.

Programme development: In the EU, programmes are often designed by funding agencies in close collaboration with industry and researchers (e.g. Tekes or Academy of Sciences in Finland). In Ukraine, programmes are developed by ministry, state committee or agency staff.

Programme management: In the EU, programme management is a key criterion for funding decisions and it is evaluated during the programme delivery. In Ukraine, the programmes are not well designed with regard to financial planning, co-ordination between different projects or general implementation.

Programme manager selection: In the EU, programme managers are often managers of enterprises or leading scientists. In Ukraine programme top managers are appointed by the state and are high ranking officials of state bodies such as central executive authorities, top officials of the National Academy of Sciences (often the level of a Vice-President), or ministries (often the level of Deputy-Minister).

Funding criteria: In the EU, funding decisions are taken by groups of independent decision makers, according to transparent procedures and selection criteria. In Ukraine funding decisions are not transparent enough.

4.3 Regional Governance

There is no best model for the governance of a regional innovation system. Different policy mixes are suitable to different regions depending on their particular internal characteristics and also on the capabilities, governance structures and processes of the regional authorities. Moreover, regional authorities will be able to implement effective science, technology and innovation policies if on the one hand they have the autonomy to define a wider set of policies directly linked to innovation (such as educational policies) and on the other hand if there is a good coordination with other regions and more importantly with the central government policies and priorities.

Policy dilemmas present different challenges for policy makers depending on the particular characteristics of a region and its state of development as seen in the table 4.2. According to this line of argument **before policy starts focusing on the development of excellence in selected scientific areas, the creation of competent local actors and organisations should be pursued**. Similarly, before policy focuses on the system as a whole, the development of key institutions and industries should be a priority. Therefore, the experience and the good practices identified in EU countries should be used with caution, as they are suitable for more advanced research and innovation systems.

Table 4.2 Association of development stages and policy areas

Necessary policy effort at initial stages	Desirable policy action at further stages	Policy areas mainly concerned
Creation of local actors and/or resources	Establishment of fields of international excellence	<ul style="list-style-type: none"> • <i>Development of human capital</i> • <i>Research collaboration of public research organisations with the private sector</i> • <i>Support of public research</i>
Raising of regional awareness	Best practices as examples for further development	<ul style="list-style-type: none"> • <i>Improve R&D governance</i> • <i>Creation of an innovation friendly environment</i> • <i>Networking, co-location and clustering measures</i>
Support of key institutions and industries	Systemic instead of actor-centred support	<ul style="list-style-type: none"> • <i>Networking, co-location and clustering measures</i> • <i>Knowledge and technology transfer to enterprises</i> • <i>Financial R&D measures for the private sector</i>

Source: Maroulis, N., & Koschatzky, K. (2007). Specific Analysis on the Regional Dimensions of Investment in Research

As a corollary, different policy options are suitable for high performing regions with dynamic clusters and for weak systems with weak institutions, low levels of clustering and “lock in” in traditional sectors where path dependency is predominant. However, in order to create a regional advantage, national and regional authorities cannot rely only in the segmentation proposed above into different type of regions but also should take into account the fact that different sectors exhibit specific learning interactions (Asheim, Coenen, Moodysson, & Vang, 2007), the increasing importance of internationally distributed knowledge networks and the importance of the regional competence base embedded mainly in highly skilled people.

Thus policy makers should take into account the fact that the innovation process of firms and sectors varies substantially and requires specific knowledge bases, i.e., different mixes of tacit and codified knowledge, qualifications and skills. In some sectors innovation takes place mainly through the recombination of existing knowledge while in other sectors innovations require heavy investments in cognitive and rational processes through R&D. This in turn has implications as to the policy mix and measures that should be introduced in an economy in order to foster innovation.

Regional innovation support in Ukraine

There are 3 main tools of regional innovation policy in Ukraine

1. Regional Programme of Innovation Development (regional innovation programs).

2. Agreements on regional development.
3. Agreements between the State Agency of Ukraine for Investments and Development and local authorities.

The operational status of regional innovation programming in Ukraine

Level 1 - Programming authorities

Usually in Ukraine, the regional innovation programmes' initiator and developer is a regional state administration or a local executive authority, but sometimes the development initiative comes from local governments. In case, when the regional state administration (the local executive authority) initiates program's development, the local executive body prepares a draft version of administrative document (Order, Protocol Order) on program's draft preparation, which identifies its developer, executive in charge and the deadline of its preparation. When the local government initiates program's development, it submits a proposal on program's development necessity to the regional state administration (the local executive authority) in order to prepare an administrative document on a draft program formulation. The draft program is formulated by the local executive authority on stand-alone basis or jointly with scientific organisations, enterprises, institutions interested in program's adoption and implementation. In order to ensure the draft programme preparation there can be created groups of authorities', businesses', scientific and public organisations', political parties' representatives.

Level 2 - Managing authorities

Coordinating councils on regional development of S&T and innovation activities could be the managing authorities of regional innovation programs. Such councils were established at the number of regional state administrations (e.g. in Donetsk, Kharkiv, Mykolaiiv, Rivne, Zhitomir regions). In case of the absence of such councils or other specialized bodies to manage the programs, coordination program functions are referred to the economic departments in the regional state administrations.

Level 3 – Co-ordination of regional with national policies

Technically according to Article 10 of the Law of Ukraine "On Innovation Activities", local state administrations, executive bodies of local governments in the sphere of innovation activity have the rights of engaging businesses, institutions and organisations located on the subordinate territory, with their consent, to addressing the problems of the regions innovation development; and, carrying out financial support for innovative projects of programmes within the funds provided in the local budget.

The following categories of regional innovation support activities exist in Ukrainian regions:

- 1) Priority directions of innovation activity
- 2) Programme of innovation and/or S&T development (activity)
- 3) Special programmes designed to support certain aspects of innovation

According to the existence or not of such activities, Ukrainian regions can be categorised as follows:

- 1) Regions with "Priority directions of innovation activity" (Crimea region).
- 2) Regions with "Priority directions of innovation activity" and regional innovation and/or S&T programmes (Chernihiv, Cherkassy, Donetsk, Poltava, Kirovohrad, Vinnytsia (draft) regions).
- 3) Regions with only regional innovation and/or S&T programs (Dnipropetrovsk, Zaporizhzhya, Ivano-Frankivsk, Rivne, Ternopil, Kharkiv, Chernivtsi (draft) regions).
- 4) Regions with special programmes designed to support certain aspects of innovation activity, including:
 - Regional target program "Creation of the innovation infrastructure in the Odessa oblast in 2008-2012".
 - "Conception of regional innovation system development (draft)"(Zhytomyr oblast).
 - "Kyiv city programme of industrial development based on innovations in 2007 – 2011".
 - "Programme on establishment of cross-border transport and logistics centres as structural parts of innovation clusters in the Zakarpattya oblast for 2009-2011"

All Ukrainian regions can also be divided into two other large groups:

- 1) Regions with special programmes to support innovation and/or scientific and technical activities
- 2) Regions where support of innovation and/or scientific and technical activities is integrated into the programmes of social and economic development

It should be noted, that the first group is heterogeneous. There are the only draft innovation programmes in a number of regions (e.g. in Vinnytsia, Chernivtsy regions), while in others innovation programmes have been already approved by the local authorities. The main deficiencies of regional innovation programmes lie in the uncertainty of program financing, the broad sets of objectives and the lack of monitoring and evaluation components.

4.4 Decentralisation and regional governance

In almost all EU countries governance of research and innovation policy is based on the interaction of regional and national policy actors (multilevel governance). Despite this complex division of labour some patterns can be identified. At the regional level we can often identify competencies for the lower and medium levels of education, the creation of incubators and innovation centres, technology transfer agencies and, more recently, cluster policies. At the national level in many cases we find competencies for universities, specialized research organisations, and funding for R&D and innovation, as well as the setting of national goals and priorities. Decentralization implies institutional changes in at least two directions. On the one hand the devolution of powers from a national to a regional and/or local level and on the other hand the delegation of certain tasks to intermediate organisations of usually public nature.

In addition the distribution of competencies and responsibilities between these layers can be explained by the varying degrees of political autonomy for regions within Europe in terms of designing, funding, administration and implementation of policies, according to different constitutional systems as can be seen in table 3.

Table 4.3 The variable degrees of decentralisation within the EU-27

Federal countries and countries with 'autonomous' regions	Centralised countries, with regional capabilities	'Single-region' countries
Austria, Belgium, Germany, Spain, UK	Bulgaria, Czech Republic, Finland, France, Greece, Hungary, Ireland, Italy, Netherlands, Poland, Portugal, Romania, Slovakia, Sweden	Cyprus, Denmark, Estonia, Latvia, Luxembourg, Malta, Slovenia

Source: Maroulis, N., & Koschatzky, K. (2007). Specific Analysis on the Regional Dimensions of Investment in Research

The EU experience of the decentralization of science, technology and innovation policy making with the 10 East European countries (plus Bulgaria and Romania) heightens the fact that the transition process from a centrally planned regional policy towards a more decentralized model is a very slow process, with setbacks and that it is still twenty years later a process far from completed.

Particularly for larger countries, it appears that there is a trade-off between the comparative advantages of multi-regional programmes (achieving critical mass of finance or skills and avoiding duplication) versus regional programmes (allowing tailored made solutions to regional specific issues). However, there is not an optimum universal answer as to how best countries should balance between these two needs, but rather it seems that due to the diversity of innovation potential of each region and country diverse approaches to priority and target setting are required.

Moreover, the discussions on the optimum institutional set ups is far from over. On the one hand, proponents of decentralization state that regional governments are more able to cater local needs, establish links with revenues needed to finance programmes and increasing the accountability and efficiency of these programmes. In contrast, there are arguments supporting centralization in terms of macroeconomic stabilization particularly in times of crisis and for the achievement of economies of scales and increased spill-over effects across regions.

The central issue of the healthy degree of decentralization cannot be answered in a definite way, but it is rather an issue of a variable geometry, depending on the specific characteristics and development stage of countries and regions, as presented in the table below. The norm is that the regions that are competent in terms of the enablers the more likely it is for this specific region to have more autonomy and efficiency in formulating and implementing its own science, technology and innovation strategy.

Table 4.4 Balance of Central vs. Regional innovation policies

Variable	Key issues - enablers
Competencies	Skills, efficiency, effectiveness in designing, implementing, monitoring and evaluating policies at the regional level.
Legislation	Degree of legislative autonomy of the region in terms of R&D, innovation, educational and economic development policies
Local conditions	Existence of clusters, networks, research centers, higher education institutes, foreign firms, i.e. institutional conditions
Finance	Do regions possess their own funds or are they entirely relying at the national authorities for funding? Presence of VC's, FDI potential, specialized banks and other financial institutions and their level of specialization and competencies.
People	Existence of skilled personnel in S&T, managerial skills, etc
Political directions and structures	General level of decentralization of regional policies

Source: Maroulis, N., & Koschatzky, K. (2007). Specific Analysis on the Regional Dimensions of Investment in Research

To conclude, the decentralization process implies an increasing need for strong political leadership and at the same time to clearly delineate local, regional & national roles to avoid duplication, and build coherence. *These can be supported by establishing an evaluation framework to support policy.*

Decentralization in Ukraine

Starting from a different policy tradition, the efforts in Ukraine for empowering regions participation in policy making were combined with centralization of power, which is reflected in the nomination of the regions' governors by the government and the dependence of the regions financial resources on government. In Ukraine, regional innovation policy is still at its infancy stage, although, efforts have been made by the government and the regional authorities to define specific objectives and *initiate projects mainly for developing innovation infrastructures*. Moreover, the emphasis on developing regional innovation policy varies substantially among regions. However, despite the differences, development of S&T and innovation infrastructures, including techno parks and universities, and hi-tech companies are common for most regions. Overall regional innovation policy remains marginal and mainly as a by-product of industrial, FDI or education policy.

Ukraine is a centralized state with a high concentration of power in the capital. Regions have their 'mini-parliaments' (Oblast Rada), elected by the local population, but the President nominates the governors. Decentralization issues have been raised for a long time in Ukraine. Particularly after signing the European Charter on Local Self-Government in 1997, Ukraine officially recognized decentralization and stakeholder's participation in the design of science, technology and innovation policies as integral elements of European legal understanding of democratic governance.

The planned and discussed reforms after the independence of Ukraine regarding the devolution of power from the central government towards the regions gravitated around the following issues:

- territorial (change of the administrative and territorial division)
- administrative (delegation of significant power to the local authorities, changing the power vertical)
- financial (redistribution of budgetary funds for the purpose of targeting it to the local level).

However these intentions were not supported by appropriate policies, institutional reforms and implementation of the appropriate measures. Some changes have taken place, but the development of a comprehensive (or complex) "transformation strategy" from the unitary and still very centralized country remains underdeveloped.

The main reasons for these delays can be summed up as follows:

- The absence of a consensus regarding the scope and depth of decentralization.
- The lack of capabilities and competences at the regional level in terms of design and implementation of science, technology and innovation policies.
- The limited available financial resources and the absence of a central mechanism for transferring funds to the regions (including tax revenues).
- The absence of a coordination framework between the national and regional authorities
- The insufficient and unclear legislative framework regarding science, technology and innovation (as the contradictions in the chapters of the Ukraine Constitution, defining territorial basis, the organisational system of local authorities and local administrations).
- The existence of legislative barriers (e.g. commercialization of research results produced in the public research sector and Intellectual Property Rights) that limit the scope of policy interventions.

As a result, today it seems that regional authorities have no financial resources and clear legislative basis for the formulation of any dedicated innovation support programme. According to the existing legislation regional authorities are responsible for formulation of the regional R&D and innovation programmes, the provision of financing of science, technology and innovation programmes within the limits of regional budgets; and the monitoring and evaluation of science, technology and innovation activities financed from the regional budgets. In practice, the picture looks different. However, despite these difficulties, some regions had tried to introduce special measures of innovation support within regional development programmes.

