

RIS

Innowacje w Dolnym Śląsku



Lower Silesia's Innovation Strategy

| | |
|--|----|
| Introduction | 3 |
| Conclusions | 21 |
| 1. Extension of economy's adaptability | 23 |
| 2. Systemic development of the existing competence resources..... | 23 |
| 3. Assisting innovators | 24 |
| 4. External financing of research | 26 |
| 5. Practical orientation of research..... | 27 |
| 6. Shaping innovative attitudes | 28 |
| 7. What should be done? | 30 |
| 3. Strategic mission | 32 |
| 4. Strategic objectives | 34 |
| Strengthening regional competence blocks | 34 |
| 2. Activating research circles | 35 |
| 4. Financing innovations | 36 |
| 6. Education for innovation..... | 38 |
| 7. Propagating pro-innovative attitudes..... | 39 |
| 8. Accumulation of social capital..... | 40 |
| 5. Implementation and monitoring | 42 |
| 1. Professionalisation of procuring funds for investments | 42 |
| 2. Rapid assistance paths for innovative projects..... | 42 |
| 3. Lower Silesia Fund "Stawka na innowatora"..... | 43 |
| 4. Lower Silesia Innovation Council at the Office of the Voivodship Marshal | 43 |
| 5. Centre for Regional Studies (CRS) and Analysis Bureau for innovative processes in Lower Silesia..... | 44 |
| 6. Bridge priorities | 45 |
| 7. Continuation of works on developing the Lower Silesia Innovation Strategy | 45 |
| 6. Schedule of bridge activities | 47 |
| 7. Strengthening ties between science and economy of the Region..... | 49 |
| 1. Leading research fields in the Region as potential areas of innovation and new technologies | 49 |
| 2. Identification of potential areas of co-operation between the sectors of science and economy in the Region..... | 50 |
| Annex 1 Elements of innovativeness conceptual network | 54 |
| 1. Phenomenon of innovativeness..... | 54 |
| 2. Basic concepts..... | 54 |
| 3. Innovation concepts | 60 |
| Annex 2. Challenges, which have to be met | 65 |
| Annex 3. Summing up the results of research..... | 68 |
| 1. Innovative potential of scientific, research and development institutions in the Lower Silesia Voivodship..... | 68 |
| 2. Non-commercial institutions of business environment in the Lower Silesia Voivodship..... | 69 |
| 3. Innovative needs of enterprises from the SME sector in the Lower Silesia Voivodship | 70 |
| 4. Initial analysis of the potential for enhancing innovation in Lower Silesia | 71 |
| Annex 4. Selected proposals of activities to the benefit of implementing the Regional Innovation Strategy | 73 |
| 1. Activities integrating scientific and research and development (R&D) potential in the Region..... | 73 |
| 2. Activities levelling the existing "digital division" between Lower Silesia and the best developed regions of Europe and the world | 75 |

Introduction

At the end of the 20th century, globalisation, eventually, unblocked the processes of economic growth in the so-called Third World. In the light of the emerging economic reality, countries and regions face the fundamental choices: either to develop innovative economic or else they will be forced to compete with China as far as production costs are concerned. China will not become a highly developed country until the next year, when it is going to spend twice as much of GDP interests on testing than Poland.

For the wealthy and moderately wealthy societies, the choice seems obvious. The rejection of the innovative way of development would, as a consequence, mean equating living standards downwards. The understanding of the gravity of the situation has underlied the concept of the economy based on knowledge, was expressed in the Lisbon Strategy and explains the need to formulate the national and regional innovative strategies.

The implementing of various innovative strategies has not, however, brought any expected economic profits so far. It is more and more emphasised that the defeats in this field emerge from the erroneous understanding of the nature of innovative processes. Procedural policy of support based on this understanding fails.

The presented Lower Silesia Innovation Strategy is based on the conviction that innovation in itself is of cultural phenomenon and the growth of social capital resources of Lower Silesia is the key to success. Only then the fragments of the innovative system, already existing in the region, can be integrated into the functioning whole. Only then the import of technologies and capital will favour the development of the economy based on knowledge. Such a diagnosis does not promise an easy success but in case of prosperity it gives realistic chances of improving the competitive position of the region. It should be noticed that if the innovative economy could be simply bought, it would not be affordable and the most innovative region in Europe would be the former GDR.

The layout of the document is as follows:

- The first part elaborates on the subject of the innovative potential of Lower Silesia and the external conditions of the construction of the region's innovative system. It refers to researches conducted particularly within the confines of preparatory research work and to **The Development Strategies of the Lower Silesia Voivodship and National Plans for Development**. It also includes an appropriate SWOT analysis.
- The second part presents the foundations of the innovative policy of the Voivodship. Referring to the regularities observed in well-functioning innovative environments, it names processes that should be adopted in Lower Silesia for effective regional innovative system to emerge.
- The third part, indicating the growing insecurity concerning economic conditions, which result from the accumulation of challenges on the European and global scale, formulates the strategic mission of the innovation in Lower Silesia: *Innovativeness as an answer to the future challenges*.

- The fourth part presents eight strategic aims that Lower Silesia - understood in terms of community and business union - should try to reach in order to become an innovative region. It also presents all courses of actions to achieve every aim.
- The fifth part characterises the prime tasks of self-governments of Lower Silesia, the implementation of which conditions the success of the strategy as well as the issues of monitoring and co-ordination of strategic implementation.
- The sixth part includes the proposal of platform activities, supporting the implementation of the strategic aims.
- The seventh and the last part defines the potential areas of the innovation, new technologies and the proposed areas of the co-operation between the scientific and the economic sectors in the region.
- The first annex deals with the subject of the number of theoretical concepts that the structure of strategies was based on. It was advisable, since the knowledge of the innovation phenomenon is far from being complete and agreed upon, and vivid discussions, conducted both in scientific and political environments, concern sometimes basic issues.
- The second annex presents the challenges, which – if confronted – condition the success of the strategies.
- The third annex presents *in extenso* the conclusions of the managers of the research projects, implemented within the confines of preparatory works for the Strategies.
- The fifth annex presents the proposal of the particular activities integrating scientific as well as the research and development potential (R&D) in the Region.
- The sixth appendix presents the catalogue of model plans and projects used for implementing the regional innovative strategies, which was formulated on the basis of positive experiences of the regions in the European Union.

1. Innovative conditions of Lower Silesia.

Some courses of action and the particular undertakings which lead to the emergence of the innovative regional system in the coming future – the pro-innovative net of connections between institutions, organisations, economic entities that support innovators and improve processes of the implementation of the innovative solutions, above all the technological and organisational ones are the aim of the innovative strategy. It aims at the emergence, not the structure of the system, to emphasise the limited features of the process that lay at its basis. The obvious components of the postulated system are:

- the enterprises of Lower Silesia;
- research and development institutions;
- companies and other organisations servicing the enterprises, especially within the confines of their innovative activities;
- Educational system, especially tertiary-level.

Obviously, there must be a place for other actors of the social and economic life in the region (media, subsidiary organisations, but also individuals, above all the designers of the innovative ideas...). However, for such a system to emerge, which in our conditions is a brave undertaking, some external and beneficial for its growth conditions, above all the cultural ones, are a must as well as the favourable external context – the regional (the consistency between the postulated system and the general developmental concepts described in “Development Strategy of the Lower Silesia Voivodship”), national and European one.

This part gives the draft of the opening balance - the analysis of the potential actors of the system and the necessary conditions from the point of view of their actual functioning in the system. The detailed depiction of the Lower Silesian panorama with its society, economy and science in the region is not suitable here. They are well described in other chapters. From the point of view of this strategy, they are not important for two reasons:

- First of all, the phenomenon of the innovation basically concerns the processes occurring in the margins of the functioning system and as far as statistics are concerned they are omitted in all surveys. What can and should be studied, concerns the pro-innovation attitudes among actors of economic, social and intellectual life. The remarks given below mainly concern this aspect and are based on the research conducted, intentionally for this strategy, in the first part of 2004. They covered basic elements of the postulated innovative system of Lower Silesia - enterprises, R&D sector, and business-support institutions.
- Secondly, the emergence of the efficient innovative system in Lower Silesia is one of the main concerns, since only its elements function at this moment. The multiplicity of the data describing this status quo hardly changes the situation and it can barely influence the recommendations of the implementation. Thus, educational and cultural conditions, which the mentioned researches did not cover and external conditions, influencing the evolution of processes in our region, are more important. Placing pro-innovation activities in the whole of strategic settlements concerning the regional development is essential.

2. Financial potential

Lower Silesia has got a meaningful and varied financial potential, which potentially can be an absorptive market for various innovations, as well as an area, in which innovations come out and develop. Various factors concerning the development of the enterprise place Lower Silesia among the four strongest regions of Poland, and filling the SME sector with enterprises acting in the area of high technology, is the highest in the country. There is a clear rumour which verifies that enterprises of Lower Silesia (including the biggest ones) are ready to co-operate in creating the regional innovative system. However, the researches conducted for this strategy showed the series of essential problems.

- The companies of the SME sector are important actors of the innovative processes but their place and role in the process of creating and implementing innovations are various. Innovative processes occur, first and foremost, in the medical instruments industry, precise and optic, as well as in the chemical, engineering, and machine ones.

- These enterprises have a relatively high opinion about the level of the innovative production and technology. It should be, however, noticed that technological novelties are rarer than the productive ones and they represent a lower level of innovation.
- The co-operation with other entrepreneurs – co-operators, suppliers, and receivers - is the important source of inspiration for the modernisation of both products and technological processes.
- The co-operation with R&D sector is low-valued by the enterprises. They have problems with reaching particular people, the offered services are too expensive, the time of accomplishment is too long and effects are unpredictable.
- The evaluation of the co-operation with non-commercial institutions of support and self-government administration (which 2/3 of the companies is in contact with) is “relatively positive” and it improves in the course of the co-operation. However, the administrative organs are too inflexible in relation to the expectations of the entrepreneurs.
- A lot of critical opinions aim at the financial service of the country.
- Creating and implementing innovations cause a lot of trouble due to the limited access to capital, the high cost of its gain, bureaucracy and over-zealous officials and the high costs of appointing and operating on the enterprises.
- The biggest companies of Lower Silesia have great innovative supplies (patents, licences etc.) they use their own innovations or buy the new ones. They also value the usefulness of R&D sector very poorly.

Summing up, it should be emphasised that – from the enterprises point of view - there are no basics for positive opinions about the conditions of developing and popularising innovations in Lower Silesia. The offer of the regional R&D area, directed at the enterprises, needs improving and also the self-governmental (and governmental) administration should understand the viewpoint and the conditions of the economic activities of the innovative enterprises.

3. Research potential.

The conducted researches show the varied potential of the institutions of the R&D sector acting in Lower Silesia. Basic ratios of the research and development activity place the Voivodship in the fourth-sixth place among Polish regions, which refers more or less to the national potential, but not to the ambitions of the region, its contribution in creating GDP and challenges resulting from its geographic position in Europe.

- Material collected during the researches confirmed the formed scientific hypotheses within the confines of the ageing staff and problems with communication and the flow of information from SME and the supporting institutions.
- The sustained weakness of the sector within the confines of ability to commercialise the results should be highlighted. The results of the researches show the unwillingness of the research institutions’ management to “business tests” of their workers. A small technological company has not been recognised yet as the most effective form of transfer and technological commercialisation, either in Lower Silesia or in the whole country.

Companies established by the participants of the researches, based on the new technological knowledge - collected during the research and development work - enable to check flexibly the possibilities of the market, with a relatively low risk.

- There is a lack of the particular procedures allowing to secure the institution's interest and the alternative future profits from the successfully finished undertakings. The contemporary situation results in "the grey academic area" against which the owners of many institutions defend themselves in the form of the so-called "loyalty statement".
- The co-operation with business is not satisfactory, although greater openness and flexibility in seeking economic contacts and the lower level of the incomes that are not connected with research and development activity of the R&D institutions in Lower Silesia in comparison to other regions in the country, is worth attention.
- Research institutions state the problems connected with reaching potential receivers of the survey results, and the used technologies of promotion leave much to be desired.

Thus, from the point of view of the research institutions, the development of the net of connections between various partners of the innovation activities, above all creating the common ground between economy and science, is significant in the postulated innovative systems in the region. Efficient information concerning the existent solutions on one hand and problems on the other is very important. There must be a fundamental breakthrough in the commercialisation of the research results (*spin-off type* enterprises). There is a need for broad conveniences for this kind of activity as well as promotional and marketing help. Eventually, the procedural and administrative support for attempts, which tries to order the issues of intellectual properties of the implemented innovations, is essential.