4.5 Innovation measurement and evaluation

Developed countries have allocated over half a trillion USD annually for R&D development in recent years. Even more substantial financial resources have been allocated for innovation activities. Therefore, it is natural that both individual countries and international organisations pay special attention to the development of relevant statistic tools to assess the levels of S&T and innovation activities. The key role has been played here by the OECD secretariat since the 1960s.

It is not always possible to collect relevant data on the basis of national statistics using traditional methods. For this reason, the so-called Community innovation surveys (CIS) are regularly conducted in the EU countries and some non-EU countries. As a rule, they are held once in two-three years. They constitute an important supplement to the regular (annual) innovation information collecting and processing procedures in the majority of OECD countries. In addition, innovations statistics, in some cases, is still not fully comparative. For instance, indicators on patent activity, (quantity of patent applications, number of patents received) is often used in innovation research but it is impossible to compare patents procedures in different countries due to differences in national legislations and traditions.

The European Innovation Scoreboard's indicators system makes it possible to compare countries. Integral indicators of innovation development, including so-called EU Innovation Index, are calculated within the European Innovation Scoreboard framework in order to make comparisons more substantial. It allows measuring the "distance" between countries and regions, to define best practices and to develop recommendations on transformation of the national innovation systems.

The necessity to conduct a comparative analysis of the current state and the perspectives of S&T and innovation potential development of Ukraine and other countries is determined by the need to clarify Ukraine's place in the sphere of S&T. Such evaluation is an important precondition and element of integration, broadening and deepening Ukraine's participation in European structures.

There are different sources of information could be used for collection of relevant statistical indicators in Ukraine. They could be grouped in five categories.

1. 'Traditional' statistics forms of the States Statistics Committee of Ukraine

The values of many innovation activity indicators may be obtained on the basis of existing statistical information from the form No1 – innovation "Survey of technological innovation of industrial enterprise" and some other forms, which do not have direct relation to innovations but contain some indicators, related to different aspects of scientific, technological and innovative activity. It shall be submitted by the legal entities of all the organisational and legal forms as well as their branch offices that carry out a commercial activity the classification code of which under the classification of economic activity types (KVED), regardless their main activity. The results of data collection and processing are published annually in the statistical yearbook of the State Committee of Statistics of Ukraine "Research and Innovation activity".

2. Results of the specialized innovation survey carried out according to the EU methodology (specialized SSC survey).

In 2008-2009, the State Committee of Statistics carried out a pilot CIS-type survey on innovation activities in 2006-2008. Although, there are still some methodological and technical problems related to the formation of relevant samples and thorough data processing, the first nationwide survey was successful. The first results of the Survey were put on the website of the State Committee of Statistics, but detailed information has not yet been published, except one 20-pages chapter in the last statistical yearbook (published in November 2010).

3. The results of regular competitiveness surveys carried out by the SSC of Ukraine

The State Committee of Statistics of Ukraine jointly with the S&T Complex of Statistical Studies (Research branch of the Committee) carries out such surveys with the purpose of studying the process of investment and innovation implementation exactly at the industrial enterprises where investments are attracted and new technologies are implemented more often.

The competitiveness survey, which is conducted by the State Committee of Statistics on the quarterly basis since 1997, just recently was completed by the questions on innovative activity. Such surveys allow obtaining the up-to-date information on the level of this activity at the level of sectors of the national economy. Moreover, the competitiveness surveys give an opportunity to estimate the prospects of innovation activity, since there are questions related to the company plans in this sphere for the next year.

4. Information collected by different ministries and state agencies various departments

Usually, this statistics is collected in Ukraine by different ministries and agencies (for example, by the National Academy of Science of Ukraine NASU) on the sectoral basis. As a rule standards of data coincide with the standards of the State Statistics Committee of Ukraine. Herewith, certain issues of innovation activity are detailed by the sectoral statistics, while the others are not considered at all. Such approach is quite natural, but in some cases the sectoral statistics do not allow to make correct comparisons at the national level and it duplicates the nationwide statistics (the information from the SSC of Ukraine).

5. Data of specialized innovation surveys carried out by researchers and organisations.

The data of specialized innovation surveys, carried out in the framework of specific research projects, provide the information about innovative activity of particular enterprises and economic sectors. Under such surveys, the collection of questionnaire data is often accompanied by the detailed research of particular companies (review of so-called "cases") that allows getting important and qualitative information directly from the companies. In addition, the similar projects allow making a thorough analysis of particular groups of companies, for instance, large, medium-, and small-sized enterprises. Another important point is that small enterprises report to the government under a

simplified procedure and it is hardly possible to introduce additional indicators of innovative activity in the relevant statistical forms.

However, a negative feature of the specialized surveys is their casual nature and difficulties with the generalization of received results. In many cases the data of such surveys are used for the calculation of generalized indices of “development”, competitiveness etc. Political orientation and disregard of the rules of social research conduction result in getting unreliable results.

Innovation measurement in Ukraine

The CIS-type innovation survey allows making a conclusion that the majority of indicators, which are used in the EU countries, may be used in Ukraine also. First of all, it concerns the indicators of the number of innovative enterprises, structure and quantity of innovations etc. In addition, there are rather problematic data on the venture capital availability and the areas of its utilization, as well as information on the activity of small enterprises. The latest is determined by the discrepancy in the small enterprise definition used by the EU and Ukrainian statistics. Also, the criteria of small enterprise definition used in Ukraine are somewhat different, if compared to the unified criteria, which are used in the EU countries.

There is a problem with the venture funds. Due to the drawbacks of legislation, they virtually do not finance the innovative activity even though they are widespread on the real estate market. The application of data on the venture funds activity in Ukraine cannot be compared with similar activity of the EU countries. At the same time, there is a possibility to calculate a large number of indicators that allow analyzing the peculiarities of innovative activity in the country. It should be mentioned that in the EU countries the expenditures for innovative activity are not calculated on the level of the government, since it is extremely difficult to determine such expenditures in general industrial activity.

Regarding the patent statistics, one part of data of Ukraine is collected according to the standards of the World Organisation of Intellectual Property (Ukraine has joined the majority of international agreements in this area), the other part is collected by the international organisations (first of all, it refers to the data on the number of patents of the USA, EU, patents of ‘triadic group’, etc.). There may be some problems with the retrospective data while compared as far as in the particular period of time 1990 – beginning of 2000 years in Ukraine there were so-called declarative patents, the value of which was low according to the experts.

The implementation of the European innovation survey in Ukraine on a regular basis would give an opportunity to make large-scale and reliable comparisons with the EU countries. In the course of calculation, there may be some problems with the statistical data that are not directly connected with the statistics of innovative activity in Ukraine. For example, the data on advanced training under the EU standards are not collected, there is a slightly different categorization of working people by age groups (a lower retirement age compared to the EU countries), and it’s widely common for people to work after retirement, keeping their salary in full. However, these technical problems could and should be solved.

Chapter 5: Framework conditions

It is widely recognised that a supportive regulatory framework will not in itself suffice to promote innovation if science education and other policies are not well designed. Moreover, when an innovation-friendly regulatory strategy has been devised, implementing and enforcing reform to sustain it will be crucial but remains challenging. As an OECD study sums it up: “Some of the required reforms may affect vested interests, such as in universities and scientific institutions, as well as business sheltered from competition, benefiting from public support or confronted by technology-induced structural change. Strong political leadership and efforts to develop a clear understanding by the various stakeholders of the problems and of the solutions – including the costs they involve- can all help communicate the needs for reform and foster acceptance”. Therefore, tackling such obstacles requires systematic audits that should be followed by sustained actions to ensure that the obstacles identified are duly reduced or removed. This implies a functional and independent judiciary system.

5.1 Investment climate & regulatory framework

The investment climate affects both local and foreign firms and their ability to generate knowledge transfer and innovation. The quality of regulation and its enforcement are recognised as critical determinants of the capacity of new and innovative firms to grow and expand. Restrictions on firm entry, exit, and activities can impede technological progress by propping up inefficient firms and limiting the expansion and creation of innovative ones. An inadequate regulatory environment inhibits business development in general but particularly affects smaller firms. Many issues affect a country’s investment climate. They range from firm start- up to business closure, from competition to access to land and credit, from customs practices to business setup procedures.

The regulation system in Ukraine, including permits, inspections, mandatory certification and standardization procedures has been a major barrier in doing business: 100% of goods produced in Ukraine are subject to mandatory standardization requirements; 80-90% of enterprises are inspected each year by various government agencies; over 50% of enterprises have to get at least one permit per year. The State Committee of Ukraine for Regulatory Policy and Entrepreneurship (SCURPE) had carried out deregulation enforcing laws in 2003 and 2006. However, deregulation reforms have been slow and incomplete, and most procedures still correspond more to the Soviet command and control economy rather than those to a modern market economy.

Table 5.1: Ease of doing business in Ukraine 2011 (economies in 183 countries)

Topic Rankings	DB 2009 Rank	DB 2010 Rank	DB 2011 Rank	Changes 2009-2011
Overall rank ease of doing business	145	142	145	No change
Starting a Business	128	134	118	10
Dealing with Construction Permits	179	181	179	No change
Registering Property	140	141	164	- 24
Getting Credit	28	30	32	-4
Protecting Investors	142	109	109	33
Paying Taxes	180	181	181	-1
Trading Across Borders	131	139	139	-8
Enforcing Contracts	49	43	43	6
Closing a Business	143	145	150	-7

Source: World Bank ‘Doing Business’ Reports (2009, 2010, and 2011)

The number of regulations, required certificates, and inspection regimes in Ukraine imposes a significant regulatory burden on private enterprises. While the time and costs related to business registration have been reduced, the GoU still requires enterprises to obtain numerous permits to conduct business. The Law "On Permits System in Economic Activity," which entered into force in January 2006, cancelled more than half of the required permits and increased the number of locations for obtaining permits six fold. The government also tried to expand "One-stop Registration Shops" that allow new businesses to be registered within two to three days, instead of a month, as in the past. The World Bank "Doing Business 2010" report on 183 countries rated Ukraine 134th for ease in starting a business, down from 126th in the 2009 report. "Doing Business 2010" estimates that on average it takes 27 days and approximately \$154 (5.8% of GNI per capita) to open a business in Ukraine; OECD averages are 13 days and 4.7% of GNI per capita

Permit, inspection, and technical regulations systems remain major regulatory barriers to business development and steady growth. Despite a number of laws, decrees, and regulations that have been passed to address these issues over the past five years, implementation remains slow, leaving businesses to navigate an opaque and costly regulatory environment.

IFC estimates that enterprises and sole proprietors that underwent permit, inspection and technical regulations procedures in 2008 incurred a total cost of \$1.55 billion¹⁸ to comply with them. Given that these three are not the only regulatory procedures that entrepreneurs need to follow in order to start and operate businesses, it is clear that private businesses face significant cost in complying with regulations.

According to IFC report (2010), Ukraine's legacy inspections regime, which consists of 85 controlling agencies, currently inspects a larger share of the nation's businesses, and with greater frequency, than the regime of any other post-Soviet country. In 2008, three fourths of all enterprises faced at least one inspection. On average, an enterprise was inspected more than five times and spent almost three weeks under inspection. Sole proprietors faced almost the same inspection burden. They faced an average of seven inspections annually and were under inspection for three weeks out of the year. These inspections did not address risk factors and in some cases had nothing to do with improving public safety.

Technical regulations and standards applying to products and processes seek to address safety aspects of the consumers, the users and environmental threats. Certification costs aiming to demonstrate compliance can generate additional costs for the exporter. Such costs are especially onerous when exporters face a range of constraints for exporting similar products to different countries.

Technical regulations and mandatory product and service standards affect a significant percentage of Ukrainian businesses. While 41 percent of enterprises on average must comply with some form of technical regulations, in some sectors the figures are much higher. The manufacturing sector, for example, is highly regulated, with 67 percent of the products regulated by either mandatory standards or technical specifications. Registering a technical specification or standard is the only way businesses can introduce innovations into their products. Doing so, however, is very costly in terms of time and money. In 2008 an average enterprise registering technical specifications bore the average direct cost of \$2,960 and devoted more than 12 weeks to the chore.

As a legacy to the Soviet Union, Ukraine inherited GOST (Russian for state standard) along with 11 other CIS countries. GOST standards are predominantly prescriptive. This brings rigidity, especially when embedded in technical legislation since the solution prescribed was stabilized for long period of time. European standards have become performance oriented; permitting more than one prescribed technical solutions. Likewise, European standards facilitate up taking of innovation. Ukraine is turning towards this direction.

5.2 International trade and innovation

International trade rules and practices and intellectual property agreements strongly influence countries' abilities to attract partner and foreign investments, benefit from technology transfer through increased trade opportunities, and stimulate local innovation. Governments endeavour to create an adequate framework to build an enabling environment that is both attractive to foreign investment and locally supportive to innovation, adaptation of technology, and dissemination of knowledge. Government policies to support innovation should embark on reforms that update the regulatory and institutional framework for innovation and remove bureaucratic, legislative and regulatory obstacles to innovation. These obstacles affect competition laws, licenses to operate, government authorizations, technical norms and standards, customs procedures, and many other regulations and processes.

Trade contributes to innovation in at least three ways: Through embodied technology in the form of goods and services; through knowledge, practices and processes linked to the use of technological goods and to contacts with foreign suppliers and customers; and through capital and investment (notably foreign direct investment (FDI)).

FDIs can be an important channel for technology and knowledge transfer. Foreign companies can offer a package of mobile, tangible, and intangible assets that include capital, technology, know-how, skills, brand names, organisational and managerial practices, access to markets, competitive pressures that stimulate innovation, and environmentally sound technologies. The extent of spill overs depends on domestic absorptive capacity. The investment climate determines also the degree to which transnational corporations are encouraged to raise local capabilities.