4. Institutional potential.

There are 120 supportive institutions acting in the region, almost half of which act in the confines of the enterprise support, technology transfer and the local development. It is the potential corresponding to the statistical rank of the Voivodship against other regions in the country. The researches showed that the supportive institutions are slowly becoming an essential element of the business surrounding in the region. The process of the construction of the non-governmental sector of support takes place systematically but slowly. The Voivodship cannot be recognised as one of the leaders on the national scale; however, the range of innovative and highly valued initiatives (Wroclaw Technological Park, the beginnings of *venture capital* funds) can be showed. The fact that the supportive institutions cover with their range the whole territory of the Voivodship is worth emphasising.

- The organisations of the employers are characterised by particular dynamics, which gives evidence of the openness of financial environments on the self-organisation and self-help activity in the region. They do not limit themselves to the interest defence of their members but they build up services raising financial qualifications of the local companies. They contribute actively to the construction of co-operation platforms and inter-environmental discussions (e.g. the systems of awards and economic certificates in Lower Silesia including the technological level of the companies, Lower Silesia Political and Economic Forum).
- The low level of the organisational advancement and the lack of strategic thinking should be, however, noticed. Only every third institution (e.g. incubators, loan funds,

technological transfer centres) owns a long-term plan of development as well as certificates and standardisations of the provided service.

- Definitely training is the most developed, as well as advisory and informative activity. Practically all institutions offer such services. However, training activity has in greater extent an immediate character and is undertaken in the moment of acquiring external funds.
- Activities supporting innovations and the transfer of technologies are rare. With the exception of individual examples, institutions are not prepared to act in this area, simultaneously; they do not show any interest in pro-innovation initiatives. It partly results from the domination of the co-operation with the traditional enterprises, in which the pressure of technological modernisation is not that strong as in the modern branches.
- The low level of consolidation of the supportive institution environments and the lack of leaders on the regional scale should be emphasised. Particular entities hardly ever decide on common undertakings; the sub-regional and regional co-operation platforms and the exchange of experiences have not been established.

The conducted analysis shows the necessity to widen the co-operation of the business-support institutions, including the co-ordination of their informative activities (e.g. regional Internet portal) concerning the service. The development of the new specialised forms of stimulation of technological enterprise in the region needs support.

2. Administrative potential.

The institutional surrounding also stands for the national and self-governmental administration, being, potentially, an important element of the regional innovative system. The researches concerning its attitude towards the regional innovation has not been conducted yet. However, on the basis of other analyses, observations of the functioning of administration and self-governments, there may occur the following generalisations.

- Administrative procedures, the service of the entrepreneurs and administrative help for the existing enterprises are estimated as negative. It mostly concerns Inland Revenue Service but also organs of the self-government operating on the verge with the enterprise.
- The endeavours made for attracting significant foreign investors do not have their counterpart in pro-investment activities in favour of native capital. Particularly, except for few incubators and the beginnings of technological parks, there is a lack of systems of encouragement for the development of the innovative companies.
- Within the general self-governments, there is a particular interest in attracting the investment of high technology. Initiatives of the investment areas specially meant for it have also appeared.
- Economic innovation is a declared value in the strategy of the Voivodship and it occurs also as a slogan in strategic documents in some communities (e.g. of Wroclaw). However, there is a shortage of practical solutions, that are good and worth spreading.

- Some of the self - governments' activities, especially the provincial ones, have some positive influence on the construction of the regional clusters of qualification. The integration of the particular environments with the accomplishment of such undertakings as The Lower Silesia Energy Strategy or The Lower Silesia Garbage Charter can be enlisted. The logic of the postulated developmental strategy in the Voivodship "*gamble for the region*" favours such processes. Simultaneously, they are successful undertakings within the confines of public and private partnership, carried on regardless of the lack of appropriate legal regulations in the region.
- Euro-regions acting in the area of Lower Silesia are important elements of its panorama. They accumulate great qualifications concerning international co-operation, the use of European means of help, support for social and educational initiatives recurrently of the innovative nature.

Pro-innovative activities of the administration require the procedural improvements and the change of the attitude towards the enterprises in general as well as implementation of the help systems for the innovative SME. The formulation and lobbying of legal solutions that should be accepted on the national scale are an important task. The subject matter of pro-innovation activities should also become the subject of regional debate, favouring the co-operation of various self - governments, the exchange of experiences and promoting the best solutions.

6. Educational potential.

The existing researches do not identify clearly the connections between the training process and the dynamics of the innovative processes and the possibility of establishing the economy that is based on knowledge. Undoubtedly, creating the economy based on knowledge, increasing the economic possibilities to develop and implement innovations require efficient training system on all levels, above all on the university level. On the other hand, however, the qualified staff does not guarantee a proper level of innovation. The conducted analyses refer, only in the limited spectrum, to the identification of the entrepreneurs' expectations. Subsequently, it should be noticed that employers expect from their employees with higher education: faster mastering of the workshop, independence, availability and initiative. They expect, simultaneously, not only theoretical qualifications but also the practical ones. It is worth noticing that these features are essential to create and implement innovations.

Lower Silesia has got a strong educational potential. Over 150 000 students study in 14 national and 18 private colleges (the number of them, just like in the whole Poland, increased in the last decade almost three times). Over 3 000 participants of the PhD studies and 10 000 participants of the postgraduate studies (their number has fallen by 30% in the last two years) can be added to this number. It is worth mentioning that the basis for the higher education is the well-developed net of secondary schools among which some lead on the national scale.

Diagnosis of the college system condition in Lower Silesia allows to formulate the following postulates concerning the establishment of the economy based on knowledge, and the system of developing and implementing innovation, and the essential is:

- Further improvement of the general level of social education, especially in the fields that are essential for the economy of the region and within the confines of abilities and

knowledge required to develop and absorb the technological, organisational and financial innovations.

- Drawing nearer the college and practice, especially the economic one, including the exchange of staff between the colleges and other sectors of social life.
- The interregional struggle with marginalisation of persons and environments as far as the access to education is concerned, thus, the existence of second-rank schools (this postulate has been fulfilled to the great extent with the development of various types of vocational schools).
- The equality of rights of financial investments and expenses on the educational activities both in administration and in enterprises.
- The creation of stable forms of contacts between the representatives of the self - government employers, national authorities and the ones of the college to improve the flow of information concerning the expectations of all partners.
- Elaboration and implementation of co-operation systems with the talented youth - the offer for the need of the region.
- The increase of students' mobility - the flux between the colleges and the college fields of study, foreign studies for our youth but there also should be endeavours to increase the number of foreign students in our colleges.

7. Cultural potential

Lower Silesia has a unique, and to some extent potentially pro-innovative cultural capital. It is the sum of various aspects of the Polish and ethnic minorities' cultures, brought by the settlers after WWII. It also combines noticeable layers of the former (also multicultural) past, encoded mainly in the material field (architecture, town planning, the net of infrastructure connections, unique objects connected with the history of technology). A lot of elements of this formerly rich area have declined, other, however, survived, and some have regained their vitality in the last few years. In a lot of places a conscientious effort to incorporate the achievements of the former inhabitants of this land to the cultural circulation is noticeable. The Lower Silesian cities are seeking their history and the officials of colleges in Wrocław are trying to reconcile the genesis of Lviv with the secular academic traditions of Wrocław.

The unique beginnings have shaped features of the Lower Silesia society distinguishing it from the inhabitants of other regions in Poland. First and foremost, it is their great resourcefulness, displaying especially in recessionary condition such as: the smallpox epidemic in 1963, martial law and the floods in 1997 and 1998. The new examples of this resourcefulness in the economic field could be observed in the first phase of the political system transformation, it is also noticeable on the Polish and German borderland. Researches conducted at the end of the 90's showed that the Lower Silesian entrepreneurs depend more on their own abilities rather than on administrative activities.

Lower Silesia is a region relatively open to the newcomers. The visitors from the country and foreigners often emphasise the high level of disinterested benevolence. The newly settlers of Lower Silesia do not encounter any serious troubles in pursuing their careers, including the

political ones. The level of xenophobia (including the Germans) is surprisingly low, which has found its reflection in the support, over the average level, for Poland to join the European Union.

It is not accidental, that a range of innovative long-term concepts has been drawn up in Lower Silesia. They include the Polish and German agreement (cardinal Boleslaw Kominek), uniform trade union "Solidarność" (Karol Modzelewski), Polish and Czechoslovakia solidarity movement and, the first in Poland Euro-region of Nysa. Very important and original artistic trends have been established here; fine arts avant-garde of the 60's, Grotowski Theatre, Tomaszewski Pantomime Theatre and Frydrych Orange Alternative. It is worthwhile mentioning the construction of the new type of financial sector in Poland (Leszek Czarnecki, Mariusz Łukasiewicz) and the innovative forms of social dialogue (Lower Silesia Annual Political and Economic Forum in Krzyżowa).

It should also be noticed that the same factors in the social structure of Lower Silesia, owing to which various initiatives come out and shape relatively easy, simultaneously, hinder their presence. A lot of achievements of Lower Silesia have disappeared without a trace. The obvious weakness of the Lower Silesian lobbying in Warsaw as well as low immunity of the Lower Silesian economy to the penetration by the companies outside the region can be explained in the same way (Wielkopolska shows greater unity).

The above mentioned observations are of segmentary kind and they concern in the greater extent Wrocław itself rather than post state-owned villages. Summing up, it should be, however, admitted that uniqueness of the Lower Silesian social culture exists and is generally positive. Resourcefulness, openness, creativity and variety of Lower Silesia inhabitants belong to the main advantages of Lower Silesia in the process of construction of the regional innovative system.

Unique monuments of the scientific and technological thought of the European and global virtue in Lower Silesia are worth mentioning too. Their correct inventory, exhibition, and maintenance (first and foremost protection against erosion and devastation), access and promotion, in terms of the regional tourist attraction, may constitute an essential element to stimulate aspiration and imagination of the potential innovators.

8. Developmental strategy of the Lower Silesia Voivodship.

The Development Strategy of The Lower Silesia Voivodship adopted by the self - government in the year 2000 constitutes a firm basis for this document in at least two aspects.

First of all, the innovation of the economy is a clearly settled strategic aim. Within its confines 72 activities, which were either to strengthen the regional innovative system or create direct (aimed at the economic factors) or indirect (through the profitable changes in other areas) conditions to the pro-innovative transformation of the economy in the region, were enlisted. In the notes to the strategy some of the problems and proposals developed here can be found. For example, the domain of the enterprise enlists both the development of the regional innovative system and the stimulation to co-operation between regional economy and science as well as access to *venture capitals*.

However, all the goals of the strategy are connected in an essential way with the problem of the development of the regional innovation. Aims such as *Integration of Lower Silesia* and

Civic Society are essential for the strengthening of public capital, without which the regional innovative system cannot function, and *Renaissance of the civilisation* and *Openness to the world* refer to the different aspects of modernisation process.

The secondly, except for the goals and strategic tasks connected with them, pro-innovative aspect of *The Development Strategy of the Lower Silesia Voivodship* has a more essential meaning. The accomplishment scheme introduced to it, that is: *gamble for the region*, constitutes the invitation for all possible entities to **creative** activity in the accomplishment of strategic aims. Everyone who is interested may put forward a proposal of raising one of the issues or joining the group of people who are already working on this subject. Everyone can offer, on equal terms, the solutions to the raised problems or the way of accomplishment of the certain undertakings. The provincial administrative structures may be either partners or initiators of the activities, but they have to give support to the initiatives corresponding to the strategy. As it has been proven till now, such a scheme of accomplishment (corresponding more and more to the popular attitude towards co-operation and social discourse that is *open space approach*) favours the innovative solving of the problems of the regional development.

9. Pro-initiative national policy.

In the light of the influence of this strategy, the current policy of the country is not as important as its probable changes in the future, which are declared in the strategic documents. Statements included in the “National Development Plan 2007-2013” (NPR) and “The National Strategy of Regional Development” (NSRR) may influence the shape and functioning of the regional innovative system. Unfortunately, these documents are not enacted yet and it is only possible to refer to their assumptions that are open questions to the public discussions. A particular role belongs to some of the governmental documents, e.g.: “The assumptions of policy concerning science, technology and science, and innovation of the country till the year 2020” (the project from 1.10.2004 The Ministry of Science and Information Society Technologies) and “The proposed directions of the development of the informative society in Poland till the year 2020” (The Ministry of Science and Information Society Technologies, September 2004). All these documents, their mostly updated versions, and next amendments have to be analysed without delay from the point of view of their influence on the settlements and the process of accomplishment.