Ukraine does not capitalise on FDI when it comes to innovation uptake of the country. Over the last decade, investments into Ukraine have risen twelvefold. However, the share of investing enterprises active in upgrading innovation dropped by over one third.

Figure 5.1 Regional investment

Total investment in fixed assets in 2009 was 151777 mln. Hrn.
Investment in fixed assets per capita in 2009 was 3308,6 hrn.



Source: Scientific and innovation activity in Ukraine. Statistics collection. Kyiv: Information and publishing centre of Derzhkomstat of Ukraine, 2010

5.3 Taxation

In both developing and emerging market economies entrepreneurs perceive taxation issues (tax administration and tax rates) as major obstacles to enterprise development. Governments of catching-up economies are increasingly realizing the importance of reducing the tax burden on enterprises and of streamlining the tax administration.

Tax incentives have increased significantly over the last 15 years in OECD countries. They mainly focus on R&D and are referred to as indirect measures to promote R&D and innovation, as opposed to subsidies as the main direct measure. There are two basic types of tax incentives: Those which provide credit or allowances for deductible income, and those which do so for payable taxes. Tax incentive schemes are further differentiated by deduction base use, eligible costs to be included, and specific terms for targeting effects for specific purposes. Distinctions can also be made between how the incentives treat non profit companies, subcontracting, foreign R&D, monetary thresholds for receivable credit or allowances, or R&D type. The differences direct the impact of the incentives, e.g. on technology transfer and industrial uptake of research, development of high-tech products, etc. It is difficult to disentangle the true impact of tax credit schemes from other schemes due to the policy mix employed.

Taxation in Ukraine remains a major obstacle for enterprise development. The Ukrainian laws do not constitute a single system and are conflicting. According to survey results in 2003, around three-fourths of respondents indicated the main taxation problem areas were high tax rates; constantly changing laws; a large number of taxes; and frequently changed reports forms. In 2008 there were 26 national and 14 local taxes. Enterprises pay on average 9 – 12 taxes and mandatory duties. The system is overburdened with numerous minor taxes, expenses for calculation, control and administration of which exceed the proceeds of their payments. . It is well known that the existing tax regime in Ukraine seriously complicates direct procurement of modern scientific equipment or fine chemicals from abroad. Importing them to Ukraine multiplies the costs to the research entities 5-10 times and makes it financially unaffordable for majority of research units thus undermining the research as such. On the other hand the heavy tax burden prompts legal and physical entities to move to the shadow economy by using double-entry bookkeeping or avoid paying taxes at all. This situation makes introduction of internationally reputable tax incentives useless and ineffective.

Figure 5.2 Tax compliance for businesses



Source: IFC report, 2009

Recently, first in the history of Ukraine, a Tax Code has been enacted (Tax Code of Ukraine, N 2755-17 with amendments by the Law of Ukraine N 2856-VI of 23.12.10, last version of 01.01.2011). A benefit of the Tax Code is that it is a single document that supersedes and consolidates a number of separate tax laws and regulations that are currently in force. However, it appears that the draft Tax Code contains numerous new provisions which suggest a negative impact on the business environment in Ukraine. The proposed draft has raised a number of comments and proposed amendments suggested by the professional and business communities, representatives of foreign companies doing business in Ukraine (e.g. the Chamber of Commerce in Ukraine), of political fractions etc. It is expected that certain provisions of the Tax Code will be further amended during 2011. The Cabinet of Ministers and specifically the Ministry of Finance set up a special working group whose task is to provide comments to the existing Tax Code and to assist in developing the plan of harmonization of Ukrainian by-laws with the Tax Code. In any event, a tax regime in favour of enterprises, especially Small and Medium sizes Enterprises (SMEs) must be accompanied by other conditions, such as access to finance for enterprises, improvement of banking system or well trained corporate managers.

The only tax privilege for Techno Parks that survived 2005 is the increase from maximum export (import) settlement period from 90 to 150 days. Ukraine has special tax incentives for R&D, not for innovation activities. Likewise, officially listed research organisations do not pay VAT for publicly financed R&D projects. Also they pay reduced land taxes and no tax on imported research equipment or materials. Moreover, they enjoy a special amortisation rate of capital assets.

It is hard to quantify the exact correlation between R&D tax incentives and the global deployment of R&D. In any event tax preferences should be given only to enterprises that can prove their innovation and R&D activities. It is a challenge to embed R&D tax incentives within the overall taxation policy. Ukraine may wish to decide to more directly steer innovation policy interventions towards specific technologies and sectors. Care must be taken to balance the policy mix rather than to focus on choices between R&D subsidies versus tax incentives.

5.4 IPR

In many countries researchers, their research institutes, and their universities did not enjoy incentives to commercialise the Intellectual Property Rights (IPR) generated in publicly funded research institutes. As a result many research results rested on the shelf, or were given away (almost) for free, hereby not benefitting the publicly funded research infrastructure that yielded the outcomes.

Policy makers in many countries addressed this issue by amending ownership rights hereby giving researchers and research infrastructure remuneration for successfully commercialised research results.

In parallel many governments worldwide have set up functioning mechanisms to commercialize research results. Nowadays in many universities and public research organisations Technology Transfer Offices help researchers to evaluate the commercial potential of their research results, to patent these, to find partners, to license or sell IP, or to establish spin offs. The offices reach sustainability after around a decade. Moreover, the Enterprise Europe Network (EEN) helps in the international partner search and facilitates technology deals among hundreds of thousands of enterprises and research institutes.

It is largely acknowledged that Ukraine's huge R&D potential is not fully exploited when it comes to commercializing research results to industry.

It shows Ukrainian companies prefer to buy technology abroad rather than to elaborate technology solutions with Ukrainian public research institutions and universities. Indeed communication and operative interaction between academia and business environment is almost non-existent. The challenge remains to improve academia's understanding of the business environment.

One part of the problem is that neither researchers nor research institutions have an incentive to commercializing their research results. Legislation on ownership rights of research results is still contradictory. The central executive authorities usually define themselves as the owners of research results obtained in publicly funded research. Likewise many researchers do not report their research results to university/research institute administration. Also some researchers tend to be introvert hereby rather disguising than sharing core details of their inventions. The costs of foreign and domestic (85 to 40 % more expensive than in many Western countries) patenting are prohibitive to some. Many researchers do not speak English and are impeded to accessing free patent databases. There is no legislative base for creation of innovative spin-offs from Ukrainian universities.

5.5 Innovation culture

To overcome the gap due to their history, transitions economies like Ukraine need to pay attention to organisational capabilities, such as innovation-friendly culture, entrepreneurship and market orientation that are important drivers of wealth creation and growth.

Among others, transition economies should focus on 1) the creation of innovation-friendly culture in society at large. Care should be taken to embrace the overarching importance of schools in the innovation structure of a society, 2) the support of small and medium-sized innovative companies to enter innovation activities, 3) the involvement of the business sector in R&D efforts, and 4) increasing the role of the government in stimulating R&D in general.

Fostering innovation culture has been on the priority list of Ukrainian innovation policy since 2003. According to the materials prepared for the parliamentary hearings of July 2009, there are fundamental barriers that make implementation of support measures of innovation culture difficult. The role of science education has greatly diminished in the education system, which erodes the competence base required for R&D and innovation activities.

Moreover, the prosperity of innovation culture is dependent on other cultural factors, such as the level of social capital and trust in the society. If there is lack of trust among the citizens and organisations of the society and the effectiveness of government is not well established, support measures that function well in the EU are not likely to succeed in the advancement of innovation culture. On the basis of the parliamentary hearings of July 2009, Ukraine faces great challenges in these respects and supporting the functioning of civic society should be prioritized, since it is a necessary condition of innovation culture, if, for instance, public-private collaboration is considered.

Nevertheless, it is also possible that support of innovation culture may have a positive impact on civic society at large. From the point of view of regional development, there is evidence suggesting that innovation activities are liable to cluster within certain city areas, and cultural factors, such as openness and tolerance of the people in a region, affect this clustering. Ukraine could make use of the finding that this implies looking beyond the provision of supply-side resources, such as investments in training and education at regional level. Regional governments could also search for possibilities to provide a mixture of vibrant cultural spaces and more relaxed urban infrastructures and suburbs that may be attractors of talented work force.

It is well established that enterprises with a successful innovation management and a sustainable innovation culture perform well in innovation activities, grow faster and are more profitable. It is, however, very difficult to imitate or apply innovation cultures found in business organisations. Organisational research is only about to start to address these issues. Concerning governmental organisations, Ukraine could make use of the lessons learned about the barriers hindering the advancement of innovation culture in a bureaucracy. For instance, the risk aversion and high level of accountability lead to reluctance to undertake or implement changes in governmental organisations both in EU and abroad.

Advancement of innovation culture in governmental organisations is dependent on many factors. Clarification of organisational goal setting procedures, provision of sufficient resources, monitoring and communicating good practices, as well as effective human resource management including recognition and reward mechanisms are found important and mutually reinforcing support measures of innovation culture in governmental organisations. It is likely that the situation is not different in Ukrainian governmental organisations.

Promotion of innovation culture to general public has been on the agenda of many EU projects. On the basis of the parliamentary hearings of July 2009, this issue is also on the agenda of the Ukrainian innovation policy. The measures undertaken in the context of the European Year of Creativity and Innovation 2009 provide a great deal of examples of events and other communication actions addressing general public. It is recognised that the use of media like TV and games helps to raise public awareness of innovation, especially in case of lower income groups that are hard to reach by conventional promotion measures. This finding should also be kept in mind in the Ukrainian context if promotion means are called for reaching the widest audience possible.

Concerning education and training, science and engineering qualifications are of great importance in the EU policy agenda. Nevertheless, entrepreneurial skills, innovation management and vocational skills and competences have gained prominence as policy issues during recent years. Ukraine could make use of these findings and reflect on the conditions to diversify educational provision in the Ukrainian context. The key competences of lifelong learning that are required in knowledge-based society are central part of modernisation of educational systems in the EU context. It is likely that advancement of these competences, including communication skills, mathematical competence and skills in the use of ICT, is important for innovation and competitiveness both in EU and Ukraine.

5.6 Eco-Innovation

During the last 40 years Europe has developed environmental laws that have given Europeans cleaner water and air, whilst ensuring predictability, a level playing field for businesses and imposing sanctions on those who pollute and damage. In addition, great new technologies have developed that increase energy efficiency in homes and transport, generate renewable energy, substitute hazardous materials and make other materials easier to recycle. It has to be noted, that Green regulations have created a solid market for eco-products and processes globally with China and South Korea allocating significant budgets. Being clearer, resource efficiency is not only energy efficiency. Energy is a hugely important resource, but it is not the only one. We must also consider material resources such as metals, minerals and food, and natural resources, which provide services, including clean air, land and water. Resource efficiency isn't just about promoting the growth of a lucrative niche of eco-innovation companies. Obviously resource efficiency needs eco-innovation - the two go hand in hand - but we need to green the whole economy, not just develop a promising niche. We need cleaner industry in general, not just cleaning-up industries.

European eco-innovation policy is supported by main actions lines like in the Competitiveness and Innovation Programme (CIP - support of energy efficiency and eco-innovation) of the European Commission as well as in almost all directions of the Structural Funds. Such policies are dominant all over the world today. According to HSBC bank the total stimulus packages worldwide relating to eco-innovation and green industries is around half a trillion dollars today. Most of this money (around 70%) is directed to renewable energy sources and around 50% of this is spent in Asian countries, most of it in China. It is interesting to mention as an example that 90% of the national stimulus package of South Korea is going towards eco-innovation actions.

Energy saving and green technologies application have been declared as priorities by the Ukrainian Government. Ukraine has the potential to become a good performer in this area. The large R&D infrastructure, land and mineral resources, and human resources as well as its international positioning in the energy arena makes Ukraine a typical player if it takes advantage of the timing and international conditions. Another reason to focus on eco-innovation is the high level of environmental contamination in Ukraine, including results of Chernobyl disaster and industrial wastes in the regions with domination of ferrous metallurgy, chemical and coal industries. This creates an urgent need to introduce technologies, which could help to solve specific environmental problems of the country.

Chapter 6. Policy Options for Innovation Support in Ukraine

6.0 Introduction

Ukraine's international position over the last years has worsened in most of the global competitiveness indicators. According to the 2011 World Bank Doing Business Report, Ukraine, a lower middle-income country, is 145th of 183 countries by the indicator of 'ease of doing business'. Also, the rank of Ukraine among up to 142 countries by the World Economic Forum's Global Competitiveness Reports for the last four years are summarised below.

Table 6.1 International rating of Ukraine by Global Competitiveness Indices (GCI)

Indicators	Ranks 2007/08 (out of 134)	Ranks 2009/10 (out of 133)	Ranks 2010/11 (out of 139)	Ranks 2011/12 (out of 142)	Difference 2007 -2011
Overall GCI	72	82	89	82	- 10
Institutions	115	120	134	131	- 16
Property rights	123	127	135	137	-15
Intellectual property protection	114	108	113	117	-3
Burden of government regulation	91	108	125	130	-39
Infrastructure	79	78	68	71	-8
Macroeconomic stability	91	106	132	112	-23
Higher education and training	43	46	46	51	-8
Extend and effect of taxation	127	128	136	141	-14
Business impact of rules on FDI	120	121	128	130	-10
Financial market development	85	106	119	116	-31
Technological readiness	65	80	83	82	-17
Business sophistication	80	91	100	103	-23
Innovation	52	62	63	74	-22
Capacity for innovation	31	32	37	42	-11
Company spending on R&D	52	68	69	75	-23
University-industry collaboration in R&D	49	64	72	70	-21
Gov't procurement of advanced tech products	54	85	112	112	-58

In chapters 1 – 5 we have therefore tried to highlight briefly the main areas that influence global competitiveness in general and innovation development and policymaking in particular. We have described the competitive position of the country globally, the role of the enterprises in the Ukrainian economic system, the main infrastructures and their functionality, the main characteristics of the system governing innovation at national and regional level, as well as the most important framework conditions that support or inhibit innovation activity.