According to the National Development Plan, in the mean time, the basic aim of the economic and social policy should be the maintaining and fixating high, over 5% GDP annually, the pace of economic growth. Only then can the distance, distinguishing Poland from other country members of the European Union, be lowered fast enough, and also finding the solutions to the main national problems, with the maintenance of the budget deficit at the acceptable level. To reach this aim, the public finances and effective structural policy (financed not only from the national supplies but also with the help of structural EU instruments) have to be improved. The economy developing at such a pace has to be highly competitive not only on the European scale. The accomplishments of structural policy in the horizontal (in accordance to all economic entities) and regional scale can lead to such a situation. The domain of the policy conducted in accordance to particular economic sectors (branches, divisions) is to lower. Some sectors will, however, stay in the area that is under the particular influence of the national policy, which refers mainly to agriculture, power industry and environmental protection as well as particular services (e.g. education and health protection).

The rules and instruments of public help determine the movement from the sector policy to the horizontal one. Soon the help should be given mainly to small and average private enterprises, implementing new technologies and models of administration and it should associate with complementary local and regional activities. It should favour the promotion of competition and effective localisation of the factors of production.

An essential area of the horizontal and structural policy is entrusting the economic entities, especially the small and average ones, with the access to financial capital, the lack of which has become a great barrier to the development of the enterprise and innovation. National policy is to lead to the removal of this barrier, which is to be achieved by effective exploitation of structural funds for the development of various forms of financial agency, especially of those, which are oriented on the local and regional communities. Various deeply rooted local and regional institutions of financial agency should, in the first place, support the construction of the new economic entities (the loans on founder's capital) and make opportunities for those, which have become firmly established in the market, to set up undertakings based on modern techniques and technologies.

The opportunity for Poland to gain a fast and versatile development is advisable in the construction of the economy based on knowledge, an essential element of which is its innovativeness. That is why, an important area of the horizontal and structural policy should support an innovative activity, including the one oriented on the diffusion of the modern technologies, and motivating demands on the results of the R&D sector. It demands among others regulating, without delay, the status of the research and development units, especially those ones, whose potential supports the development of new production and services at the minimal level.

The structural and horizontal policy should also be firmly oriented on the development and the exploitation of human supplies. The development and competition of the economy depend on the development of human and social capital, what assumes new tasks and essential changes in education, e.g. new approaches to the educational projects, flexibility and new work style of schools. Defining priority areas and the direction of the economic development is also essential, and it will have its counterpart in formulating preferences within the framework of vocational education on all levels, as well as for the higher education system. Thus, the next preference, conditioning our entering the new social and economic era, based on knowledge, is education.

Eventually, next to the engagement of the national investment, the development of public and private partnership, which can allow a wider access of the investment means to the economy, is essential.

Some of the assumptions of the National Development Plan shortly described here give good basics to construct regional innovative system and running the regional innovative policy. It should be emphasised that they are highly convergent to the assumptions of this strategy and the formal and legal solutions, postulated by both documents, go in the similar direction. The same statement concerns the remaining enlisted documents and especially the known assumptions of The National Strategy of Regional Development. They put emphasis on the fact that the development of the regions should be a result of their endogenic potential, and their competence should be build on:

- science, education social capital;
- researches, technologies and economic competence;
- the growth centres and the network of spreading of the development;
- forming the social culture of foretelling future and efficient managing.

Eventually, “The assumptions of science, technology and science, and national innovation policy till the year 2020” highlight the role of regional strategic innovations as one of the main instruments of the development of science. They also highlight the strategic thematic areas of research in four groups: Info (software engineering, the knowledge and the decision support, the intellectual networks and their surrounding, optoelectronics), Techno (new materials and technologies, nanotechnologies, qualified systems), Bio (biotechnology and bioengineering, new technologies and techniques used in the environment protection, agriculture and medicine) and Basics (computational studies and creating scientific information supplies, the physics of solid body, chemistry).

Summing up, it should be assumed that the national policy - in its current declared shape - would be a very strong and positive condition to create the regional systems of innovation. Comparing the opinions mentioned above, with those promoted recently, the conclusion can be drawn that this tendency will intensify in the time of the accomplishment of the strategy.

10. European factor.

Poland’s accession to the European Union structures and its neighbourhood with the Czech Republic and Germany settle for Lower Silesia some particular challenges and additional chances for development. The openness to the international exchange, co-operation and partnership, as well as localisation of the foreign enterprises are under important criterion of the international competence. It is essential for describing the “export strength” of the region, which is based on goods and service of the international brand, being the label for the region. This strength creates the basis for the firm development and the positive image of the region in the nearer and further surrounding. It is also essential that it is influenced by the financial attractiveness of the region, which offers its supplies and infrastructure. The attractiveness of Lower Silesia, in the conditions of the international competence, including the European one, depends on the modern communication and telecommunication infrastructure (which need a considerable improvement), but above all on the quality of human capital or even wider - social capital.

The imparting of the economic dynamism in Lower Silesia, resulting from its contribution in the European economic space, is important factor acting in favour of the emergence of the regional innovative system. The other factor, of a very similar kind, is our contribution to the European educational space (Bolognese process), which will favour the modernisation of our system of training, especially on the higher level. Their narrowing of the relations between research institutions and European partners (European research space is said to be a natural complementation of integration in other areas) should be emphasised. Some other obvious factor acting in this direction is the access to European funds, mostly directed to the pro-innovative activities.

The last element is connected with our contribution to the policy of the European Union, of which two aspects are very important here.

First of all, the European Union puts great pressure on regional activities. Even though in the Constitutional Treaty, the role of the regions has not been emphasised enough, but the practice of the European Committee is obvious in this field. As a consequence, the further growth of the role of the regions, in the construction of the united Europe, and the firm drift of qualifications within the framework of co-operation with European institutions, from national level to the level of the regions, can be foreseen. Well-motivated activities, heading towards the increase of the unity of the regions and their efficient functioning, and those leading to the emergence of the regional innovative systems, may depend on the European structures' support.

Secondly, the problem of the innovation is one of the major issues in the policy of the European Union, and it was shown in the Lisbon Strategy, from which results the pressure on the governments and regions to create appropriate strategic documents. Even though the tools, with which the European innovative economy was to be strengthened (which goes along with its competence on the global scale), occurred to be inefficient, it has not made the problem expire. In the near future a new phase of discussions on this subject and new institutional solutions, probably more respecting the limitations of the processes that ought to be strengthened, should be expected. Yet, it is not unlikely that our strategic document will become a part of the main stream of the already anticipated changes.

Summing up, on the part of the European Union the long-term help in the accomplishment of the strategic innovations can be expected, although to use it effectively, there must be close observations of changes in the European policy and fast reactions to possible changes of the rules of play for European means. The activity of the region in the carried discourse and the efficient promotion of the region and its achievements in various areas are also important.

Finally, two more aspects of European co-operation should be taken into account. Except for the undeniable benefits, the integration causes also some troubles - above all the opportunity to attract talented individuals away from the region, without whom regional innovation is out of question (it is described in detail in the second appendix). However, the European co-operation gives also incredible chances to use the possessions of the others - including the experience of the regions, which coped with the problems we are still facing. There are also regions in Europe, which cope better with the problems of stimulation and spreading of innovation. These experiences can and should be responded to.

11. Distinctive areas of the economy and science in the Lower Silesia Voivodship.

The areas in which the innovations are expected can not be forejudged. There is little possibility to predict which areas of the economy and science will be essential for the region in the long-term perspective. It means that defining the directions of the development of the region can be a continuous process. The strategy should define the identification mechanisms and strengthening the positive developmental trends. On the basis of the surveys the areas can be defined, which distinguish our region from the others, create the potential of the region and can, in the future, distinguish our region from others in Poland and in the world even more, if appropriately strengthened and restricted.

Below, there are the economic sections and areas, which were identified during the works on the strategy as a characteristic and essential for the Lower Silesia Voivodship:

Industry:

- mining;
- production of food and drinks;
- textiles;
- production of chemicals;
- production of medical instruments, precise and optical, clocks and watches;
- engineering;
- production of motor vehicles, trailers and semitrailers;
- production of goods from non-metallic leftovers;
- generation and provision of electric energy, gas, and water.

Service

- financial agency;
- property service, leasing, training and the service concerning the running of economic activity.

The activities, which strengthen the innovation in the economic areas mentioned above, can in a particular way contribute to the distinguishing and raising the competence of the region. The development of the technology and products for the enterprises, from the areas of the economy mentioned above, should govern the construction of the research infrastructure and the conduction of research and development works in the region.

The areas of science, defined with the creation of Wrocław Technologic Park in 1998 and with the signing of the settlement concerning the construction of the Lower Silesia Centre for Advanced Technologies, serve to strengthen regional branches.

The founders of the Wrocław Technologic Park decided on the priority of the conditions created for the development of the enterprises, which use advanced technologies, or engaged in research and development of areas, such as:

- telecommunication, electronics (including optoelectronics and mikroelektronics),
- computers, data processing;
- agricultural and victuals production, and genetic engineering, molecular biology;
- medical equipment and materials, pharmaceuticals;
- the protection of environment, energetics (electric and thermal energy, alternative sources of energy);
- chemistry, new materials, plastic;
- automatics, measuring apparatus and laboratory equipment, precision mechanism;
- cryogenic technologies of high pressure, vacuum.

The Lower Silesia Centre for Advanced Technologies has decided on the prior areas of the research work:

- *Materials, Science and Manufacturing;*
- *Information Technologies;*
- *Quality of Life;*
- *Energy;*

The detailed description of the areas is included in Chapter 7.

In both cases defining of the areas was preceded with the analysis of the scientific, research and development potential of the scholarly and economic environment of the region.

12. The SWOT analysis of the innovation in the Lower Silesia Voivodship.

The SWOT method is the procedure aiming to show, settle and give the useful structure of knowledge owned by all important actors acting (in this case) in the area of innovation. This method helps to show developmental activities in the criterion of strengths and weaknesses, and opportunities and threats resulting from the influence of the surrounding.

The following SWOT analysis conducted in the Lower Silesia Voivodship was made on the basis of:

1. Works done on the diagnosis of the situation in the Lower Silesia Voivodship, which has been conducted since August 2004.
2. Source materials collected by the group of people, formulating this strategy.
3. Consultations during the works of the Controlling Committee and discussions, of the working groups, on the strategy.

The analysis of the weaknesses and strengths of the innovative system in Lower Silesia was decomposed so as to distinguish in a certain way the enterprise sector, R&D sector, covering the system of higher education, and subsidiaries of the research economic units, especially those of the industry, and the system and institutions of innovative system support.

The analysis of opportunities and threats was not decomposed due to the assumption that there is no need to distinguish the occurring opportunities and threats in the particular areas contributing to the construction of the system and implementing the innovation.

1. The potential of the economy and enterprise

| 2. Strengths | 3. Weaknesses |
|---|---|
| <ul style="list-style-type: none"> - The existence of industrial centres, with high potential, in the branches with long tradition. - Well-developed industrial branches, especially: mining and copper production, lignite mining, mineral and raw materials, the production of chemical goods, engineering, machines and electric equipment, the production of sub-assemblies and part of motor vehicles. - The existence of the three well acting and well spread certain economic areas. - The combined branch structure in the SME sector. | <ul style="list-style-type: none"> - A relatively high number of companies, which have economic problems. - High unemployment rate in the region, including the long-lasting structural unemployment. - Low expenditure of money on the modernisation investments. - Low level of innovation, especially among small and average enterprises. - Low expenditure of money on the innovations resulting from the lack of financial means. - The relatively low level of the modernity |

| | |
|--|--|
| <ul style="list-style-type: none"> - The shaping of the development KGHM area. - The growing awareness of the technical and technological modernisation and readiness to implement innovation, - High level of “intellectual capital” in large (essential) enterprises. - Relatively modern machine park in some of the enterprises. - Ability to adapt to difficult conditions of managing - Advancement in connection to European Union norms. - Ability to adapt new technological and organisational conditions. - The increase of the sale of new or modernised products. - The growing foreign capital contribution to the formulation of productive and service structure. - Direct access to the markets connected with large city centres abroad (Berlin, Dresden, Goerlitz, Prague). | <p>of production.</p> <ul style="list-style-type: none"> - Little awareness of the needs and benefits resulting from the implementation of the innovation. - Inability to gain competitive advantage based on technological and productive innovations. - Low supplies of the intellectual capital in small and average companies. - Shortage of qualifications needed to use the service of the institutions of support, especially SME. - Too low experience concerning the activity on the EU markets. - Low level of co-operation with EU partners. - Low number of the advanced technology products in export. |
|--|--|

| |
|--------------------------|
| 4. R&D sector |
|--------------------------|

| 5. Strengths | 6. Weaknesses |
|--|---|
| <ul style="list-style-type: none"> - Strong academic centre in Wroclaw and the development of the higher education system in other cities of the region. - Significant, in terms of quantity, potential R&D sector as far as institutions are concerned. - Increasing intensification of co-operation between the regional R&D sector and foreign centres. - Access to technology and scientific | <ul style="list-style-type: none"> - Growing gap between national (including Lower Silesia) and European (also regional) research sectors. - Low level of financing of the research and developmental activities resulting from public financial crisis. - Small research backup in the industry, which keeps on deteriorating, and the narrowing of the stream of orders from the enterprises to the colleges and. - Occurrences of the grey sphere of |

| | |
|--|--|
| <p>achievements owing to contribution in European research projects</p> <ul style="list-style-type: none"> - Good examples of scientific projects fulfilled in co-operation with the enterprises. | <p>qualification transfer from the colleges and from the research backup of the industry.</p> <ul style="list-style-type: none"> - R&D sector is weak in terms of the commercialisation of the results and co-operation with business. - Little level of research activity in the modern and full of perspectives specialisations, such as; optoelectronics, telecommunication, biotechnologies, material engineering. - Research and development projects, conducted for the economy, are made in the traditional branches - mining, transport, and engineering. - Lack of the system of gathering and spreading information about research and solutions ready to be commercialised. - Ineffective and unsuccessful - from the view of the innovation - system of financing the education, and evaluating the R&D institutions, and the evaluation of the staff. - Lack of exchange between the staff and the economy. - Insufficient adjustment of the educational projects to the needs of the economy of the region. |
|--|--|

| |
|---------------------------------------|
| 7. The instructions of support |
|---------------------------------------|

| 8. Strengths | 9. Weaknesses |
|---|---|
| <ul style="list-style-type: none"> - Growing awareness of the importance of the institutions of support in the European and Polish innovative policy. - The growing potential of the institutions of support. | <ul style="list-style-type: none"> - Lack of the qualified service in the institutions of support in favour of the innovation. - Lack of regional projects of training and improving supporting institutions. |

| | |
|---|---|
| <ul style="list-style-type: none"> - The activity of the institutions of support aimed at SME. | <ul style="list-style-type: none"> - Lack of projects of support for the enterprises and innovation as well as the development of the SME on the regional level. - Lack of the flexible net of co-operation and co-ordination of the administrative activities, supportive institutions, R&D sector, large companies and other organisations. |
|---|---|

10. General issues

| 11. Opportunities | 12. Threats. |
|--|--|
| <ul style="list-style-type: none"> - Economic growth in the global and the European economy and the enlargement of the markets for the companies of Lower Silesia. - Growth of attractiveness of Lower Silesia region as a place of the location for capital and investment. - The location of the internal developmental factors of Lower Silesia and the construction of the particular organisational structures, describing the acquisition and exploitation of the European Union supplies. - Construction of a flexible network of connections between the entrepreneurs, self - governments, colleges, politicians, engineers and journalists qualified enough and ready to take responsibilities of the regional affairs. - The opportunities to establish co-operation and the exchange of staff with the B+R sector institutions both in the country and abroad. - The opportunities to use structural funds to finalise common scientific projects in favour of the regional economy. - Formulating legal and organisational solutions allowing the flexible financial and organisational support for the innovative undertakings. | <ul style="list-style-type: none"> - Growing gap between the national and European R&D sectors. - The possibility of “brain drain” as a result of the unlimited flow of staff in EU. - Petrification of the system financing education in the country as well as the system of evaluation scientific units, promoting and staff promotion. - Sustaining gap of the entrepreneurs’ motivation to co-finalise the researches and implementing the innovative undertakings. - Lack of a system, which allow the flow of young staff to the R&D sector. - Lack of system of support adjusted to the requirements of SME. - Lack of solutions allowing easier access to the external funding of the innovative undertakings. |

Conclusions

The available statistical data are not optimistic. In the present situation the postulate of developing the Lower Silesian innovation system is a bold postulate. We are finding practices and trends on which such a system can be built, but the ones which seem to prevail should be dismantled in the first place, in order to create a place for a **construction**. The majority of institutions, regulations and competencies recognized in the EU as indispensable exist only in the embryonic form. But most of all, the system lacks money.

Komentarz [MK1]: | We
wcześniejszych fragmentach używano
słowa 'construction'.

The above conditions for the development of innovations in Lower Silesia allow for the formulation of the following important conclusions and remarks useful in the formulation of strategies.

1. On the one hand, factors in the social structure in Lower Silesia cause the fairly easy development of various initiatives, and on the other hand, there are difficulties with their deep rooting.
2. The mentioned cultural specificity, including first of all, the potential of cultural variety, is still a very important asset which should be taken into account when creating the regional innovation system.
3. The development of an economy in Lower Silesia based on knowledge requires study and implementation of mechanisms as well as actions leading towards the removal of the existing limitations and barriers of the exploitation of innovations in economy, and especially:
 - supporting the development of the industry of new technologies, first of all, in the SME sector (small and medium-sized enterprises) and enlargement of companies' abilities to implement innovations;
 - creation of mechanisms allowing for the use of the research potential of Lower Silesia to the benefit of innovations through strengthening the research potential and the development of new forms of organisation;
 - ensuring the possibility of interactive cooperation of companies, administration and non-commercial institutions in the field of innovations;
 - making efforts to commercialise scientific researches and creating common "dialogue" grounds between economy and science;
 - supporting the development of new specialized forms of activating the technological entrepreneurship in the region;
 - creating programs to support entrepreneurship, innovativeness as well as the development of small and medium-sized enterprises on the local level.

It is difficult to build a strategy specific for Lower Silesia, because of obvious reasons, it is dominated by the removal of the effects of negligence and by approaching normality. Moreover, the existing areas of negligence are to a large extent common for the whole of Poland or even for Central Europe.

Fortunately, innovation is a process that escapes the statistics. A lot of people have to try in order for few to succeed. The considerably richer and better organized prove unsuccessful at this task, which may mean that the core of the matter lies somewhere else. Recent years have

provided much evidence of inventiveness and resourcefulness of the inhabitants of Lower Silesia. These talents, however, were directed at surviving in the conditions of absurd in the system. There is a hope that in more reasonable conditions these talents will turn out to work well in more regular innovative actions.

2. Assumptions of the innovation policy of Lower Silesia

The linear model of innovation (the triad: science-technology-industry) created false ideas about the mechanisms of the innovation processes. As a result, the research field expects the creation of such conditions which would allow for the buying and implementing of their theoretical concepts by economy which, in turn, demands the research field to provide ready and tested production recipes. This causes mutual grudges and attempts at improving the suction and pumping mechanisms, whose role in practice is minor.

In reality, real innovative solutions are born to a great extent spontaneously in the chaotic zone between theory and practice. The solutions are used both in practice, where they are commercialised, and in theory which develops by providing explanations why the solutions work. However, the more theory and practice perfect and formalize their inner organisation, the harder it is for them to understand and appreciate the nature of the innovation processes on their borderline. They want to extort transparent relations in this, by nature, blurred zone, and thus they destroy the processes of organic and evolutionary character that take place there. The modern theories of innovation accept the irremovable chaotic nature of the innovation processes taking part on the borderline of science and market, and give up the attempts at controlling them. They concentrate on developing conditions in which such processes take place efficiently. From this perspective, innovation appears as an emanation of a certain research-business culture based on a social capital of high quality. The relation system in the Silicon Valley serves as a model solution in this field. One should attempt at shaping an innovation system functioning on similar principles in Lower Silesia. Despite obvious differences and disproportions, it seems to be possible. Moreover, the experiences with the attempts at stimulating innovation in the whole world seem so far to indicate that there is no other possibility. (The issues are broadly discussed in Annex 1.)

When the innovations become mature enough for their usefulness to be obvious, the problem of their implementation through the production and service structures as well as the problem of profiting from the innovations appear. Lower Silesia is adequately prepared neither for one nor the other. Right now it seems to be a secondary issue compared with the deficit of the innovations to be implemented.

The knowledge of the subjects connected with the exploitation of innovations, though not at all simple, is much better codified and more easily available than the knowledge concerning the development of innovations. One can assume that professional institutions of support for innovations have it and will make it available. Developing a net of these institutions one can hope that the commercialisation of innovations will be carried out rather efficiently. What is more important, corporations, which have generally come to terms with the fact that their inner culture is not favourable for innovations, have developed a strategy for searching the populations of small innovation companies in order to identify those which have an already tested product at their disposal. These companies are bought together with the rights to their product which is then perfected and professionally marketed. If small companies with an attractive innovation and adequately secured intellectual property appear in Lower Silesia, buyers interested in them will certainly appear. In this situation, **the innovation policy of the**

voivodship should concentrate on initiating the process of mass creation of small innovative companies in the region.

The described mechanism will not suffice in the case of innovations directed at specific needs of the region such as, e.g. innovations in the health care system. In such a case, self-governmental authorities will have to carry out the task of a wide implementation of successful pilot projects. The logic of these projects, however, should not differ much from the functioning logic of small innovation companies.

1. Extension of economy's adaptability

In the coming years one should take into account the possible rise of instability in economy resulting from the overlapping of the EU reform-processes, globalisation, change in the consumption style in the aging societies, etc. The extension of economy's adaptability, i.e. its ability of fast adjustment to new challenges, can be the only answer to this instability. Each such an adjustment is an innovative substitution of old practices with the new ones that are more effective in this situation.

The extension of economic adaptability requires resigning from many established administrative practices. In particular, one should:

reduce the attempts at managing the development, and, instead, support the initiatives of entrepreneurs and innovators,

limit the horizons of planning, and, instead, extend the abilities to react to a change,

reduce the system destructive delays caused by complex and ambiguous procedures,

replace nominal priorities with the proactive ones — instead of declaring in advance in what fields the changes will be supported, concentrate on the ones where the pursuit of changes exists (game over the region).

Simultaneously, one should **limit modernisation through imitation**, and, instead, search for and implement more or less original solutions. At the same time, the **accepted level of risk** of the innovative undertakings must be **raised** as it is impossible to carry out an efficient innovative activity assuming that all, or even only the majority of the realized projects must be successful. One of the major difficulties on the way to creation of an efficient innovation system is the insertion of such a conscious type of risk into the procedures of institutions distributing public means. The costs of such a risk should be limited by cumulating them in the initial and pilot phase of the innovation and by implementing on a wide scale the solutions that have already been tested.

2. Systemic development of the existing competence resources

In the last decades (especially in the U.S.) the place where innovations are produced has been shifting from corporate laboratories to networks established by technological companies, research universities and capital markets. It is necessary to aim at creating a similar network in Lower Silesia, constituting an **engineering eco-system**. The existing resources should be shaped and developed with this aim in mind and development of new resources should be stimulated.

In Lower Silesia there are already quite a lot of elements necessary for constructing a regional innovation system. Nevertheless, some elements are missing and the ones that are there operate in isolation and they are far away from creating a network. It is necessary to activate the missing links (especially within the scope of innovation financing) and harmonise the

operation of the remaining ones. Atomising the existing structure requires **institutional and persuasive pressure of regional authorities**, stimulating cooperation and triggering-off synergy. Therefore, it is necessary to identify and persuade people, companies, organisations and institutions useful in developing innovative systems to cooperate.

The structure that needs to be built should be a **horizontal, flexible and intelligent network of co-operation**. The binding agent of such a structure is trust. It is necessary to facilitate system interaction through systematic increase of the **trust** level among its elements. A high level of decision openness and activity transparency is necessary. A decisive exclusion of those partners who violate trust should accompany the building of trust. Nevertheless, the system has to differentiate between failures related with a high risk of innovative activities, which need to be accepted and acts of violation and negligence, which should be penalised.

Small and medium-sized enterprises encounter a barrier on their way to innovation; this barrier is very high and at the same time little visible from the decision-making level: these are the financial and procedural thresholds of concluding innovation contracts. Little can be done without removing bureaucratic stiffness limiting the co-operation mainly between private companies, state research sector, the EU capital sources and the administration of the self - governments. Risk co-financing mechanisms are also necessary.

In the recent years opinions have crystallised which say that the basic innovative entities are the **regional** production or service **clusters**, comprising the entire complex of small and medium-sized enterprises and organisations contributing to the creation of a particular bundle of products. It is necessary to support the processes of shaping and strengthening the vital industrial and service clusters. In the present it is particularly urgent to strengthen the ties between companies constituting the core of such clusters and the regional research facilities, as well as regional co-operators. It is necessary to make use of the resources of areas equipped with service infrastructure and tax exemption possibilities for creating clusters of regional innovative companies and for attracting such companies from beyond the regions. The horizon of these activities cannot be limited to the regional scale. Certain valuable initiatives, such as The Highway of Newest Technologies (Autostrada najnowszych technologii) require co-operation of several voivodships. The other ones may extend beyond the borders of a country.