Our effort was concentrated in identifying some main barriers and drivers to innovation in order to propose sets of actions that could be useful for the policy makers to consider. In this part of the report, we summarise the main areas where we consider that action should be taken. The aim is to trigger discussion on the specific priority areas that have been highlighted as important from our analytical work. These sets of actions/measures can be grouped under the following policy action lines:

- A. Policy Action Line 1: Better governance in favour of innovation**
- B. Policy Action Line 2: Enhancing innovation in enterprises**
- C. Policy Action line 3: Bridging R&D potential with Industry**
- D. Policy Action Line 4: More Innovation in Regions**
- E. Policy Action Line 5: Developing an innovative culture**
- F. Policy Action Line 6: Globally competitive on Eco-innovation**

Each proposed action can be characterised as framework modification, new programme or mode of financing and, changes or additions in the legislation/regulation conditions. Our proposals are a result of our own understanding of the situation and the opinions and comments that have been gathered during the last months from various stakeholders in the country.

The proposed measures along with more specific ones, measured in the following sections, could lead to substantial improvement of the Ukrainian positions in innovation relevant indicators. If indicators of the EU Trendchart⁶ are used for assessment, it is expected that in 2020, Ukraine will move from the group of 'catching-up' countries to the group of 'moderate innovators' and can reach the following results (see Table below).

Table 6.2: Relative EU Trendchart indicators of Ukraine in 2020 (optimistic scenario), EU=100%

Number	Indicator	Ukraine/EU, %, 2009	Ukraine/EU, %, 2020
1.1.1	S&E and SSH graduates per 1000 population aged 20-29 (first stage of tertiary education)	122	100-120
1.1.2	S&E and SSH doctorate graduates per 1000 population aged 25-34 (second stage of tertiary education) ⁷	n/a	90-100
1.1.3	Population with tertiary education per 100 population aged 25-64	n/a	100-120
1.1.4	Participation in life-long learning per 100 population aged 25-64	n/a	50-70
1.1.5	Youth education attainment level	109	100-110
1.2.1	Public R&D expenditures (% of GDP)	64	80-90
1.2.2	Venture capital (% of GDP)	n/a	40-60
1.2.3	Private credit (relative to GDP)	19	40-60
1.2.4	Broadband access by firms (% of firms)	56	80-90
2.1.1	Business R&D expenditures (% of GDP)	18	50-70
2.1.2	IT expenditures (% of GDP)	100	90-110
2.1.3	Non-R&D innovation expenditures (% of turnover)	87	80-90
	Linkages & entrepreneurship		
2.2.1	SMEs innovating in-house (% of SMEs)	37	50-70
2.2.2	Innovative SMEs collaborating with others (% of SMEs)	57	40-60
2.2.3	Firm renewal (SMEs entries + exits) (% of SMEs)	n/a	80-90
2.2.4	Public-private co-publications per million population	n/a	30-50
	Throughputs		
2.3.1	EPO patents per million population	> 1	20-40
2.3.2	Community trademarks per million population	> 1	20-40
2.3.3	Community designs per million population	> 1	20-40
2.3.4	Technology Balance of Payments flows (% of GDP)	13	30-50
3.1.1	Technological (product/service/process) innovators (% of SMEs)	45	70-80
3.1.2	Non-technological (marketing/organisational) innovators (% of SMEs)	16	80-100
3.1.3	Resource efficiency innovators (% of firms)	n/a	50-70
3.2.1	Employment in medium-high & high-tech manufacturing (% of workforce)	65	70-80
3.2.2	Employment in knowledge-intensive services (% of workforce)	22	70-90
3.2.3	Medium and high-tech exports (% of total exports)	32	50-60
3.2.4	Knowledge-intensive services exports (% of total services exports)	35	40-60
3.2.5	New-to-market sales (% of turnover)	110	80-100
3.2.6	New-to-firm sales (% of turnover)	132	80-100

Ukraine has already relatively high values for indicators, which are related to the quality of human capital (level of education), shares of expenditures on ICT in GDP and some others. However, the country is lagging behind the EU average level in the bulk of indicators. It would be possible to cover existing gap and to reach the average level for eight from 29 indicators. While for eight indicators this level, probably, will not be reached, bearing in mind existing difference between the EU and Ukraine. However, progress in innovation development could be significant, and it would bring substantial benefits for the social and economic development of the country as a whole.

⁶ EU Trendchart is the key instrument for measuring level of innovation development in the EU countries and for comparative analysis of these countries with the other leading world economies. It includes a number of special indicators, related to innovation, S&T, human and economic development. See corresponding annex of this Report for more detailed description and indicators, which describe the current situation.

⁷ For Ukraine, total number of Doctors of Sciences and Candidates of Sciences are considered. There is no unified approach to recalculations of the number of researchers of higher qualification from two-stage system (some post-Soviet states) to one stage system, which is common in the Western countries. However, such approach is used by the National Science Foundation (USA) and similar organizations in the EU countries for statistical and operational purposes (for instance, for comparative analysis or for selection of candidates for academic exchange programmes).

6.1. Policy Action Line 1: Better governance in favour of innovation

6.1.1 Introduction and justification

The idea of knowledge-based economy, driven by innovation, has been discredited in the Ukrainian society, due to many ineffective and inconsistent actions by the public authorities and announced measures that were never been put in practice. Responsibilities of key actors were not well defined. There were several state ministries and agencies in Ukraine responsible for support of innovation activities, but their competences were and still are overlapping and not clearly defined. Most of them had historically no sufficient resources to conduct innovation policy effectively.

In addition, mechanisms for implementing innovation policy tended to suffer due to the fact that innovation policy has not been given a high priority by the state authorities. Legal acts on innovation support have, in many cases, a lower priority when compared to other state regulations (e.g. Law on the State Budget). This results in innovation initiatives being blocked. Such unfavourable developments have created a gap between science, education and the economy (businesses). Clear definitions of responsibilities and budget are needed. Clear linkages between expected results of activities and their impact and performance need also to be established.

To focus on the still strong scientific and technological structures is an economic challenge for the country. However, the Ukrainian innovation system still functions according to a vicious circle: the country's economic output does not correspond to the big size of the R&D sector. Therefore, R&D activities, supported predominantly by direct grants until now are actually financed much below the necessary level. This results in an inefficient R&D system that contributes very little to the national economic output.

New innovative enterprises could be developed and used as a model for the rest of the economy. More efficient public coordination and infrastructures is needed in order to succeed in this. Reforms should not be related towards single changes in the system but should represent a coordinated effort. Also, changes and activities on many "fronts" require a **well-developed communication and coordination mechanism** supported by policy makers, the administration, the science and innovation community and the wider public. This approach cannot be supported with the creation of ad-hoc Committees, without putting adequate political weight on both decision-making and budgets.

Building an innovation driven development strategy constitutes a radical shift in the development paradigm of the country and conforms to a swing into the European development path. A necessary precondition for this is the elaboration of a strategy that is supported by the major stakeholders in the society. Such a strategy would allow the creation of **efficient decision-making and coordination structures**. Coming up with a shared and operational vision for Ukraine may be the biggest challenge of all.

6.1.2 Proposed actions

Framework Conditions

1. *** Introduce European governance standards to public institutions by applying to criteria for an effective legislative framework: 1. Identification and punishment of violations; 2. Definition of norms and procedures for the decision-making process and prevention of discretionary decision-making; 3. Safeguard the independence of controlling or supervisory bodies from those under supervision; 4. Mandatory regular controlling and monitoring of organizations, procedures and standards; 5. Provision of constant oversight over the effectiveness of legislated norms and rules; and 6. Universal application of deontological rules, that is, a code of conduct for public servants.
2. *** Guarantee property right protection according to international standards. This embraces the evolvement of the legal system to cover transaction and disputes that arise over the possession, use, transfer, and disposal of property, most particularly involving contracts. Accompany the law defining such rights with judiciary adjudicating and enforcing property rights. This legal certainly will positively contribute to the investment climate that determines also the degree to which transnational corporations are encouraged to raise local capabilities. More Foreign Direct Investments (FDIs) will result and will be important channels for technology and knowledge transfer to Ukraine.
3. *** Specify in detail the responsibilities of the bodies that should design and/or implement innovation policy in the country, in addition to the recent approval of the MEDT, MESYS and SASII regulations by the President. The distinct role of SASII (the innovation agency) with fixed political value, scope, functions, long-term existence and budget is very important in order to perform the policy directions and to implement the measures decided. Additionally, the policy shaping mechanism should also be elaborated further. It is proposed to create an effective advisory body by the President solely for policy development, like the case of Finland. The Finnish

Research and Innovation Council consists of the Prime Minister, the Ministry of Education, the Ministry of Economy, the Ministry of Finance, up to four other ministries, leading funding organisations, business and industry employee organisations, universities, and other qualified members. It is managed by a Council Secretariat with three staff that initiates and elaborates proposals. The Council convenes four to six times per year to discuss key problems of S&T and innovation development and to generate recommendations to the government.

4. *** Develop a national strategy and 3-5 years plans on R&D and innovation in Ukraine by inter alia defining specific research and innovation priorities (not only general ones, as it does at present time), sets of co-ordinated and harmonised programmes, system of coordination by the government agencies and ministries activity, state support mechanisms, funding volumes and system of monitoring. The potential needs of the State S&T, innovation and technology transfer programmes need to be determined by the State planning taking into consideration their interaction and the desired final results. Involve stakeholders in the decision-making process concerning state programmes formulation (consultation mechanisms). The key for success of the measure has to be obligatory provision of declared financial support. Otherwise, the programme has to be cancelled automatically with corresponding punishment of persons or organisations, which violated the already accepted decision, especially, if it was formulated as a state law.

(to the Law of Ukraine «On State Forecast and Elaboration of Economic and Social Development Programmes in Ukraine» № 1602 – III dated 23.03.2000, the Law of Ukraine «On State Target Programmes» N 1621-IV dated 18.03.2004, the Law of Ukraine “On Scientific and S&T Activities ” N 285-XIV dated 1.12.1998, and the Decree of the Cabinet of Ministers of Ukraine «On Approval of the Order of State Target Programmes Development and Implementation» N 106 dated 31.01.2007)

5. ** A structured process for **setting priorities** for R&D and innovation policies in Ukraine should be set up. A key factor of success is the co-ordination of the involved actors. Research and innovation priorities should be shaped taking into consideration forecast-analytical studies and global technological trends based on the results of the National Foresight-type programme with broad involvement of the representatives of national business circles and foreign experts. The Ukrainian authorities should mandate the relevant bodies (Academies, agencies, funds etc.) to prepare the methodology for this priority setting process. The process should involve identification of themes, experts/stakeholders/users consultation, budget estimates, etc. It is important to increase the share of competitive financing of R&D and implementation of co-financing principles for industry-oriented research.

(to the Law of Ukraine «On State Forecast and Elaboration of Economic and Social Development Programmes in Ukraine» № 1602 – III dated 23.03.2000, the Law of Ukraine “On Priority Directions of Science and Technology Development» № 2623-III dated 11.07.2001 (last edition – 2519-17 dated 9.09.2010), the Law of Ukraine “On Priority Directions of Innovation Activities in Ukraine ” № 433-IV dated 16.01.2003)

6. * Launch a study in order to **map, evaluate and rate the total public R&D infrastructure**. The significant information on research output of all Ukrainian research institutes collected by the Ukrainian Institute of Scientific, Technical and Economic Information (UkrISTEI) should be taken into account. The study should be performed by an international independent organisation (this will be in addition to the existing studies i.e. BILAT project).

7. ** Regular **innovation surveys**, in line with the CIS survey methodology, should become the main information source on innovation activities in Ukraine. This will allow comparing Ukraine with the EU countries, to analyse regional scientific, technical and innovation activities, to identify weak and strong features of regions, to reflect on the existing tendencies and to develop measures, aimed at enhancing STI policies. For this purpose, establish a programme of harmonization of statistics methodology with a view to ensure better comparability with international data. CIS- type surveys have to be conducted along with the Eurostat and, if possible, with some national statistical organisation from the EU. Ukrainian government should initiate corresponding programme (project) within next stage of neighbourhood policy actions.

8. ** The lack of an established system of innovation performance **monitoring and evaluation** is an important systemic gap. Monitoring and evaluation is needed in order to assess the performance of policies and programmes. There is a need to establish a permanent independent coherent and consolidated system of long-term innovation measurement and evaluation under SASII that will make continuous use of the information collected through the innovation surveys and supply it directly to the Cabinet of Ministers and the Presidential Administration.

9. *** Develop a consolidated and coherent **evaluation** system both for policy measures and programmes. One dedicated body (e.g. SASII) should be in charge of setting evaluation methodology, advice and its introduction through trainings to various bodies involved (relevant policy making departments, funds, agencies, regional bodies, etc). Evaluation is to be promoted as a management and knowledge building instrument within the public administration through information and training of stakeholders. Funding for the evaluation of programmes and policy measures is to be set aside in the magnitude of around 3 % of the budget allocated.

10. ** In order to ensure effective monitoring functioning, the reporting requirements (indicators) on the **progress of STI related State programmes implementation** is to be defined. Establish a system of information collection, analysis, and reporting in order to support further strategy development and validated policy options. It is important to include foreign experts into expert groups for evaluation of R&D institutions, as is common practice in the EU countries. This measure makes the evaluation process more objective and relevant

to the purposes of transformation of the R&D system. Criteria for assessment have to be developed jointly by Ukrainian and foreign specialists.