It is necessary not to **take for granted the areas in which innovations are expected**, and therefore supported. Such a policy usually amounts to a race with the industry leaders and very rarely ends in a success. The more unexpected is the innovation, the bigger are the chances for the novelty income. Apart from the economy and technology sector, and beyond these fields, interesting innovative activities should stand a chance of support.

3. Assisting innovators

True innovators will be recognised easily when their innovations prove their value. From that moment onwards they usually do not require support, because the market takes care of them. It is necessary to support potential innovators, and this group is much more numerous than those who achieve success in the end. The risk estimation criteria do not exist, and assistance is usually necessary for a number of years. What is more, if the assistance is considerable, persons successfully imitating potential innovators appear. Due to these issues assisting the innovators with public funds is extremely difficult.

The strategic task is **procuring the potential innovators for the Region and linking them with the Region**. The target group are young people with appropriate, yet rare talents. These are usually people who completed their studies, but not necessarily top students; they display practical creativity, which is very rarely noticed by the universities. In this phase of life they

are often looking for an **interesting job** and basic conditions for establishing a family. If they do not find it in Lower Silesia, they will leave and a great majority will never come back because they can work their way up with their talents in the whole world. Lower Silesia deprived of their talents may become a cheap workforce base for more successful regions. Therefore, a selection programme is necessary, which would identify such people, as well as scholarships (also PhD scholarships) which would exclude them for a couple of years from the everyday fight for existence. After they have been properly inculcated, they can be sent abroad for internships and practices – a great majority of them will come back with new competencies to the region which took care of them, others will act as the agents of Lower Silesia impact in the structures in which they choose to work.

Procuring potential innovators is a first step in the process in which **trust** has a decisive role. Innovative credit of trust is high-risk credit, the only real guarantee of which is the personal integrity of the borrower. Therefore, innovative successes are the domain of circles characterised by a high level of the know-who knowledge. Innovation gamble takes place in accordance with its own rules. Selection of winning solutions, which is necessary in the last stage of innovation, may be destructive in the first one. The road to innovative success usually leads through a series of failures. A number of persons have to strive with determination so that few can attain success.

The innovators often risk years of work, career opportunities and their own income for the pursuit of their passion. Maybe this is the aspect which distinguishes them from other people (the readiness for devotion is used by some business incubators in selecting the candidates). This risk has to be adequately compensated in the case of success. **Proper mechanisms securing the innovators' interests** are necessary, as well as social approval for their work. There is a common consensus that a group of innovations possible for financing by the own funds of the innovators is currently quite limited. In this situation it is necessary to couple the innovator's risk with the risk of the environment through **assistance by public funds or business funds**.

The innovators should occupy an important position in the regional networks of competencies of all types. This would not only increase the prestige of such networks. The networks need the spirit of innovation and the innovators need to establish contacts with companies, research institutions, facility organisations and private people of success, who – as it sometimes happens – become the “angels of entrepreneurship.”

The typical way to innovation leads through the stage of **small innovative companies**. These can be spin-offs, which begun in research institutions or industrial laboratories, they can also be individual initiatives of particular persons. Unfortunately, one can observe a tendency of unexpected complications in the procedures of establishing such companies; also the costs related to such activities are increasing. In a number of cases these necessities (repulsive for a creative mind) result in terminating innovative activity before it had even started. If an innovative company gets through this stage, then it has to establish its position on the market, providing insignificant and often untypical services. Meanwhile, the regulations to which it is subject are general provisions, established for companies operating in a routine manner. As a result, it is much more difficult to operate an innovative company than an ordinary company. Moreover, by operating in an unknown environment, innovative companies are a particularly easy target for swindlers. Inefficient legal system gives slight chances of getting out of such situations, which often leads to the bankruptcy of a company. A number of Lower Silesia innovators consider these aspects as the principal obstacles in their operation. At last, in the final stage there is the necessity to obtain and protect the intellectual rights. And also in this case the procedures and costs may constitute an insurmountable barrier for innovators acting on their own behalf.

Innovative talents are rarer and different from talents which enable businessmen to navigate efficiently in the procedural jungle. From the innovators' point of view, challenges related to it are more overwhelming than problems related with creating new products. One cannot dream about the heyday of innovative companies if the innovators will have to spend majority of their time in offices. **Without simplification, transparency and acceleration of procedures and without inexpensive access to procedural support institutions, there will be no innovations.**

4. External financing of research

The level of financing research in Poland is very low. It amounts to 0.7% of GDP in comparison with approx. 3% in Japan and in Korea, 2.7% in the USA, 2% in the EU and 1.5% (objective for the year 2005) in China. It is difficult to get rid of the opinion that the domestic political sphere, in majority overcome by the idea of modernisation through imitation (both business and social solutions), does not expect practical benefits from the existence of research and development circles and it is satisfied with superfluous solutions. Finances, for the major part, are concentrated in Warsaw, which may be sensible from the perspective of survival of the existing façade, yet it does not create conditions for development of regional innovative systems.

Polish economy is very weak in financing research. In the U.S. business contributes into research 200% as much as the state, in the EU it is approx. 125%, whereas in Poland – 60%. It is possible that the forecasted tax allowances will change that, though these will not necessarily be money which is bone fide innovative. Funds from the capital market, allocated for financing innovative projects, are practically inaccessible.

Hopes for the future of regional research and development institutions are currently connected mainly with the European structural funds. It is commonly believed that they will considerably exceed the value of currently available funds. The institutions hope that the Office of the Marshal, making use of its position on the decision path, will give them a wide access to such funds and that they will be able to develop their activities in a better and more intensive manner.

The problem is connected with the fact that the activities pursued by such institutions are slightly related with innovativeness, at least in a direct manner. As a consequence, increased funds may improve indexes which these institutions have grown accustomed to maximise (scientific promotions, publications, quotations, even patents) – without real economic effects. At least such effects were observed in the EU and in the U.S.

The administrators of public funds (including European funds) come across a well-known dilemma: to provide a fishing rod or a fish? The answer may seem temptingly simply: it is not necessary to support institutions, but only pay for what such institutions do for the innovative system. It would really work this way if the innovative processes were predictable and scheduled, if it was possible to define costs and benefits at the very beginning. However, the reality is different, which is clearly shown by failures of innovative projects in the last decades. Due to this fact, the obvious answer (on the surface) is only partly true.

Financing innovations in the Region will be very difficult in the nearest future. The situation may improve after the introduction of the regulations scheduled in the National Development Plan 2009 – 2013, pursuant to which some costs will be borne by the budget (tax preferences, etc.). These funds will be considerable, but not great. It is necessary to do everything possible to procure funds for innovation also from companies and financial institutions operating in the

Region. Also the budget of the self - governments should allocate some funds for these objectives.

5. Practical orientation of research

Research organisations need information on the direction of progress, because then they could organise their tasks in a rational manner, and in particular adjust the conducted research to the demands of the market. However, the knowledge offered in this field recently turned out to be unreliable, and the extrapolation of trends as a factor guiding to innovations is also fallible. In the U.S. there are opinions that the **attempts to identify the next “big thing” should be abandoned** and that instead it is necessary to improve the dynamics of the innovative systems. In this situation research strategies arising from premises other than trend extrapolation seem to be more attractive.

The conception of **concentrating research on interdisciplinary problems** seems to be very interesting. The tendency which leads in the direction of disciplinary development of science has resulted in a situation where only the areas of the paradigm central for a given field were exploited, which left white spots on the peripheries. It has been noticed that the current main stream of innovations has a character of associating solutions which have been worked out in various fields. The U.S. promotes the idea of convergent technologies. The term refers to a synergic combination of four important disciplines of science and technology, all of which are currently developing with great speed. These are: nano-knowledge, nano-technology, biotechnology and bio-medicine (including genetic engineering), information technologies (including advanced computational techniques) and communication technologies, as well as cognitive sciences examining the operation of the nervous systems, especially its cognitive aspects.

Another idea worth considering is research focused on the **needs of less affluent markets** (including Poland). At present, approx. two billion people are within the scope of market economy, joining another billion which has lived in such conditions in the 20th century. Their summary purchasing potential grows suddenly, but calculating per person, it will be much lower than in the EU and in the U.S. for quite a long time. This opens a huge market of innovations directed at simpler and cheaper versions of products and services (e.g. medical), which will be in great demand in developing economies. It seems that a competitive success is easier in this case than in the case of competition between the giants on the markets of the most affluent countries.

In accordance with the OECD, the universities (in the sense of research educational centres) are generally under pressure to assist the national and the regional innovative systems in a more direct manner. This issue is particularly clear in Poland, where the majority of the existing research potential is concentrated at the universities. The institutions established in the past as engineering potential of planned economy have collapsed or are unable to find their place in the market system.

The research system connected with the universities, analysed from the perspective of regional innovative usefulness, does not look too good. First of all, it is weakly connected with the Region. The universities are usually supplied by the state and (in perspective) by the European budget and their own ambitions are focused on the international market of publications. What is more, the research system is not interested in the final product, i.e. innovations which exist on the market, but in the institutional durability and formally valued manifestation activities, which have impact on the flow of funds from the head office.

This state of affairs is a consequence of new, old and long-forgotten priorities and regulations, the main objective of which was improving the comfort of hierarchic administration. This system demonstrates commonly known weak points, such as excessive specialisation, engagement in multi-stage academic careers, low mobility and inappropriate fluctuation of personnel. The situation has been exacerbated in the last few years by the participation of research educational centres in a national race for students. The employees of these centres are definitely busier than a few years ago, yet they are occupied with something else than producing innovations.

The absurd nature of the existing state of affairs is increasing at the universities and more and more is being said about the necessity of reforms. In the strategy prepared by the Wrocław University of Technology, the first place is occupied by the demand for commercialising research oriented towards the needs of the Region. The Region has to back up these activities in a decisive and intelligent manner.

The core of the problem is the inflexible administrative and financial structure of universities imposed by legal regulations and accumulated shortages in the laboratory base on the one hand, and on the other the capital starvation of the existing and emerging innovative companies (a large number of such companies derive from universities). In these circumstances the universities are forced to impose high overheads and conclude inflexible contracts, which rule them out as partners of small and poor innovative companies, fighting for survival every day. As a result, a surrogate circulation of competencies is created, within the scope of which the university teachers provide services to different companies on a more or less private basis. The advantage of this solution is the fact that their competencies are available cheaply, quickly and directly, which even brings to mind the operation of the Silicon Valley. The obvious drawback is the fact that universities do not receive any funds because of that, which causes depreciation of the research base and decreases the personnel's availability. The external capital has to flow to the contact point of innovative companies and universities; this solution would decrease the access barriers of the companies to the research potential of the universities. There are no obvious and simple recipes, and radical actions may throw the innovative baby out with the dirty bath water of current connections. It is however obvious that **a quick and flexible solution of the problem of financing research services at the universities is a condition for the Region's innovativeness.**

In this place it is necessary to emphasise that the significance of universities for the regional innovative system is not exhausted by the practical orientation of research. Universities are first of all the places of transfer of knowledge and forming human and social capital, which constitute the main substratum of innovation. It is probably true that the most interesting and the most important innovations emerge in the margins of the traditional research fields. However, these margins cannot exist on their own – the traditional system is necessary for the margin to come into being. Appropriately liberal selection pressure, which is also characteristic for academic circles, is also necessary so that the margins can survive. The professors of the universities are also of great importance – as the elite of competencies and good habits they constitute a significant element of regional cooperation networks.

6. Shaping innovative attitudes

The connection between education and innovativeness is highly ambiguous. Among prominent innovators there were great numbers of self-taught persons and persons who had no academic successes. Contemplating biographies of innovators and the context of their activities one can draw conclusions about the elements of educational system which

contribute to shaping innovative skills and attitudes. Unfortunately, these elements are pushed aside in the current school practice. They refer to the form of **providing knowledge** (and not only information), **developing talents and shaping attitudes**.

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Knowledge disseminated in schools creates objections both with respect to its contents and form. These are the two particularly important examples. Well-revised **knowledge in the field of exact science and natural science** is extremely important for innovators. As it is known, the position of these subjects in the preferences of schools and pupils is falling. What is more, the number of classes devoted to them is decreasing and the programmes and manuals get rid of everything that could appeal to imagination and root the new concepts in intuitions deriving from everyday life. Instead, formal terminology is introduced with great effort, but no time is left for discussing the interesting applications. As a result a number of potential innovators finish their education without having experienced an intellectual initiation.

The second example refers to **shaping of interests and technical skills** (including manual). In the past the everyday environment was replete with products of simple structures, which could be easily disassembled, assembled, repaired and even improved. It was easy to develop a technical knack and stir interest in technology. In the times of disposable items and authorised services, when practical knowledge of technology is limited to the operation of an appropriate remote control, it is much more difficult to become an innovator. And in this situation the schools have decided to get rid of technical classes...

Schools have a tendency to present knowledge in the form of a labelled system. For a person with innovative disposition knowledge is a set of tools, which can be more or less useful in solving an interesting problem. Such a person is interested in choosing the right tools from different drawers, and not compiling a set of tools from one drawer. The innovators need to be taught by **learning by doing**. Modern schools do not have possibilities for that and in the number of cases they also lack competencies.

The impact of personal examples is of primary importance in the shaping of attitudes. Schools lack teachers with innovative skills, potential and attitude. Providing young people with contacts with such persons would require the educational centres to open to creative persons from the outside: inventors, entrepreneurs and artists.

Despite the whole diversity when it comes to innovators, there are a few features which almost all of them share. The most important one is **imagination and curiosity**. Presently, they are destroyed even in kindergarten, where children are overwhelmed with literal toys and exposed to uncontrolled flood of information. The school continues this act of destruction, providing children with prefabricated information which is necessary to pass tests. Other important features are: **courage** (the capacity to accept cognitive risk), **ambition** (willingness to tackle problems which proved too difficult for others) and **loyalty** (capability of co-working in a team). Schools – on every level – do not devote appropriate attention to these features.

At last, at the foundation of innovativeness there are the resources of social capital. This concept comprises social bonds, based on solidarity and trust, which make it possible to

cooperate in enterprises characterised by high uncertainty level. All the educational levels should attempt to increase the level of social capital. This objective has been commonly, though not consciously, ignored. It is necessary to get rid of accumulated dysfunctionalities, e.g. through getting rid of the cabinet system in schools or through more intensive integration of student groups at universities.

The drawbacks of our system are nothing peculiar. It has been stressed in a number of studies that the foundation of economy based on knowledge is the proper educational system. The OECD experts are extremely critical towards the existing practices. In their opinion: *theses that at the universities the students should acquire codified and theoretical knowledge as a preparation for its practical application cannot be further sustained. They argue that: the students cannot be taught something that they need to know – they can only be properly trained. They declare that the didactic mode: (lecturer – student) is defective and they postulate going back to the apprenticeship model (master – pupil). They emphasise that a very important function of a university is shaping cognitive and social manner in which the students act, including readiness to take risks and loyal co-operation. They draw attention to the fact that the university environment is not an environment where the students could easily acquire features such as flexibility and creativity, which would allow them to adapt and be successful in inappropriately defined, ambiguous and open situations which they often encounter at work. They argue that we are at the starting point of understanding the interdependence between education and social capital.* Whilst modernising didactic processes at universities, one has to take into account conclusions drawn from these observations.

The Voivodship cannot change the programmes of teaching, yet it can provide arguments for the introduction of changes. It is necessary to make use of school-specific programmes for carrying out changes (on experimental scale) which contribute to the education of the future innovators. It is necessary to diversify the didactic offer in a way that the widest possible range of skills is included. Diagnostic and methodical assistance for the teachers who come across students with above-average innovative talents is necessary. This implies further development of the “zDolny Śląsk” system. Space is necessary (both in literal and metaphorical sense) for creative experiments.

7. What should be done?

The answer to the question: “how to develop regional innovativeness?” should be innovative. The procedural philosophy embodied in the Lisbon Strategy has to be treated with reserve, because it seems to be a failure. Nevertheless, the objectives of this strategy are still up-to-date. The orientation of the innovative policy of Lower Silesia should be as follows:

The most practical and the most obvious task for the immediate years is developing competence within the scope of procuring structural funds. At the same time it is necessary to develop a system which will invest the obtained funds in a good manner.

The strategic objective is building a regional innovation system, based on local economy and supplied by local economy, and at the same time included in the global system of capital and information flow.

Innovativeness described in comprehensive terms is an organic creation; its basis is social capital, i.e. competencies of people plus trust. Increasing social capital resources in the Region is the primary task. The regional educational, social, business and political systems should be evaluated and improved with this perspective in mind.

Innovative society is a network society, based on personal contacts. It is necessary to assist initiatives conducive to formation of various co-operation networks for Lower Silesia among various actors on the regional stage.

It is not possible to design and build such a system; it has to evolve from the resources of the Region. These resources are defective and dispersed, but quite significant. It is necessary to use all efforts so that they see the moment of their usefulness in a good state.

Further progress in integrating Wrocław with the rest of the Region is necessary. Wrocław is the main basis of competencies which the innovators need; the Region is the base of talents, opportunities and capital. Both sides need to understand the nature of mutual interests in a better manner.

After the accession to the EU, the processes taking place in the Region, including innovative processes, will depend on the processes taking place on international scale to a greater extent. On the one hand we gain access to huge resources of competencies and funds, on the other, our innovators may easily disappear from the Region. These issues require uninterrupted attention of all the parties interested in the prosperous future of Lower Silesia.

It is not possible to develop experimental economy without experimenting. If at present the existing regulations exclude such possibilities, they will either have to be changed, or there will be no innovative economy. Lower Silesia has sufficient potential to make its initiatives and arguments understandable for the politicians.

Moreover, it is necessary to create social demand for innovations. Wide public opinion is not so much interested in innovations as before; its attention is drawn only by those which have a sensational aspect (e.g. cloning). Innovations are treated as phenomena taking place in a world far away, from which the ordinary people will not benefit and with the creation of which the ordinary people have nothing to do. There are quite common opinions that the risk should be taken by others and that we should only apply verified solutions, because we will never come up with any ideas. Changing this attitude will increase the chances of success of the regional innovative strategy. The awareness of innovative solutions created in the Region will be a strong impulse for the positive shaping of regional identity.

3. Strategic mission

On the day of Poland's accession to the European Union, the context in which Lower Silesia was functioning has changed. Suddenly it ceased to be important that we are one of the best developed and best situated regions of Poland; that fact that we are one of underdeveloped, peripheral regions of the EU became of primary importance. Our regional metropolis is a pretty, vital and fourth biggest city in Poland, yet in the group of fifty EU cities with population of more than half a million people we still have to work on our position. Young, ambitious people do not have to pursue their careers in Wrocław or Warsaw anymore; Brussels, Berlin, London, Paris and other equally fascinating places are also within the range of their opportunities. But who will take care of the future of the less resourceful Lower Silesians who are left? Our economy makes benefits from good economic conditions in the EU, but it will also experience its potential troubles, e.g. at the Iberian Peninsula. These issues are not new. Even though no one exactly knows what to do, there is awareness of potential benefits and risks resulting from current relations between the normality of the present-day Poland and the normality of the EU, which invited us to its team.

A different story is being aware that this European normality, which a number of us treat as a target model for our way to better future, is not a static creation. On the contrary, it is at a threshold of difficult and fundamental changes, which have been postponed for a long time but which cannot be postponed any longer. Regulations regarding retirement pensions, health service, employment, migration and other practical issues need to be reformed, and in the background a wider conflict is swelling, related with European identity and values. Europe also has problems with its economy, which loses competition with the U.S. economy. This distance has been increasing for the last thirty years. Until recently, it seemed that at least the second place was guaranteed, but with the revival of China, the entire South-East Asia experiences regeneration and competition has intensified. Therefore, the Union decided on a pursuit, yet the Lisbon Strategy, which was supposed to guarantee success, turned out to be a fiasco. It is difficult to see what will emerge from this confusion, yet the new Europe will be quite different from the one we know now and which many of us want to pursue.

Changes are also approaching with respect to other contexts. Terrorism has emerged as a force which is capable of disrupting global politics. If the other two billion people in China and India will join, as it is forecasted, one billion of present-day consumers, the black scenario referring to the environment and natural resources presented in the first report of the Club of Rome may materialise rapidly. Other challenges described in the Strategy of Lower Silesia Voivodship are also active.

What can Lower Silesia do in the face of clearly defined yet not entirely precise challenges, entangled in ties which stun by their complexity? If it is not possible to foresee the future, plans and priorities lead nowhere. The only thing that can be done is development of social, economic and intellectual potential, making it possible to recognise and react properly to the emerging opportunities and threats. As there will be no ready-made answers for a number of key-questions, their quick preparation is of primary importance. Therefore, innovativeness becomes the key. This is where the mission of our strategy derives:

Innovativeness as an answer to the future challenges

In this spirit we would like to shape the future of Lower Silesia as a region which is creatively involved in solving its own problems and reasonably contributing to solving the problems of Poland, Europe and the whole world. Technological innovativeness, oriented towards the market, constitutes the fundamental subject of the Strategy. However, we perceive it as a

derivative of a wider phenomenon: pro-innovative activity of the inhabitants of the Region, especially its financial, economic, cultural, academic, political and social elites.

4. Strategic objectives

The main objective of innovative strategy is to build economy based on knowledge in Lower Silesia and by these means to increase the Region's adaptative potential. Only in this manner the Region will be able to face the already sensed and emerging challenges.

The cluster of seven strategic objectives presented here indicates the areas where the activities supporting innovativeness concentrate, and which have to find their place in the voivodship politics. They refer to: economic structures, research potential, support institutions, conditions of innovators' operation, educating innovators, promoting pro-innovative attitudes and forming social capital.

Each of the strategic objectives has been combined with a few programme indications. These indications refer to pro-innovative activities for which the voivodship authorities declare their assistance. Proposals of undertaking these activities are presented to various persons active on the Lower Silesia business, research, financial and political scene; persons, who are interested in co-operation in the form of a gamble for the region, adopted in the Development Strategy of the Lower Silesia Voivodship.

The specified objectives have been arranged in the form of priorities due to three aspects:

A harmonious development of the regional innovation system is necessary, which requires simultaneous actions on a number of levels.

In accordance with the rules of the gamble for the region, the Voivodship's assistance should be directed at areas which demonstrated the greatest activity, invention and readiness to engage their own funds.

The European Union policy has shifted from assisting individual industries onto horizontal objectives, such as: regional development, employment, environment, research and education.

Strengthening regional competence blocks

From the point of view of regional policy, the basic objective of innovation policy is supporting regional business clusters, especially stimulating their development in the direction of regional competence blocks.

The main industrial clusters of Lower Silesia, i.e. copper and power industry, show a considerable level of regional roots, and they have at their disposal considerable financial capital and human resources. They can transform into regional competence blocs on the condition that their mission is defined in a wider manner and their activities are harmonised with other entities. All activities aimed at eliminating deficiencies with respect to the scale and completeness of their functions need to be assisted, related for example with making use of the regional research, conceptual and cooperative potential.

The main service cluster, i.e. health services and tourism, is integrally linked with the Region, it generates a large number of work places and it is indispensable for the well-being of the inhabitants. Due to various considerations both of these services are in the state requiring huge innovative potential – continuing the previous practices threatens with systemic bankruptcy. Assisting innovative projects in these fields has to attract attention of the Voivodship authorities.

The financial cluster which is emerging in Lower Silesia demonstrates strong innovative components. Its development lies within the Region's interests, also due to the fact that it brings hope for the establishment of a regional system of financing innovations.

It is necessary that the production and service companies dispersed in the Region organise themselves into a cluster, especially companies which generate large numbers of work places and make use of regional resources (food processing industry, mineral products, construction, transport, etc.). It is necessary to take care of the completeness of the emerging structure so that they comprise specialist financial and procedural services, research potential, consulting, training, IT networks, etc.

The hope of the Region relies on the emergence of new clusters, especially within the scope of new and original technologies. The traditional directions of support are: IT technology and pharmaceuticals, and in this respect the potential of the Region is quite considerable, yet it needs to be further developed. It is necessary to support, in a decisive manner, the process of formation and maturation of spin-offs, especially the ones related with the regional research potential and oriented towards the needs of the Region.

A specific strategic challenge is the naturalisation of foreign outsourcing companies with the companies of Lower Silesia. As a rule, such companies do not develop a local innovative activity, importing know-how from their parent companies. It is necessary to assist measures which have the objective of making these companies rooted in the regional innovative system.

Cluster-assisting activities cannot be hindered by the fact that some of them go beyond the borders of the voivodship or even the country (e.g. potential cluster of vehicle producers).

2. Activating research circles

The research potential of the Region, which is nominally quite considerable, has to start supporting the regional innovation system in a real way. The self - governments of Lower Silesia should concentrate on stimulating investments going in that direction, especially those which do not find proper supply in the existing system of research disciplines.

In the processes of creating innovations, theoretical knowledge is inseparably intertwined with experimental knowledge. It is necessary to design solutions which will allow for smooth and easy inclusion of the academic research workers in the activities of small innovative companies. Sporadically, it is necessary to support inclusion of innovators from companies in the didactic and research activity carried out in tertiary-level schools. This will require the schools to redefine their principles of co-operation with the economy sector in an innovative manner. Funds are necessary to reimburse the universities for the costs of this activity.