(to the Law of Ukraine «On State Target Programmes» N 1621-IV dated 18.03.2004)

11. ** Set up and fund a comprehensive Ukrainian **NCP support system** with thematic NCPs to be systematically trained by the coordinating NCP. NCPs are to provide information and assistance to Ukrainian researchers interested in the participation and actively participating in FP7 based on the principles of transparency, equal access, impartiality and confidentiality. They need to work with autonomy. They need to ensure regional and institutional coverage. Also they should present Ukrainian researchers and research institutes abroad. Link the Ukrainian NCP network with European NCP networks to ensure the dissemination of information regarding FP7 opportunities to potentially eligible research institutes and companies. Care must be taken to adapt the NCP system to national policies, priorities and strategies, into national structures (government, research funding system, science and business communities), and to FP7 and European NCP networks. The Centres of Science, Innovation and Informatization (CSII), the Institutes of the National Academy of Sciences, the State Space Agency and Ukrainian universities should be the basis of such structure. Evidence from Austrian, Dutch, and Polish NCPs shows that the costs for the setting up and maintaining comprehensive NCP support systems are rewarded by a significantly enhanced inflow of European R&D finances, by improved research quality and relevance gained by international collaboration, and by an enhanced international visibility of researchers.
12. ** Develop a communication platform that links the main stakeholders in research and innovation related stakeholders in Ukraine with the main sources of policy information in Europe such as the Trend Chart and Scoreboard on innovation in Europe, the ERAWATCH, OECD, Europe INNOVA etc. The platform could also include innovative software applications for policy development and could act as information diffusion system amongst stakeholders in the country. Mandate an Agency responsible for technical and administrative support to the platform. This task may be given to SASII which can rely on its network of Centres for Scientific-Technological and Economic Information. Expenses on creation of the Platform will be moderate. They could not exceed 4-20 thousand Euros per month (depending on the number of participants and instruments, which could be involved into the process of interaction. For instance, if the costs of access to international databases on scientific publications could reach 10 thousand Euros per month, while it would open the opportunity to assess the level of international recognition of the Ukrainian scientific achievements. In turn, this will make possible to select best scientific projects for financial support and it could lead to more rational distribution of limited financial resources).

Financing schemes/programmes

13. *** In order to improve the efficiency of the State funded programmes for RDI, a review of the State Budget process should be carried out. One of the options would be perspective multiannual planning of budget allocations for various programmes and measures. These can be developed in the context of a priority setting exercise, the revision of the RDI strategy, or in the context of multiannual programmes. These allocations should be formally approved by the Government.

Increase the percentage of state budget invested into R&D. The Lisbon strategy recommends 1% of GDP to be invested by state, and 2 % invested by industry. In 2009 the Ukrainian state invested 0,37 % of GDP, and industry invested 0,48 % GDP (including financing from foreign sources). In the same year the EU average was 0,66 % and 1,05%, respectively. The innovation leader Sweden invested 0,99 % and 2,13 %, respectively.

(to the Law on the State Budget of Ukraine, the Law of Ukraine "On Scientific and S&T Activities " N 285-XIV dated 1.12.1998)
14. ** Further develop institution building capacity of relevant bodies (agencies, funds, etc.) in terms of planning, public procurement financing and management of funds and measures, in line with best international practices. Develop and implement, in collaboration with the already existing higher educational establishments of Ukraine, advanced **training** courses for **managers** and **project officers** in the public sector who run STI programmes. This can be done through EU and foreign aid projects. There is a need to shift from existing scheme of financing of the universities, where R&D play subordinate role to creation of 10-20 research – oriented universities with distribution of time of professors between research and teaching in proportion of 50 to 50 (or similar proportion , bearing in mind administrative obligations).
15. ** Design and introduce programmes on **state support for patenting Ukrainian inventions** abroad and to develop public and private agencies (centres) providing professional services for patenting inventions in other countries. Establish a system to access **foreign patent information** through the further development of free Internet access points and advisory support points in the regions of Ukraine. The state enterprise 'Ukrainian Institute of Industrial Property' could play a central role in developing such system.

Provide to Ukrainian enterprises as favourable conditions as in the EU Member States for patenting inventions. Concerning utility models, provide the legal entities with the possibility of reduced fee rates for activities associated with rights protection, qualifying examination and transforming a patent for utility model into a patent for invention during the validity of exclusive valuable rights.

(to the Law of Ukraine «On Protection of Rights for Inventions and Utility Models» No. 3687-XII dated 15.12.1993)

16. *** Formulate legislation on R&D competitive bidding in line with EU Member States` standards, providing that: the base for the selection criteria for such projects are the qualitative characteristics and the scientific level of the research team – project performer. To envisage that finance of projects is provided based on the results of the competitions. Tenders for particular R&D projects are to be organised by the main administrators of the budget funds. It is crucially important to make selection procedures open and transparent, inter alia by choosing independent evaluators free of conflicts of interest.

(to the Law of Ukraine “On Scientific and S&T Activities ” N 285-XIV dated 1.12.1998; the Law of Ukraine «On Public Procurement» № 2289-VI dated 01.06.2010)

6.1.3 Expected results

Due to the implementation of the mentioned measures the country can benefit in the following ways:

- The legal certainly will positively contribute to the investment climate that determines also the degree to which transnational corporations are encouraged to raise local capabilities. More Foreign Direct Investments (FDIs) will result and will be important channels for technology and knowledge transfer to Ukraine.
- Creation of a special advisory body at the President of Ukraine will result in better coordination between executive authorities involved in innovations and investment issues
- Development of perspective plans will enable more rational use of state financial resources avoiding topics duplication. Budget savings stemming from streamlining current overlapping functions and structures can be invested into priority research
- Increase of competitive financing share will result in higher competition in science and facilitate R&D effectiveness in Ukraine
- R&D infrastructure development will also promote higher level of research and effectiveness as currently some research teams in Ukraine are not able to compete with foreign centres particularly for the reason of modern equipment missing
- Regular innovations surveys according to the EIS methodology will enable correct international comparisons and more precise evaluation of the level of the national scientific potential development. Based on the EIS indicators it is possible to create an efficient monitoring system for the national research and innovation activities
- Changes in reporting in accordance with international recommendations and improved efficiency and effectiveness of departments active in policy design and implementation by clear work descriptions will result in better governance of S&T and innovation spheres.
- Creation of NCP system will promote internationalization of Ukrainian science and involvement of Ukrainian scientists in international research networks.
- Business friendly framework conditions are largely recognised as indispensable condition for value added local and foreign investment. Besides, amendments to the legislation according to the developed countries' practices would facilitate increased attractiveness of the country for Business Angels and foreign venture funds.
- Creation of favourable patenting conditions might already in the upcoming decade result in 8-10 times increase of revenues due to IPR enforcement.
- As international experience proves, increase in S&T funding, will result in positive structural changes in economy and corresponding GDP growth per capita to the level of the country which has an advanced economy structure.
- Improved international perception of Ukraine due to clear allocations of responsibilities and resulting more effective and efficient governance.

6.2. Policy Action Line 2: Enhancing innovation in enterprises

6.2.1 Introduction and justification

Most scientific and technological innovations should be related to the production of new goods and services that demand capital investment, managerial capacity, effective infrastructures, knowledgeable human resources and international orientation.

State innovation policy in Ukraine is not enterprise-centred and does not provide conditions for enterprises to perform their role as the main innovators in the national innovation system. SMEs and large enterprises have limited incentives to acquire or transform R&D results into new products and services, and pursue their own R&D. In addition, there is a low level of cooperation for innovation between enterprises and R&D institutions. Thus, there is an urgent need to integrate innovation and SME policy in Ukraine.

Until today there is a serious lack of effective economic incentives for enterprises to carry out technological modernisation based on new knowledge. In parallel to that, in some cases, Ukraine's system of technical regulations is a significant obstacle to trade, modernisation and investment. Based on the old Soviet system the Ukrainian technical regulation system is characterised by burdensome, ex ante control and widespread compulsory standards that is a source of inefficiencies and makes it significantly different from systems in Europe and OECD countries.

The recent years and in addition to the banking crisis, corporate and consumer lending to innovative enterprises by the banks has been very limited. In addition, the amount of investments for private equity is also limited and it is less than 0.1% of any given year. According to the Ukrainian Investment Business Association there are more than 500 so-called 'venture funds'. However, these fund are mainly focused on real estate projects and do not invest in high-tech and start-up companies. As far as international venture funds are concerned, they do not show strong interest in Ukrainian technology projects simply because there is a strong focus on the technology itself and not on the business aspect. This leads to the assumption that technological VC funds should be initiated in collaboration with the government (co-investment in funds). Another factor that influences technological investments is the capacity of the local human resources to handle managerial aspects relating to new technology trading.

A key problem in Ukraine is the gap between the stated policy goals and actual implementation of policy measures. Official declarations regarding the need for innovative development are not supported by carefully tailored measures and, especially, by appropriate and efficient mechanisms, programmes and framework conditions.

There is a need to focus on specific Ukrainian technological and sectoral objectives as the new "Programme on Investment and Innovation Activities Development in Ukraine" declares. However such focus requires the design of specific state aid programmes and instruments for innovation support, in parallel with a solid coordination structure.

The national innovation system and innovation infrastructure (i.e. business incubators, technology transfer centres etc.) must be strengthened in favour of small and medium innovative enterprises. Although the Ukrainian legislation in the field of intellectual property rights is almost harmonised with that of the EU, particular attention should be given to effective implementation. In addition, further improvements in government regulation and economic incentives for enterprises in the area of IPR, licences and technology transfer should be introduced.

6.2.2 Proposed actions

Framework Conditions

1. *** Concerning credit support of enterprises relating to innovation activities it is suggested to envisage:
 - Compensation (full or partial) of interest paid by innovative enterprises to commercial banks and other financial and credit institutions for innovation projects crediting
 - Non-interest crediting (under inflationary indexation) of priority innovation projects
 - Provision of state guarantees for commercial loans backings for credit priorities innovation projects for banks providing credits
 - Ensure allocation of fixed percentage of State Budget R&D expenditures (UAH 3,398.6 m in 2009) for credit support of SMEs. Identify suitable representative by establishment within SASII a finance and credit institution and its further transformation into the National Venture Company.
(to the Law of Ukraine "On Innovation Activities" № 40-IV dated 04.07.2002, the Law on State Budget of Ukraine)
2. ** Introduce preferential taxation of start-ups' revenues for certain period of time in the cases of:
 - Selling high-tech products

- Exporting high-tech products
- New technology acquisition
- Income generated by the use of inventions

3. ** Investigate if and how R&D tax incentives can be embedded within the overall taxation policy. It is hard to quantify the exact correlation between R&D tax incentives and the global deployment of R&D. In any event tax preferences should be given only to enterprises that can prove their innovation and R&D activities. Policy makers may wish to decide to more directly steer innovation policy interventions towards specific technologies and sectors. Care must be taken to balance the policy mix rather than to focus on choices between R&D subsidies versus tax incentives.

4. *** If decision for tax incentives were taken, introduce preferential taxation (tax credit in Europe) for research and developments in the form of income tax reduction by an amount equal to a proportion of R&D expenditures during a business year, or increased depreciation allocation differentiated for large enterprises, small and medium enterprises (125-200% of R&D expenditures). Introduce investment preferential taxation (investment tax credit) for new technologies acquisitions and introduction in the form of income tax reduction by an amount equal to a percentage of the stated expenditures. Introduction of preferential taxation can be an 'experimental' measure for a limited period of time and its level could be corrected, depending on results of the 'experiment' in order to predict how the proposed measure will work in the context of other (general) economic regulations.

(to the Tax Code of Ukraine, Law № 2755–VI dated 2.12.2010)

5. * Develop standards that build on international standards and seeking harmonization with them. Align DSTU standards with European standards.

Financing schemes/programmes

6. *** Enlarge the range of external financial sources for innovation in SMEs to build (restructure) the Ukrainian venture capital finance mechanisms in accordance with the European practice etc. This requires identifying a suitable government institution to be responsible for the evaluation of domestic VC market, development of regulations and legislation on venture capital funds, attraction of foreign venture capital and cooperation with international institutions (such as EIB European Investment Fund). Such funds can include: venture funds of early development to support high-tech start-ups, in particular, innovation development funds; venture funds of growth which major objective is long-term capital growth, development of existing enterprises, attracting funds to invest in innovation projects etc. To support the activity of venture funds through:

- realisation of the state program on financial support of the venture financing,
- compensations of a part of their expenditures for innovation programmes and projects implementation,
- tax incentives, or
- direct participation in statutory capital of the funds,

Take measures on foundation of the national venture company as "fund of funds" – that is investor of a number of venture funds.

(to the Commercial Code of Ukraine, Act № 435-IV dated 16.01.2003, the Law of Ukraine "On Innovation Activities" № 40-IV dated 04.07.2002).

7. ** Creation of an Ukrainian Fund for Innovation-Based Start-up Enterprises, a state-owned financing company to provide start-up capital in the form of loans on a competitive basis. The loans can be used for investments in machinery and equipment, as working capital, for other start-up or expansion innovation projects. The programme is suggested to be implemented by SASII – to execute the overall management of the Fund; to form an Expert Council; to organise business plan competition for innovation-based start-ups on an annual basis; to monitor the activity of the Fund; to assess the performance, and by MEDT and the Ministry of Finance – to foresee funding for the initiative in the yearly approved state budget.

8. ** Develop sector-specific or technology specific competitive State co-financed programmes for SMEs participation. Introduce incentives by increasing the percentage of financing for collaborating with technological and research institutes, the production of innovative or high-tech products and increasing of exports.

9. ** Develop programmes in favour of the internationalisation of enterprises. These could include participation of firms in international business networks, international innovation-related events and exhibitions and identification of new markets abroad.

10. ** On the basis of a National Clusters Policy, introduce measures for efficient regional cluster development activities and management. Networking systems (clustering) should be developed in sectors where the most advanced technologies are developing and implementing. Develop programmes at national and regional level that support the creation, development and management of clusters in specific sectors of interest as

mentioned in the 'Programme on Investment and Innovation Activities Development in Ukraine' with identification of organisational and legal forms of cluster organisations, mechanisms of direct and indirect support of clusters. Foster collaboration in some strategic clusters by launching and funding cluster initiatives for a time horizon of around 2 years comprising around 3 - 4 full time staff, office equipment, and marketing costs. Selected sectors must have real growth potential, such as agriculture (be it traditional and/ or organic) in Poltava or ICT in Kyiv. It is recommended to carry out feasibility studies to investigate needs in business support services, and a business plan to the cluster initiative's sustainability.