Dominant sources of innovations are creative combinations of the already known solutions into new products. This indicates the necessity of supporting interdisciplinary projects, which go beyond the borders of the existing research disciplines. This in particular refers to the activities which may result in development of innovative production in the Region.

Research teams should not be entirely excluded from the mobilising pressure of competition. The postulate of not duplicating research is only sensible in the case of projects devoid of innovative elements. In the first phase of innovative projects it is worthwhile to commission research on a parallel basis.

Creation of the Lower Silesia innovation system is conditional upon active and efficient inclusion of the potential of regional universities and research centres in the activities increasing competitiveness of the regional economy. In order for these units to meet their requirements, efficient mechanisms of financing them by the economy of the Region need to be created, as well as European funds and projects generated on a regional level.

Awareness of the needs and potential of Lower Silesia is not satisfactory in the scientific circles. It is necessary to increase the attractiveness and prestige of research carried out for the Region by creating a voivodship system of awards and scholarships. It is necessary to support innovative projects resulting from such research and in particular to finance pilot projects.

The Region has to have at its disposal competencies within the scope of newest technologies, at least due to the technology transfer and attracting investments. It has been indicated that the most promising direction is set by the so-called convergent technologies (nano-bio-info-cogno). High hopes are pinned on the establishment of the Lower Silesia Centre for Advanced Technologies. Regional research and educational centres have to be supported in maintaining contacts with the directions of scientific exploration developed in the world.

3. Construction of innovative infrastructure

Lower Silesia should have at its disposal innovative infrastructure, assisting both the incubation processes, as well as innovation commercialisation. Modernisation and extension of the existing system is necessary, as well as equipping it with new elements. Lower Silesia enterprises, especially small and medium-sized enterprises, as well as individual innovators should have an easy and inexpensive access to the entire range of necessary services.

The critical phase of the innovation process comprises period in which a risky idea should be transformed into a promising prototype, whereas the innovator lacks both means and business experience. Establishing and financing business incubators should be assisted, especially those incubator models which relieve an unseasoned innovation company of administration and logistic activities.

In the phase of innovation maturation, the access to new technologies becomes critically important, as well as obtaining information which refers to intellectual property, sources of financing, administrative procedures, etc. Development of technology transfer centres and centres of excellence should be supported, as well as other consulting and training organisations and companies. The best way of support is subsidising the access of the beginner innovative companies to appropriate services.

Obtaining certificates which admit the innovative products to various markets becomes indispensable in the final phase of innovation development. Development of the network of accredited laboratories authorised for issuing such certificates should be supported, especially in the case of products created in Lower Silesia;

The newly-established innovative companies hardly ever have enough funds to invest in the indispensable production infrastructure. In such a case localising the company temporarily in a technology park or technology and industry park may turn out to be beneficial. Such parks should be created and developed along with the increased demand of the innovators for this form of assistance.

Effective information infrastructure ceased to be a competitive advantage and has become an indispensable condition of surviving on the market. The development of companies offering services in this field should be supported, as well as development of commonly available broad-band information networks in the Region and its surroundings.

4. Financing innovations

The principal drawback of the Lower Silesia system of financing innovations is its absence. This situation also occurs in other regions of Poland. In order to create such a system, legislative solutions which have been announced for a long time need to be implemented on a national scale. Such solutions should allow for: tax preferences, distributing the risk of innovative activity, incurring innovative credit, access to the seed-capital funds for newly established companies, public and private partnerships, etc. By the time the above solutions are implemented, the possibilities of financing innovations in the Region are extremely limited; however, they exist and it is necessary to make use of them.

The possibility of accessing the European structural funds will attract the attention of a number of entities. It is necessary to strive for their pro-innovative usage with full determination. Structural funds have to finance development and not activities restraining processes of creative destruction in economy.

Certain financial institutions and large companies in Lower Silesia have at their disposal sufficient funds to support the innovative activity in the Region. It is necessary to convince such entities to create regional funds of the venture capital type and regional guarantee funds, which could vouch for innovative enterprises.

In the situation of general innovative downturn, each positive example may have immensely mobilising impact. Despite the generally tense budgetary situation, the self - governments should find at least meagre funds for financing specific innovative projects in their areas.

Despite the wide-spread opinion, not only public funds and financial markets may support innovators. A great number of small innovative companies were established and became successful (especially in the U.S.) thanks to the engagement of resources of private persons, called business angels. Efforts must be made to develop such practices in Lower Silesia.

The voivodships which represent populations of a million or more may significantly affect the course of legislative procedures in the country. It is necessary to make use of such possibilities in order to accelerate introduction of legal solutions which streamline innovation financing.

It is often difficult for small and medium-sized companies to navigate in the jungle of ever-changing regulations, which constitutes an important barrier in their operation. It is necessary to create a regional system of information about financing innovative enterprises for such companies, including information on future possibilities.

The key problem in innovation financing is making it possible for the innovation companies which lack capital to access the research potential of universities, often coping with financial problems. It is necessary to create a system decreasing the prices of such services (e.g. reimbursing the companies for the extra charges imposed by the universities).

5. Decreasing barriers for the innovators' activities

The most precious and the most unique resources of the innovation system are the innovators. It is necessary to create a system which will allow them to concentrate on making use of their talents. Therefore, it is necessary to relieve them of the tasks which can be performed by other persons. This is particularly important in the case of the initial phase of innovation, which precedes the moment when its market value can be estimated.

The condition of innovative success is the short time elapsing between the idea and its introduction to the market. This time has been considerably prolonged in recent times, due to

quickly growing procedural requirements. It is necessary to strive for facilitating and shortening the flow of procedures conditioning the success (registration of a company, obtaining certificates, protection of intellectual rights, etc.). Professional services are required in this respect and their co-financing from external sources.

The impassable barrier on the innovator's path is financing the initial stage of the innovation. It is necessary to commercialise the advances for obtaining high-risk funds, in order to make money on successful innovations and not on potential innovators. Specialist companies, which are financed from participating in the allocated grants and not by remuneration for preparing grant proposals, are necessary. Formation of such companies should be stimulated and mechanisms limiting their risk should be created, supplied by public means.

A critical factor of an innovative success is trust. A "Lower Silesia Certificate of Innovative Credibility" – having a more or less formal form – is necessary. It would be a form of a regional passport, opening the way for verified innovators to quicker decisions and more favourable credit. It is necessary to establish an authority granting such certificates and strive for their general recognition.

The most difficult task referring to an innovative system is spotting and assisting the unverified innovative talents. This refers to young people, often without the appropriate funds and without reputation, yet who have ideas which may seem absurd to the specialists in the field. It is necessary to separate a certain amount of funds and allocate it for financing such ideas on the basis of credit trust. Due to the inevitable lack of objective criteria in such cases, the funds should be divided at random within the group of projects and people which meet the general initial requirements.

6. Education for innovation

The innovative future of Lower Silesia depends first of all on the fact whether a regional educational system is training innovators. Innovators need an extensive general knowledge, specific detailed knowledge and creativity, ability to learn through experiments, cooperativeness and communication skills. Shaping such personalities should commence already in kindergarten. This calls for significant changes in the existing education model, especially putting a stronger emphasis on shaping social capital.

The utilitarian model of the educational system, focused on transfer of knowledge preparing for a given profession is inappropriate. Educational institutions should shape the social capital, i.e. create opportunities for building bonds based on trust and solidarity, exercise co-operation activities and devote much more attention to the solution of open problems of practical character. The teacher environments should be supported in establishing appropriate conceptions.

The current drop in the birth rate provides an opportunity for carrying out changes in schools which allow for shaping the social capital. It is necessary to eliminate dysfunctional practices (e.g. cabinet system). Eligibility criteria dominated by the average of grades should be supplemented with group rankings. It is necessary to increase the mobility of teachers in a substantial manner, so that they can become acquainted with the experiences of other schools in the Region, in the country and abroad.

The current educational system loses the talented students, because they are not treated individually and no heavy demands are made on them. It is necessary to develop a consistent, and at the same time a diversified and flexible system of teaching the talented youth. It is

necessary to restore the master – pupil relation at the universities. It is necessary to make use of the “*zDolny Śląsk*” programme to select and support innovative talents.

Both the existence of easily accessible higher vocational school and development of first-rate academic centre in Wrocław are in the Region’s best interests. It is necessary to put an end to the recruitment competition between the universities and the higher vocational schools, which is destructive for the level of education. It is necessary to work for a coherent and at the same time flexible system of higher education in Lower Silesia, in which the higher vocational schools would prepare its best graduates for further academic studies, and in exchange they would receive staff and programme support from the research universities.

Chances for innovative achievements and interesting jobs are higher if the graduates have unique skills. Talented students should have an opportunity to commence interdisciplinary M.A. studies and Ph.D. studies, so that the competence resources of the entire environment are used. Incentive systems for students and for researchers engaged in such activities are necessary, especially when the directions of studies are connected with the needs of the Region.

As a result of accession, the educational system of Lower Silesia has become a part of the European Union system. This opens previously unknown possibilities of extending the scope of studies and transfers of good practices. At the same time it causes an important competitive challenge for the Polish universities, in particular the universities in Lower Silesia. It is necessary to develop a more international course of studies and prepare a model of studies in the Region which would constitute an attractive alternative to studies abroad and at the same be interesting for students from other countries.

Opening onto Europe allows for returning to the classical practices of apprenticeship, where young people used to travel around the world for a couple of years, working and studying, and then they would come back to their hometowns, enriching them with the new skills and observations. This type of mobility of the pupils, students and young academic staff should be supported; what is more, it is necessary to finance various activities conducive to obtaining such experience.

7. Propagating pro-innovative attitudes

The innovative Lower Silesia has to break away from the proliferating syndrome of impossibility and secondariness, which immediately excludes a different type of development than imitative and sponsored one. It is necessary that the self - governments undertake activities aimed at promoting innovative successes, awarding innovation authors, and in particular providing tasks which require an innovative approach.

In a situation where the way to the European material well-being average has to take (calculating cautiously) two or three generations, we cannot afford to copy a set of “European standards.” It is necessary to search for innovative methods of arriving at the required standards in a cheaper way and better adapted to the local conditions. The self - governments have to formulate these types of challenges for the research centres operating in the Region, companies and individual innovators.

Clear and measurable signals are necessary that Lower Silesia focuses on talented and creative people, who want to bind their future with the Region. Adequately oriented scholarships should be established, e.g. *Lower Silesia Trust Credit* – for young and talented people and grants, e.g. *Finish What Was Started* – for people have already had some achievements yet no measurable success.

The self - governments of all levels should take their pride and ambition in organising original innovative enterprises in their area and with the participation of local people. The Voivodship Marshal should organise regular and properly publicised contests, such as: *Idea of the Year*, *Young Innovator*, *Innovative Commune*, *The Most Resourceful Person of Lower Silesia*, etc.

The most valuable innovation initiatives usually arise from practical observations. It is necessary to create conditions for employee innovativeness in companies and organisations. The practices of Japanese companies may be applied here to a large extent, and to a certain extent it is possible to make use of the experiences of the streamlining movement. The self-governmental authorities should both propagate initiatives and act as an example in this respect.

Construction of post-innovative culture in Lower Silesia will not be successful without active support of the local media. The journalists are indispensable not only for demonstrating successful measures but also for explaining to the public opinion the intricacies of the innovation game, whetting the innovation appetite of companies and organisations and developing innovative ambitions among the talented youth. The self - governments have to value and stimulate this type of journalism.

8. Accumulation of social capital

The foundation of all types of innovation processes is the social capital. It is necessary to develop dense, formal and informal networks of connections between the main actors of the Lower Silesia scene, oriented towards exchange of ideas and co-operation for the implementation of common welfare. The networks should comprise possibly largest circles of persons active in all essential spheres of the Region's life.

- In the circles of practitioners and in the media, the role and significance of the social capital were ignored or at least neglected until recently. It is necessary to make this a subject matter of a wide political debate. Without common understanding of the mechanisms of functioning of the social capital, the innovation processes will not be able to break through suspiciousness and get away from the stifling procedural corset.
- The Lower Silesia Political and Economic Forum (Dolnośląskie Forum Polityczne i Gospodarcze), organised in Krzyżowa, has gathered strength and became the model investment building the social capital of the Region. It is necessary to support this institution and to make sure that it is surrounded by initiatives of a more permanent character.
- The discussion forum of Professor Dudek is a phenomenon not only on a national scale. On the one hand, the forum is stimulating the social capital and on the other it is an excellent example of a successful social and technical innovation implemented by efforts of a single man, with minimum outlays. Such initiatives should be promoted and their philosophy popularised.
- It is necessary to support activities directed at open dialogue of specialists beyond their specialisations. Some academic associations still continue the esteemed traditions in this respect. However, it is necessary to fill such activities with greater impetus and range of impact.
- A good method of including competent people from different circles in the activities aimed at innovative development of the Region is the foresight type project. Its participants discuss the potential scenarios of events and try to work

out opinions which may turn out to be useful for persons making decisions in uncertain conditions. It is necessary to organise and sponsor such projects.