11. * Develop programmes linking firms with management schools like co-financing of training sessions for the various categories of the companies' personnel.

6.2.3 Expected results

- Credit support for innovation in enterprises will provide incentives for innovation projects. This will result in an increase in number of innovative enterprises, total innovation expenditures, upgrade of equipment, technologies and software used by enterprises. A fixed percentage of State Budget R&D expenditures for credit support of SMEs will contribute to creation and growth of new knowledge-based companies and conducting in-firm R&D projects.
- Preferential taxation for knowledge-based start-ups' revenues will result in a sharp increase in number of innovative SMEs, high-tech production, high-tech exports, upgrade of technologies and push forward domestic invention activities.
- Introduction of tax credit for R&D in the form of income tax reduction by an amount equal to certain proportion of R&D expenditures during a business year will enlarge financial resources of enterprises and create an incentive for innovation based on in-firm research.
- Alignment of State Standards of Ukraine with international standards will facilitate the introduction of new products and services, which will ultimately affect the number of innovations in enterprises and promote innovation activities in SMEs. International standards will allow removing existing barriers in export of Ukrainian goods and services and helping SMEs to enter foreign markets.
- State support to efficient venture capital finance schemes will enlarge the range of external financial sources for innovation in SMEs.
- Competitive state co-financed programmes for SMEs in priority sectors will help them to overcome the size-related resource limitations in their attempts to grow and be competitive based not on price but on producing innovative products and services. State financing for SMEs and R&D institutes collaboration will diversify the sources of finance of domestic R&D.
- Programmes in favour of the internationalisation of enterprises will impact the general innovation and business culture in the country. Entrepreneurs will benefit from participation in international business and innovation events by learning from their counterparts in more developed market economies, by setting business contacts and advertising their own products and services.
- State support to clusters will strengthen SME development in the regions and selected sectors, and have a multiplex positive effect on an increase in number of SMEs, new jobs; taxes paid, and ultimately will promote the development of specific sectors and regional economies.
- State support for business and innovation training programmes will have a positive effect on management competence and skills of entrepreneurs, which will upgrade the quality of business management. The management schools personnel will benefit from the collaboration by having the opportunity to analyse case studies and introduce them into their training materials.

6.3. Policy Action Line 3: Bridging R&D potential with Industry

6.3.1 Introduction and justification

Differences in innovation uptake are increasingly viewed as key factor for variations in efficiency and income across different countries. Innovation is the key driver of economic growth in developed countries. According to the OECD, innovation is accountable for over 50% of the world's economic growth. Knowledge intensive products and services do and will increasingly dominate in the world economy in the future. For transition and developing economies, real economic growth will be predicated on their ability to create an environment which stimulates and supports innovation throughout the value system. According to international experts, Ukraine's productivity is stifled not only by the policy instability, limited access to financing, corruption, and bureaucracy but also by the economy's relatively weak level of technology transfer. In addition, a major weakness of Ukraine's innovation system is the weak linkage between research and industry.

Technological development of Ukraine's national economy is dominated by outdated and worn out technologies. The current technological foundation cannot support the innovative development of a modern economy for Ukraine. High-tech products make up only 2.8% of all exported industrial products from Ukraine. According to the data of 2008⁸ only 13% of industrial enterprises were involved in innovative production. In the last eight years over 40% of new technologies were purchased abroad. Almost 20% of scientists in Ukraine are working to foreign research orders. In the field of engineering science this equalled 24.6% in 2007, in the branch fields of science, 27.2%, and in the institutes of the Ministry of Industrial Policy, 41.4%. This does not strengthen Ukraine's competitiveness. Ukraine needs to substantially improve the technology transfer mechanisms, the institutions, incentives and information infrastructure to support a knowledge-intensive economy.

A science and technology based development strategy can be only one component of a larger catching-up strategy which is made up of a bundle of measures across policy fields bringing together the priorities for education, science, and businesses. Policy makers should create development strategies that concentrate on combining the cost advantage of Ukrainian economy with the innovation potential of Ukrainian R&D sector. The latter may begin with **imitative innovation efforts** that will - over time - develop into more sustainable and independent innovation activities that create competitive products and services through better quality rather than lower prices. So, measures that promote effective collaboration between the R&D system and industry should be developed as a priority and should be carefully designed and implemented in order to lead to the creation new businesses and employment opportunities.

The window of opportunity for developing and implementing such a technology-based development strategy will not be open for long. Scientific structures have been experiencing a shortage of funding for years and have attracted few people due to poor working conditions and a deteriorating reputation of science in the Ukrainian society. The increasingly severe **shortage of scientific staff** is aggravated by the outflow of the most talented middle-aged (i.e. the most productive) scientists. This situation has already led to a narrowing of the thematic range of research undertaken in Ukraine and will inevitably preclude world-class research in the future. Therefore there is a need to proceed with the further **reorganisation and merging** of research and technological activities, leading to saving both in terms of budget and inefficient personnel, and as a result redirecting the already scarce innovation resources towards a limited number of more productive technology projects in collaboration with the industry.

6.3.2 Proposed Policy Options

Framework Conditions

1. ** Define innovation and business support infrastructure (techno parks, science parks, business incubators, technology transfer structures, industry liaison office, etc) nature, organizational and legal forms, and features of activities including funding and revenue structures.

(to the Commercial Code of Ukraine, Act № 435-IV dated 16.01.2003., the Law of Ukraine "On Innovation Activities" № 40-IV dated 04.07.2002, the Law of Ukraine «On Special Regime of Innovation Activities of Technoparks» № 991-XIV dated 16.07.1999, the Law of Ukraine «On Science Parks» № 1563-VI dated 25.06.2009, the Decree of the Cabinet of Ministers of Ukraine «On Approval of the Order of Creation and Functioning of Technoparks and Innovation Structures of Other Types» № 549 dated 22.05.1996)

2. ** Technoparks were the most successful forms of innovation development in modern Ukraine. Some techno parks successfully manufactured and commercialised technologies elaborated in the host universities and research institutes. All legal initiatives, related to technoparks are 'frozen' at the moment. One draft of the law

⁸ Ukraine State Statistics Committee. <http://www.ukrstat.gov.ua/>

on technoparks was sent back to the parliamentary committee for substantial changes. Another draft, proposed by SASII has not been considered yet by the Parliament. The number of projects within technoparks declined sharply in recent years, and revenues plunged by more than 10 times in 2006-2010. There is a need to ensure efficient state support for 'technoparks' activities on the basis of sufficient monitoring and evaluation to be carried out by independent experts mandated by the state body for Monitoring & Evaluation. Develop innovation support infrastructures (technoparks, science parks, business incubators, etc.) and determine their roles, organisational and legal forms, as well as their range of activities in the national innovation system and firms' support. It is important to pass the new version of the Law on Technoparks as soon as possible to prevent complete decline of the remaining system of innovation support. The focus has to be made on creation conditions for provision of control over the commercial activities and privileges of technoparks. The number of 'Ukrainian-type technoparks has to be strictly limited (up to 5-7) and they have to work under the control mechanism, which will exclude the possibility to misuse the incentives for innovation projects by the other ('non-innovative') economic actors. As the experience of 1999-2004 shows, Ukrainian -type technoparks could increase the innovation output substantially. Data for the period of success of technoparks show, that the volume of innovation production within the innovation projects of the leading technoparks could be increased by 2-10 times during the next 3 years. Total volume of innovation production could reach 7-9 billion Euros in 2020.

(to the Law of Ukraine «On Special Regime of Innovation Activities of Technoparks» № 991-XIV dated 16.07.1999 (edition of 12.01.2006, latest changes dated 02.12.2010)

3. ** Install pilot Science and Technology Park in Ukraine according to Western standards as a pilot project. Such a park would host large and small companies and would foster collaboration between them. It would promote foreign direct investment. A mix of different sized and foreign companies would ease access to global commercial networks promoting internationalization significantly. Said pilot Science and Technology Park should host a business incubator.
4. *** Evidence shows that research institutes, universities, and SMEs need services to support technology transfer as otherwise they miss out on business and technology cooperation opportunities. Enable innovation and business support infrastructures to provide state of the art technology transfer and brokerage services by providing them with the necessary competences and resources. An EEN network with central coordination with the EU and Ukrainian stakeholders, and regional /thematic / sectoral nodes is needed. Care must be taken to co-ordinate efforts of international, national, and regional technology transfer centres, centres of S&T information (be it CSIs, liaison offices at universities, research institutions, etc). Support the technology transfer activities of the recently launched Enterprise Europe Network (EEN) Ukraine including sufficient operating financing which is to be distributed among consortium partners and associated members. Evidence from the precursor of the EEN network, the Innovation Relay Centre (IRC) network suggests that the costs for the setting up and maintaining technology transfer centres are rewarded by at least 1,8 times by the socio-economic impact gained through international technology transfer agreements of the client organisations.
5. ** Expand effective brokerage functions (e.g. liaison offices) in the main research institutions based on real market oriented models. It is recommended that institute management and administration staff be trained with skills in subjects such as accounting, evaluation of technologies, licensing, technology marketing, and creating spin-off companies based on the institute's technologies. To embrace the experiences gained by Science and Technology Centre of Ukraine (STCU), and of pilot Technology Liaison Offices (hosted by Institute of Physics NASU, Institute of Material Sciences NASU, both in Kyiv, Institute of Radio Physics and Electronics NASU in Kharkov, and Institute of Technical Mechanics NSAU in Dnepropetrovsk), and to provide services to professionally present selected technologies at international exhibitions and online. The relations between the universities and institutes and these offices have to be regulated by special legal acts, which will protect the inventors and which will not allow university and institute administration to obtain one-sided benefits from R&D results of the university and institute staff. Evidence from major university and liaison offices in the EU (e.g. Max Planck Innovation, or Patent exploitation agency Saarland) indicate the need for approximately five dedicated full time staff of experienced people in these offices. Evidence furthermore indicates the break even of investment is reached on average after 10 years of operation. It is often observed that the majority of revenues stem from licenses of only a few internationally protected "block busters".
6. *** Grant Ukrainian universities with some financial autonomy to be able to carry out some financial transactions without engaging into often lengthy and tedious application procedures with the Ukrainian Treasury. Allow Ukrainian universities to use funds provided as assistance, grants, gifts, sponsorship and other contributions without observing the public procurement procedure stipulated by the Ukrainian legislature. In a pilot phase Ukrainian universities holding a "research status" may participate. Enable universities to enter income stemming from grants, sponsors, contract research, or IP licensing and commercialization on the credit side. Allow universities to self govern the income from said funds for setting up university Technology Transfer Offices, for sharing with their professors and inventors who license their technologies, for international projects, for R&D support, organisation of international conferences, update university equipment and laboratories, publication of articles and journals, promotion of the university and its research programmes, travel of Ukrainian and foreign professors, provision of stipends to selected high scholarship students, and similar activities.
7. ** Incentivize research institutes and universities to engage in commercial activities. Consider increase of public budget share to stimulate research institutes and universities to seek collaboration with industry (contract

research, business training, etc). Special programmes of such collaboration have to be introduced through a dedicated agency or a special fund to be created. Experience from the EU suggests an average university might raise up between 10% and one third of its expenditures from collaboration with the industry. Qualitative impact stems from more focused research by enhanced industry exposure of university staff.

8. *** Simplify the procedures for innovative start-ups creation by research institutions and universities; define the sources of statutory funds formation from the side of institutions and universities, the procedure of inclusion of valuable intellectual property rights into statutory funds, and the procedure of transfer of dividends to the institutes.

(to the Law of Ukraine «On Governance of State Property Objects» N 185-V dated 21.09.2006)

Incentivise universities and research institute by allowing all revenues received from licensing and spin-offs to not be taxable and remain with the university to modernize their laboratories and equipment.

Universities and institutes must share the revenues raised between technology transfer office, university/institute department where research is performed, and researcher (author). Auditors for this function need to be established within each institution. Universities and research institutes must report licensing revenues; investments from external investors into R&D and into spin-offs, number of spin offs, revenues from spin-offs; number of jobs created in the community; and number or medical and societal products developed.

9. ** In order to strengthen commercialization of IPR results created under state budget funding, provide for public R&D secured rights for Intellectual Property Objects (IPO) to organizations – performers of the works that provide the Government with free license to use the IPO for state needs.

(to the Law of Ukraine “On Scientific and S&T Activities” N 285-XIV dated 1.12.1998; the Law of Ukraine «On State Regulation of Activities in the Sphere of Technology Transfer» № 143-V dated 14.09.2006).

10. ** Determine the size and terms of remuneration for IPO use that should be paid to their creators. In case the rights for IPO are secured to public authorities, envisage a licensing procedure and access to information on IPO taking into consideration the experience of other advanced countries.

(to the Law of Ukraine «On Protection of Rights for Inventions and Utility Models» No. 3687-XII dated 15.12.1993; the Law of Ukraine «On State Regulation of Activities in the Sphere of Technology Transfer» № 143-V dated 14.09.2006).

Financing schemes/programmes

11. ** Create bridging programmes between research institutions and universities and the industry. Co-finance their collaboration for new innovative products, high-tech products, innovations, technology transfer, and technology areas important for the national economy. The typical level of financing has to be 50 to 50. According to international practice, in the case of SMEs this share could be changed to 70 to 30.

12. ** Introduce a system for innovation related skills training to effectively carry out commercialisation of public R&D, management of IPR and innovation processes and projects.

13. * Develop business plan competitions for financing of new ideas in order to trigger competition for new ideas and promote business culture.

14. ** Encourage technology transfer from abroad to the country. Facilitate the absorption of the new knowledge through initiatives like demonstration programmes, use of clusters management structures and involve professional managers in the process. The state could establish special grants to support the best national patents for international patenting on the competitive basis. The number of such patents could be established at the level of 100 units initially.

15. ** Facilitate through state programmes the mobility of R&D staff to industry. Co-finance the employment of those researchers by the industry for specific projects. Introduce PhDs through collaboration between the industry and the State especially for the Researchers of the Diaspora. The state has to stop the practice of domination of the national publications in the processes of academic assessment and shift to internationally recognized system of research evaluation.

16. *** Take measures on public private partnership (PPP) mechanisms development in the sphere of innovation and R&D, providing for:

- co-financed programmes introduction for:
 - joint R&D in the spheres important for the state;
 - research results transfer to enterprises;
 - innovation projects,
 - regional innovation infrastructure development (clusters, science parks, centres, policies, business incubators)
- creation of innovation funds (venture funds) by using PPP mechanisms with mobilization of state and private financial resources.

(to the Law of Ukraine “On Innovation Activities” № 40-IV dated 04.07.2002, the Law of Ukraine “On Scientific and S&T Activities” N 285-XIV dated 1.12.1998; the Law of Ukraine «On State Regulation of Activities in the Sphere of Technology Transfer» № 143-V dated 14.09.2006).

6.3.3. Expected results

By bridging R&D with industry the country will benefit in the following ways:

- Increase of number of high-tech production oriented enterprises.
- Improved efficiency and effectiveness of research work in companies, research institutes, and universities.
- Innovative production increase in industrial output
- Sufficient monitoring and evaluation will result in an increase of efficiency of enterprises belonging to technoparks. Restoration of tax incentives will also lead to the enlarged number of techno parks and, consequently, to the enlarged number of innovative enterprises started-up by researchers and based on new knowledge produced in Ukraine. In addition to these tangible results, technoparks will produce an important intangible result by serving the model both for SMEs with innovation intentions and for researchers – would be entrepreneurs. Techno parks will play the role of innovation hubs in the regional economies.
- The creation and proper coordination of a nation-wide network of innovation service providers will form a development pool for an efficient use of innovation resources available within the country and individual regions. A nation-wide network of innovation service providers will also facilitate access of enterprises to international innovation resources and contribute to integration of Ukraine in the European research area. New competence and skills acquired by entrepreneurs from the innovation service providers will result in the reduction of the number of business failures.
- Improved international perception of Ukraine due to open innovation and international collaboration.

6.4. Policy Action Line 4: More Innovation in Regions

6.4.1 Introduction and justification

Coherence of the regional system in terms of efficiency, effectiveness and impact of the designed measures is of paramount importance. Recent studies have highlighted the following areas as crucial for policy making:

- The existence of structural institutions, such as regional research councils, is crucial to the process of governance through ensuring coherence and coordination of responsibilities
- Clear formulations of strategic policy objectives, well resourced, implemented and monitored, are major driving forces for good governance
- Such a view of the governance system also implies that stakeholders should participate in designing the policy measures
- Linking regional actors (firms, institutions, etc.) with clusters, value chains and knowledge organizations in other regions in order to facilitate technology transfer
- Upgrading of the absorption capacities of firms and particularly of SMEs and attracting innovative companies both domestic and foreign in order to enrich the production base
- Enhancing the technical and managerial skills of the human capital located in the region
- Strengthening of the local knowledge production base by establishing branches of research organizations within the regions which are relevant to the local economy
- Shifting the regional economy to new economic fields and technological trajectories and diversifying the local production base.
- Setting up new or diversifying existing regional research organizations into new dynamic research areas
- Supporting the establishment of start-ups and spin-offs in new advanced technological fields by ensuring that funding mechanisms (VC, bank loans) provide the necessary funding, by providing the necessary pool of highly trained personnel and by enhancing the collaboration of these companies with research centres and higher education institutes.

Today not all Ukrainian regions have regional programs dedicated to innovation. In addition, existing programs have a number of shortcomings such as unsecured budgets that lead to the low effectiveness of their implementation. In some regions such programs ended in 2010 or ending in 2011. It is necessary to work actively on improving old programs and designing new ones.

6.4.2 Proposed Policy Options

Framework Conditions

1. ***** Regional plans:** There is a need for a unified structure of the innovation action plans of all regions in the country. A common methodology, template and process should be established by MEDT, including: detailed description of economic, S&T and innovation potential of each region; SWOT analysis of the status and prospects of economic, innovation and S&T development of each region; sources of financial support; indicators of programme performance; list of the measures and performance of their implementation; list of innovation projects. SWOT analysis should be prepared in a centralised way by MEDT within a unified structure. It should contain a similar set of indicators for all regions in order to get an objective picture of the economic, innovation and S&T development.
2. ******* The preparation for innovation action plans should be obligatory for all regions on the basis of an overall negotiated government coordinated timetable. They should be submitted to the Ministry of Economic Development and Trade and/or to the Agency responsible for the state innovation policy implementation (SASII) for negotiation and approval. They could be distinguished from the general programmes of social and economic development through a separate secured regional budget line for the support of innovation measures. In addition, they have to be harmonised with other strategic objectives of the region.
3. ****** The regional administrations should effectively provide the coordination and monitoring of innovation activity in the region. An implementing organisation should be created or designated for effective implementation of regional policy measures. It is preferable that this organisation should be selected among already existing institutions (e.g. regional centres of science, innovation and informatisation of SASII) than newly established. The objective of this proposal is to coordinate regional programmes and other activities of

universities, research institutes, Technology Transfer Centres, Centres of Science. Innovation and Informatization (CSIIIs), Chambers of Commerce, and other structures related to innovations, in the region. In addition, innovation activities in the regions need to be consulted with a Regional Scientific and Innovation Council (RSIC) – advisory body at the Head of Regional Administration, which will assist the Administration in formulation and monitoring of the Regional Innovation Policy.

4. ** Regions should also develop as part of some first steps of decentralisation procedure their own monitoring and evaluation mechanism, similar to regional innovation observatories. Monitoring /audit of the R&D results financed from the state budget in all Ukrainian regions are important elements of such assessment.
5. ** Increase extrovert activities of the regions and internationalisation in their areas of competence, through active participation in forums, international consultations, and European Networks (EEN (see proposed action C3), EBN, NCP (see proposed action A10), etc).
6. ** Promote national networking of regions through the establishment of an annual regional innovation policy forum.
7. ** Promote by any means the diffusion of ICT and Internet use in all regions and not only in the main cities. ICT applications and use is the basis of all innovation related support actions.
8. ** Methods, organisational and legal schemes of targeted regional loans provision for freestanding projects should be developed.

Financing schemes/programmes

9. ** Performance of a regional action plan for innovation could be effective only if the regional authorities secure the necessary resources. Fixed sources (financial fund) should be planned at the regional budgets aimed to finance regional innovation programs. Regional innovation programs should have financial support from regional authorities through a separate secured regional budget line for the support of innovation measures. It is worth to consider creating innovation (venture) funds by using investments of interested enterprises and financial institutions at regional level.
10. ** An additional possible source that could be considered for performance of regional innovation programs is part of local taxes, part of centralized taxes such as tax on profits for enterprises. This, in combination with a specific budget stemming from the central government could be put together in order to implement the specific regional strategic plan. The part of the income tax (except income tax of municipal enterprises and financial institutions) may be such source. It needs relevant changes to the Budget Code of Ukraine and should be reflected at the annual budget resolutions and respectively at the annual State budget of Ukraine (separate for each region). It is also important to ensure the implementation of existing laws with relevance to innovations issue (e.g. the Law of Ukraine (e.g. the Law of Ukraine “On science parks”, the Law of Ukraine “On special regime of technology parks innovations” etc.).
(to the Budget Code of Ukraine, Law N 2456-VI dated 8.07.2010, Law on State Budget of Ukraine).
11. ** It is appropriate to provide (within the regional authorities` powers) tax exemptions and tax incentives for taxes paid to regional budgets, as well as provide targeted investment tax exemptions. The volume of tax exemptions could vary within the limits established by the central government. Regional authorities should have to have the right to establish the effective level of tax credit. To provide the mechanism of stimulating of the priority innovation projects at the regions which are realised in the framework of midterm priority directions of the regional innovation development adopted by the Regional Council and the competent government agency in the sphere of innovation activity. To provide exemptions from paying taxes on profits of enterprises for such innovation projects during specific time and paying part of tax later. To foresee exemption from paying taxes and custom duty for equipment, utilities which are not produced in Ukraine during defined first years of project fulfilment needed for realisation of the project.
(to the Tax Code of Ukraine, Law № 2755–VI dated 2.12.2010).
12. ** Development of specialised SMEs competitive programmes. These should take into consideration the regional capacity to innovate, the relevant infrastructures, the mobility of firms and personnel as well as the sectoral characteristics of the region. Support the technological modernisation of enterprises in specific regional sectors (co-financing of equipment) is important.
13. ** Stemming from the positive experiences from Kyiv region and having in mind prohibitive bank loan conditions it is appropriate to launch regional programmes providing innovative companies and start ups with preferential loans.

6.4.3 Expected results

Implementation of the proposed action lines will enhance innovation activity in the region, providing a synergistic effect in the following areas:

- Improvement of the efficiency of innovation process management at the regional level. Improving of coordination and monitoring of regional authorities and creation or designation of an organisation for implementing regional innovation policy will allow avoiding duplication of functions in the field of innovations. It will help to concentrate the control of innovation processes at one body. In addition, certain benefits to business support organizations and innovation promoting organizations, will allow such organizations to invest saved money directly to the promising innovation projects.
- Improvement of procedures of development and further implementation of regional innovation programs. According to the international experience, regional innovation programs are an effective tool of innovation policy implementation. Proposed unification of the program structure, as well as their adequate financial support will allow fully performing and implementing programs measures. In its turn it will lead to the strengthening links between science and industry, to the better utilization of advanced scientific research in industry. It also will lead to the development of regional innovation infrastructure and to increase of the share of innovative enterprises in the region. Such support organizations would be able to invest saved money directly to the promising innovation projects.
- The intensification of innovation at the enterprise level, which in its turn would increase the share of innovative enterprises in the region. Since there is a correlation between the share of innovative enterprises and income levels, increasing the share of innovative enterprises will increase the incomes of the population.
- Proposed monitoring /audit of the R&D results financed from the state budget in all Ukrainian regions will allow determining their usefulness for solving socio-economic and humanitarian problems of the region and for developing jointly with the business representatives the list of innovation projects.

6.5 Policy Action Line 5: Developing an innovative culture

6.5.1 E1. Introduction and justification

From the point of view of innovation process, cultural factors affect performance in two ways. First, cultural factors may facilitate or hinder creation of new ideas and their effective embodiment into new products and processes. For instance, negative attitudes towards risk taking and fear of failure impede people from taking creative efforts. Second, culture plays a role in how new products and processes are adopted and put in use. Depending on cultural factors, people may reject or resist new products and processes or, vice versa, accept and even disseminate innovation.

The spine of any educational system in the innovation-driven economy is the quality and reach of its primary and secondary education and the competence of its teachers. This is the basis of subsequent learning. Education quality and relevance were often viewed as synonymous. Many pupils do not master the competencies from problem solving to teamwork, which are necessary for adaptation to an innovation-driven economy and for entering a system of lifelong learning.

Innovation culture is directly related to the seven topics:

- **Creativity and innovation and the knowledge economy.** Debate on how the free movement of knowledge and ideas can both inspire creativity and innovation and contribute to modernising Europe, so that it can better face economic and social challenges
- **Education for creativity and innovation.** Debate on the importance of education for developing creative, innovative and entrepreneurial societies
- **Creativity and innovation in the public sector.** Debate on the innovation in the public sector through innovation of processes as well as integration of technologies, for example in the fields of health, education and social services
- **Creativity and innovation and sustainable development.** Debate on eco-innovation with particular attention to climate change, security of energy supply and the issue of innovation and job-creation
- **Creativity and innovation in business.** How business and entrepreneurship can contribute to greater competitiveness, sustainability and job creation through creativity and innovation
- **Cultural diversity as basis for creativity and innovation.** Debate organised to explore Europe's potential for greater creativity by taking account of its intercultural nature
- **Creative industries.** Debate about the role of the creative arts, including industrial design and development.

6.5.2 E2. Proposed Policy Options

Framework Conditions

1. ** Introduce improvements in the framework conditions (e.g. competition, international openness, or mobility) not just concentrating on measures and institutions directly involved in science and technology.
2. ** Promoting collaboration among regions for developing innovation capacity. Analysing the key factors for the development of innovation in target regions in line with regional agencies and universities. Promoting the organisation of "innovation weeks" event in regions based on their areas of strength.
3. ** Develop indicators to assess the level of technological awareness of the society.
4. *** Promote Internet use at regional level.
5. ** Apply open consultation procedures for the discussion of public documents. Use new document management systems to collect opinions and suggestions.
6. ** Promote innovative thoughts and engineering in schools through mobile laboratories.
7. * Use children's TV channels to advertise science & technology. The idea is applied now in the US with interesting results.

Financing schemes/programmes

8. ** Develop Awareness Tools for training SMEs in the field of protection of intellectual property. To raise awareness of the importance of intellectual capital and its protection, to develop training tools for the management of intellectual property in SMEs, to facilitate learning through case studies of good practice and to disseminate this good practice.
9. ** Introduce capacity building programmes for managerial personnel (public officers) on the issues of innovation policy development and implementation, strategic management, innovative management.
10. ** Innovative training programme for the education field. Addressing the needs of teachers in multi-grade primary schools, usually in rural areas, by developing a specialised in-service training programme using ICT and the Internet as the delivery platform.
11. *** Promote up-to-date quality and higher standards in learning, teaching, and teacher education. Equip schools with knowledge on how to enable pupils to master the competencies from problem solving to teamwork necessary for adaptation in an innovation-driven economy and for entering a system of lifelong learning.
12. ** Use Digital games as a potential vehicle for promoting cultural change, especially concerning the younger generations. There are hundreds of “serious games” with educational purpose available.
13. ** Apply the Enterprise Ireland’s “Training for Innovation and R&D” programmes. It provides a number of forms of support for training for Innovation and R&D in collaboration with the National Institute for Technology Management (NITM) of Ireland.
14. ** Support the manufacturing businesses – particularly SMEs – to tackle shortages of engineering technician skills through short courses or distance learning, thus more likely engaging employees. For example apply the “Engineering Technicians Initiative” (United Kingdom) programme.
15. * Further encourage ‘Open Doors’ policy to R&D institutions and Academia for students and pupils.
16. * Apply training schemes and ‘policy games’ (e.g. Financial Times games) for high-level public officers.

6.7 Policy Action Line 6: Globally competitive on Eco-innovation

6.6.1 Introduction and justification

Global development in the XXI-st century is facing hard environmental challenges that put at risk global security and sustainability. The biggest of them are large scale pollution and degradation of the environment, global climate change, or depletion of natural resources. Nowadays, every sixth person in the world lives in dangerous and adverse environmental conditions. Environmental degradation can destabilize societies by reducing economic opportunities. Degraded environments can become grounds for other social ills, such as impaired human health or declining social cohesion. It is evident that, to ensure sustainable living conditions for future generations, people need to seriously reconsider their attitudes to the living environments, production and consumption patterns and commit themselves to live within environmental limits, minimize carbon emissions and overall environmental pollution, improve efficiency of energy and natural resources consumption and thus enhance global security and sustainability.

Eco-innovation is an innovation for sustainable development. Business and innovation come together to create sustainable solutions for better use of precious resources and reduce the negative side effects of modern economy on the environment. The European Union has launched a number of initiatives to promote eco-innovation and support the implementation of the Environmental Technologies Action Plan under the Competitiveness and Innovation Programme (CIP). The CIP runs from 2007 to 2013 with an overall budget of € 3,621 million. The objective is to boost Europe's environmental and competitive standing by supporting innovative solutions that protect the environment while creating a larger market for 'green' technologies, management methods, products and services. The EU current eco industries' turnover is estimated at €227 billion (or 2.2% of GDP), eco industries create 3.4 million jobs. The long-term objective for Europe is to fully switch to an energy efficient/low carbon model of economic development by 2010.

Ukraine is famous in the world for its rich fertile black soils, rich natural resources and strong intellectual potential. But it is also known for a series of significant challenges:

- a. low energy efficiency (energy capacity of GDP is 2-3 times higher than EU average)
- b. heavy environmental pollution (soil, water, air) with industrial and transport emissions, municipal wastewaters and solid wastes leading to environmental degradation and loss of biodiversity
- c. significant wear out of fixed assets, and dominance of low production technologies
- d. low level of development of environmental and innovation culture in the society, private entrepreneurship, public-private partnerships, responsiveness of business and production to new innovative technologies and to cooperation with R&D.

Energy saving and green technologies have been declared high priorities by the Ukrainian Government. The total energy saving potential in Ukraine is estimated at 45% of the total energy demand. According to the First Deputy Prime Minister Mr Andriy Klyuyev, the Government of Ukraine plans to raise the share of "green energy" of Ukraine to 20% of the total national energy balance by 2015. The large R&D infrastructure, land and mineral resources, and human resources as well as its international positioning in the energy arena makes Ukraine a top player in eco innovation if it takes advantage of the timing and international conditions.

6.6.2 Proposed Policy Options

Framework Conditions

1. ** Legally introduce **ex ante environmental impact assessment** of policies, plans and activities across the government, economy and society. Coupling of economic development measures with estimated environmental and social impacts should become a dominating paradigm of national economic development as it is declared for XXI century by UN and is legally mandatory in the EU.
2. *** Introduce regulatory, financial, administrative measures/incentives to attract green investments and promote innovative entrepreneurship. **Greening businesses and reducing industrial/transport/communal pollution** should be among the top priority measures to restore healthy green and built environment for people. **Responsibility for environmental pollution** and harm should be **adequate to the damage caused and unavoidable**.
3. *** To reduce dramatic dependence on fossil fuels supply, their consumption levels and consequently growing financial burden for state and municipal budgets introduce **municipal energy management** practice that has proved its efficiency and cost effectiveness both in Europe and in pilot cities of Ukraine.

4. *** Design and run targeted state programmes and PPP schemes to **develop and implement innovative clean-up technologies** for treatment of chemical waste, communal wastewater and solid waste, support innovative ideas that could be turned into marketable green products and services.
5. * Promote and introduce **eco-innovation as a new brand** that symbolises new opportunities to market products and services, new jobs, new economic and resource efficient technologies, new opportunities for economic growth and quality of life.
6. ** Promote and support the ethics of balanced economic, environmental and social development. Introduce measures to promote/improve **green innovation culture**, environmental care and responsibility through educational/training/re-training programmes and schemes for all society groups (for schools, universities, civil servants, businesses, etc), design and run awareness raising media campaigns, open competitions etc.
7. ** Design and introduce support measures for **safe and clean quality food and drink products**, including new improved production processes with high water efficiency and strict quality control, innovative products, processes and services aiming at reducing the environmental impact of food and drinks consumption. Fake “innovations” in the food and drink sector should be legally prosecuted.
8. ** Support the development and implementation of new **organic farming technologies** in regions active in agriculture to fulfil the National Program for “Agricultural Development up to 2015” foreseeing to have up to 10 % of organic product share in total gross agricultural output by 2015. This would also give Ukraine access to a lucrative and growing market.
9. ** Introduce and apply new **eco-technologies** in the radically declining **coal and steel** industry in the affected regions that suffer.
10. ** Develop **international targeted collaborations** with selected countries that show increased potential in the respective fields of eco-innovative development such as in Europe, China, Japan, Russia, Israel, etc. They handle the majority of the funds worldwide. Develop bilateral agreements for collaboration in selected areas.
11. ** Actions that have been described and proposed in the **other Policy Action Lines of this document** (innovation supporting governance, innovation at enterprises, R&D/industry collaboration, regional innovative development, and innovative culture) should also be considered for their full or partial applicability for environmental protection purposes of this chapter.

Financing schemes/programmes

12. *** Support policy priorities in energy saving, improving energy efficiency, efficient and rational consumption of natural resources (e.g. water, gas, electricity, paper, heat) with financial tools and mechanisms (e.g. green tariffs for renewable energy generation, variable tariffs for consumed resources depending on the levels of consumption etc)
13. *** Exploit green R&D and green companies, through specific competitive co-financed collaboration programmes, start-up support (e.g. bank loans, VCs) and by directing intermediary organisations and international financing institutions towards this direction (e.g. FP-7, UNIDO, USAID, EBRD, GEF, etc.)
14. *** Introduce state budget supported financial incentives/support schemes to promote renewable energy generation technologies (e.g. risk sharing mechanism, shared funding programmes with businesses, tax benefits, etc)
15. *** Consider ways to attract/involve domestic private investors, community support mechanisms and large businesses who may wish to invest (deposit) their own resources to install renewable energy generation facilities, conduct thermal insulation works for buildings, implement water purification or organic farming technologies, etc. This could be a significant source of funding were the conditions for such investments designed attractive and mutually beneficial.

6.6.3 Expected results

- An important shift at a policy level to integrated environmental management within an overall social and economic development agenda of Ukraine;
- Rehabilitation of green environment, combating pollution and carbon emissions will become not only an important policy objective for the Government and the society but also an important positive signal to improve international image and reputation of Ukraine globally;
- Building and strengthening of eco-innovation culture in the Government, business community and society will make a huge difference in people's attitude and will be vital to enhance sustainability and quality of life in Ukraine;
- People will understand that eco-innovation means not only healthy and safe living conditions for everyone but also new job opportunities, faster economic development and better social well-being.
- Improvement of environmental legislation will bring Ukraine closer to the EU. International collaborative links in the eco-innovation field will be one of the success stories of Ukraine's Euro integration.
- Practically achievable and cost-effective energy saving potential in Ukraine 2010 is estimated around 40.5 million tons of O.E. (oil equivalents) per year;
- The overall economic potential of energy efficiency - 85.5 million tons of O.E. per year;
- "Additional" potential energy, which requires external funding - 45 million tons of O.E. per year ("additional" potential for reducing CO₂ emissions is about 81 million tons O.E. per year).
- Overall potential of energy generation (heat and biogas) from waste biomass is estimated at 24.2 million tons O.E. which is about **12%** of total energy consumption in Ukraine. Total gross cost benefit for the country will grow together with prices for natural gas for end consumers which keep raising and are now close to UAH1,000 per 1,000 m³.

6.7 Prioritization of policy options

We have prioritized the proposed measures as high (***), medium (**), and low (*) priority. All proposed policy measures contribute to leading Ukraine to a knowledge-based economy. Following prioritization the project particularly recommends the realization of the following 25 high priority measures:

1. Introduce European governance standards to public institutions by applying to criteria for an effective legislative framework
2. Guarantee property right protection according to international standards.
3. Specify in detail the responsibilities of the bodies that should design and/or implement innovation policy. The distinct role of SASII with fixed political value, scope, functions, long-term existence and budget is very important in order to perform the policy directions and to implement the measures decided.
4. Develop a national strategy and 3-5 years plans on R&D and innovation in Ukraine by inter alia defining specific research and innovation priorities (not only general ones, as it does at present time), sets of co-ordinated and harmonised programmes, system of coordination by the government agencies and ministries activity, state support mechanisms, funding volumes and system of monitoring.
5. Develop a consolidated and coherent evaluation system both for policy measures and programmes. One dedicated body (e.g. SASII) should be in charge of setting evaluation methodology, advice and its introduction through trainings to various bodies involved (relevant policy making departments, funds, agencies, regional bodies, etc).
6. In order to improve the efficiency of the State funded programmes for RDI, a review of the State Budget process should be carried out. One of the options would be perspective multiannual planning of budget allocations for various programmes and measures. These allocations should be formally approved by the Government.
7. Formulate legislation on R&D competitive bidding in line with EU Member States' standards. It is crucially important to make selection procedures open and transparent, inter alia by choosing independent evaluators free of conflicts of interest.
8. Concerning credit support of enterprises engaging in innovation projects relating to innovation activities to envisage compensation of interest paid, non-interest crediting, or provision of state guarantees. Identify suitable representative by establishment within SASII finance and credit institution and its further transformation into the National Venture Company.
9. If decision for tax incentives were taken, introduce preferential taxation (tax credit) for research and developments. As a pilot introduce investment preferential taxation (investment tax credit) for new technologies acquisitions and introduction in the form of income tax reduction.
10. Enlarge the range of external financial sources for innovation in SMEs to build the Ukrainian venture capital finance mechanisms in accordance with the European practice. Take measures on foundation of the national venture company as "fund of funds".
11. Set up and fund EEN network to enable innovation and business support infrastructure to provide state of the art technology transfer and brokerage services by providing them with the necessary competences and resources. Care must be taken to co-ordinate efforts of international, national, and regional technology transfer centres, centres of S&T information (CSII, liaison offices at universities, research institutions, etc).
12. Grant Ukrainian universities with some financial autonomy to be able to carry out some financial transactions without engaging into often lengthy and tedious application procedures with the Ukrainian Treasury. Allow Ukrainian universities to use extra-budgetary funds received.. Allow universities to self govern the income from said funds for internationalisation, R&D support or commercialisation activities.
13. Simplify the procedures for innovative start-ups creation by research institutions and universities. Define the procedure of inclusion of valuable intellectual property rights into statutory funds, and the procedure of transfer of dividends to the institutes. Incentivise universities and research institute by allowing all revenues received from licensing and spin-offs to not be taxable and remain with the university to modernize their laboratories and equipment. Universities and institutes are to share the revenues gained between technology transfer office, university/research institute, and researchers.
14. Take measures on public private partnership (PPP) mechanisms development in the sphere of innovation and R&D, providing for co-financed programmes, joint R&D with enterprises, regional infrastructure, or creation of venture funds.

15.	Regional plans: Unify structure of the innovation action plans of all regions in the country. A common methodology, template and process should be established by MEDT.
16.	Oblige all regions to prepare innovation action plans on the basis of an overall negotiated government coordinated timetable. They should be submitted to the Ministry of Economic Development and Trade and/or to the Agency responsible for the state innovation policy implementation (SASII) for negotiation and approval. They could be distinguished from the general programmes of social and economic development through a separate secured regional budget line for the support of innovation measures. In addition, they have to be harmonised with other strategic objectives of the region.
17.	Promote Internet use at regional level.
18.	Innovative training programme for the education field. Addressing the needs of teachers in multi-grade primary schools, usually in rural areas, by developing a specialised in-service training programme using ICT and the Internet as the delivery platform.
19.	Introduce regulatory, financial, administrative measures/incentives to attract green investments and promote innovative entrepreneurship. Responsibility for environmental pollution and harm should be adequate to the damage caused and unavoidable.
20.	Reduce dependence on fossil fuels supply, its consumption levels and consequently growing financial burden for state and municipal budgets. Introduce municipal energy management practice.
21.	Design and run targeted state programmes and PPP schemes to develop and implement innovative clean-up technologies for treatment of chemical waste, communal wastewater and solid waste. Support innovative ideas that could be turned into marketable green products and services.
22.	Support policy priorities in energy saving, improving energy efficiency, efficient and rational consumption of natural resources (e.g. water, gas, electricity, paper, heat) with financial tools and mechanisms (e.g. green tariffs for renewable energy generation, variable tariffs for consumed resources depending on the levels of consumption etc)
23.	Exploit green R&D and green companies, through specific competitive co-financed collaboration programmes, start-up support (e.g. bank loans, VCs) and by directing intermediary organisations and international financing institutions towards this direction (e.g. FP-7, UNIDO, USAID, EBRD, GEF, etc.)
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