- The self - governments of Lower Silesia have to appreciate and display people who have considerable innovative accomplishments. Prestigious awards are necessary for people whose broadly understood innovative success should be an example for others.

- The role of the media in the network activities is fundamental and extremely sensitive. The media are necessary in the processes of exchange and consolidation of ideas. The media have to make sure that the co-operation networks do not degenerate into corruption networks. The media have to take into account the fact that the innovative activity is and will remain a high risk activity, based on trust and the process of trial and error – and to make it clear in its communications. Procuring the support of the media for the idea of innovative Lower Silesia will belong to the most important and the most difficult tasks of the executors of the Strategy.

5. Implementation and monitoring

As it has been emphasised in a number of other places in this document, the regional innovation system, harmoniously combining very diversified elements which operate in different logical systems, such as: individual innovativeness, entrepreneurship, research works, administrative activities and financial engineering may be created and may function only by means of good understanding among all the partners, good will of the co-operating parties and a high level of mutual social trust. In a word – thanks to high level of social capital of a region. This capital is increased through organic processes, which should be reasonably directed, stimulated and supported, and not through implementation of clearly defined procedures, compliance with predetermined schedules and execution of precisely defined measures. Therefore, it requires comprehensive engagement for the sake of commonly accepted objectives of the *open space approach*. The basic implementation mechanism should therefore be **the gamble for the region**, the rules of which have been included in the development strategy of Lower Silesia Voivodship. In short, it relies on the fact that the self-governmental authorities support all the activities that are included in the strategy (or they contribute to the objectives included in the strategy, despite the fact that there were not listed by name in it) by means of available resources, i.e.:

establishing contacts between persons and environments interested in a given enterprise with other persons and environments operating within the same field;

providing indispensable administrative assistance;

providing financial support out of its own funds and external funds (including the EU funds);

providing assistance in compliance with procedures (including completion of applications) indispensable for obtaining material resources.

In order to meet these obligations in a more efficient manner, it is necessary to improve the operation of the administration and enhance the regional structure with a few institutional elements.

1. Professionalisation of procuring funds for investments

Procuring funds for innovations and pro-innovative activities should be made professional to a maximum degree. It is necessary to make best use of the available European resources, especially the structural funds, but not neglect other possibilities of obtaining similar sources of financing. It is necessary that these issues are handled by a specialist unit of the Office of the Marshal, employing persons who will be constantly updating their knowledge in this field. On the basis of inter-regional contacts of the Voivodship, they will be granted access to the best experiences in other regions; an internship in the Region's office in Brussels would also be necessary. Among the duties of the unit would also be dissemination of the acquired knowledge and maximum assistance for the innovators in overcoming procedural obstacles.

2. Rapid assistance paths for innovative projects

In the case of innovative ideas the critical element is time. In some cases even a slight delay in relation to the competitors may mean that immense advantages related with a given innovation will be lost.

Therefore, the review of all administrative procedures from the perspective of their time-consumption is necessary. The time has to be reduced to a minimum with regard to all the participants, and for innovative projects it is necessary to introduce additional rapid paths which allow passing over the possible blocks. Administration problems refer to various level and structures of the system, therefore there is no other way of solving them but through a sort of a Pact for Pro-innovative Activities, concluded by all the interested self - governments of a voivodship (voivodship, powiat and communal) as well as the state administration authorities operating in the Region. This Pact, concluded under the auspices of the Marshal and the Voivode could result in a review of procedures, their adaptation, introduction of special procedures, promoting better solutions, etc.

The speed of obtaining financial support is also a key factor. The issue of assistance in the access to the European funds has been discussed in the previous section. However, this does not exhaust all the possibilities. One should not rule out support for innovative activities from the financial market. Nevertheless, the banks operating in the Region and other financial institutions will have to understand the specific character of such an activity and maybe generate appropriate procedures and mechanisms. Activities aimed in this direction, carried out within the framework of gamble for the region, should be stimulated and supported by the self - government of the voivodship.

3. Lower Silesia Fund “Stawka na innowatora”

Implementation of strategic objectives, apart from the access to the European funds or the voivodship budget, requires an additional financial tool – this function could be taken up by the Lower Silesia Fund “Stawka na innowatora.” Among its tasks would be financing certain pro-innovative and innovative enterprises, especially:

contests, scholarships, awards for innovative activities and successful pro-innovative measures;

organisation of discussion forums and other symposiums aimed at better understanding of innovation processes and the methods of stimulating them;

popularising pro-innovative attitudes, promoting Lower Silesia accomplishments;

procedural assistance for the deserving.

The details of this enterprise (structure, procedures, sources and level of financing) should be determined by competent persons and assemblies.

4. Lower Silesia Innovation Council at the Office of the Voivodship Marshal

An independent body, comprising a few or a dozen or so persons (at the most), should be established by the Office of the Voivodship Marshal. The body would have a consulting character and it would be composed of representatives of business circles, research, expert and self - government circles. Its task would be examination of cases related with the functioning of the regional innovative system and advisory services for the Marshal in issues related with the pro-innovative policy. The council should also supervise the “Stawka na innowatora” fund and evaluate the works of the Centre for Regional Studies and Analysis Bureau, as well as shape the methodology of research conducted by these institutions.

5. Centre for Regional Studies (CRS) and Analysis Bureau for innovative processes in Lower Silesia

The increasing subjectivity of the European Union regions is also expressed by a tendency to establish local forecast centres. It is believed that these functions cannot be carried out properly by the national research centres. Activity of the leading European regions in this field is very clearly visible, which is documented in an excellent manner by a conference devoted to these issues which took place in Slovenia (Regional Foresight, Ljubljana, March 2 – 4, 2003). This was also the place where the official standpoint of the EU authorities was presented, as well as examples of the so-called “good practices” from pilot initiatives. What is more, an announcement was made that significant funds will be allocated for research projects in this field within the framework of the subsequent Framework Programmes.

Forecast research projects comprising the area of Polish western regions and the Czech Republic were also undertaken in a few German states; their objective was intensification of economic exchange with the new members of the European Union. Due to understandable reasons, the perspective of such research was mainly focused on the benefits of the party commissioning the study.

Necessity of establishing the Centre for Regional Studies

The self - government and state activists, as well as decision-makers administering economic units in Lower Silesia are faced with the necessity of preparing strategy and development plans. In this field they are not supported by appropriate studies in the Region. The activity of the Centre for Regional Studies will fill this gap and will make it possible to make use of the academic potential of the Wrocław University, contributing to the creation of conditions for optimum strategic decision making in the Region. This will also allow for preparing the local elites and the society for changes which are forecasted. As a result, it will help to improve the entire system of planning the innovative and adaptative investments in the Region.

The Centre for Regional Studies should function as a unit providing services to the Region, yet it should be established on the basis of an agreement among the higher educational institutions of Wrocław, the Lower Silesia Voivode and the Marshal of the Lower Silesia Voivodship. It should be financed from the education centres' funds within the scope of research complying with the didactics and by self - government funds within the scope of application works. Establishing the Centre and commencement of its activity will require a substantial support from the EU funds.

Analysis Bureau for innovative processes

There is a need to establish a special analysis bureau for innovative processes in Lower Silesia. Its tasks would be as follow:

monitoring and preparation of systematic reports on the processes taking place in the field of regional innovation, their course and conditions, including monitoring of the progress of Regional Innovation Strategy;

organising regional foresights (constructing medium and long-term development scenarios with the help of expert and environmental consultations) and indicating key areas of pro-innovative activities;

organising expert assistance for the actors of the regional innovative system, who need such assistance;

providing the indispensable materials and analyses for the Lower Silesia Innovation Council and the Voivodship Marshal.

Nevertheless, there are two problems which need to be solved at this point, in an innovative manner, due to the fact that standard ideas may prove to be dysfunctional.

The first problem refers to the appropriate methods of evaluating the innovative processes. Currently, they are not perfect and discussions on the possibilities of improving them are still taking place. It is obvious that only certain aspects of these processes can be evaluated by statistic methods. Other, and probably more important aspects, elude the statistics and require phenomenological approach. As a result of that, the office analysing the innovative processes will also have to learn how to analyse them.

The second problem relies on proper localisation of such an organisational unit (and financing its operation). An obvious solution on the surface, i.e. locating this unit within the structure of the Office of the Marshal, threatens with subjecting it to clerical logic and political perturbations, which should be avoided.

Until these problems are solved the duties of the Bureau should be performed by the organisational unit of the Office of the Marshal for procuring funds for the development of regional innovativeness, which was discussed above.

6. Bridge priorities

The transfer from adopting the strategy to the implementation of its mechanisms will not take place immediately. It cannot be allowed that a delay created in this manner retards the implementation of already advanced measures, directed at increasing the Region's innovativeness. Due to this issue a list of **bridge activities and priorities** is being drawn up, which is obligatory in the transitional period and comprises projects which should receive assistance as quickly as it is formally possible. The list of such activities is proposed in the next chapter, and it will be supplemented in the course of consultations carried out by the Steering Committee supervising preparation of the RIS and approved by the Provincial Assembly of the Lower Silesia Voivodship.

7. Continuation of works on developing the Lower Silesia Innovation Strategy

Works on the development and updating of the Lower Silesia Innovation Strategy will be continued in the years 2005 – 2007 within the framework of the UPRIS Project. This project will be implemented by the Office of the Marshal, the Wrocław University of Technology – Wrocław Centre of Technology Transfer in co-operation with foreign partners and financed by the European Commission from the funds of the 6th Framework Programme of Research and Technological Development of the European Union.

Economic analyses of key industries of the Region will be carried out within the framework of the project and scenarios of the Region's development in accordance with foresight methodology will be prepared. It is expected that experts and persons engaged in the previous works and formulation of the RIS will take part in the research on strategy development.

Nevertheless, engagement of the so-called third sector is also recommended (non-governmental organisations) and inviting the Trilateral Commission for Economic Issues and the Voivodship Commission for Social Dialogue to co-operation.

6. Schedule of bridge activities

The Regional Innovation Strategy will be implemented by miscellaneous activities undertaken by enterprises, universities, research and development institutions, scientific organisations, self - governments, support institutions, media, as well as individual persons.

A few proposals of programmes and projects are presented below, which may be assisted by the voivodship self - government in order to meet the objectives of the Lower Silesia Innovation Strategy. The proposed projects constitute a selection of activities implemented in the European regions and evaluated as a good example of implementation of innovation strategy; some of them are proposals from the Region.

A detailed description of the majority of these tasks is included in Annexes 4 and 5 “Methods, techniques, tools and implementation indices of activities within the scope of implementing innovation assistance tools on a regional level.”

Objective 1. Strengthening the regional competence blocks

1. Development of relations between companies by means of creating network structures (clusters).
2. Supporting companies in implementation and commercialisation of innovation technology and innovation products.
3. Transfer of good practices between large companies and SMEs.

Objective 2. Activation of research circles

1. Facilitating formation of start-up enterprises on the basis of public research and development units.
2. Bringing science closer to the industry through commercialisation of the results of research works carried out at the universities.
3. Innovations, research and development – assisting enterprises in the pre-competitive stage.

Objective 3. Development of innovative infrastructure

1. Technology centres, accredited laboratories, centres of industrial design – development of service network for companies.
2. Strengthening the operation of intuitions acting in favour of innovativeness of companies and networks: technology transfer centres, parks and technology incubators.
3. Development of commonly accessible broad-band information networks in the Region and implementation of complex management systems in public administration.
4. Formation and development of centres of excellence, the Lower Silesia Centre for Advanced Technologies and Centre for Regional Studies.

Objective 4. Innovation financing

1. Financial support for very small enterprises: seed financing.
2. Loans for start-up enterprises.
3. Investment forums for founders of innovation companies.
4. Lower Silesia Fund “Stawka na innowatora”.

Objective 5. Lowering the barriers for the innovators’ activities

1. Lower Silesia Certificate of Innovative Credibility.
2. Fund for commercialisation of the results of scientific works.

Objective 6. Education for innovation

1. New IT tools in the process of education at the university level.
2. Creating didactic programmes for the tertiary level schools within the scope of practical studies on entrepreneurship.
3. Training sessions within the scope of managing research and technologies.

Objective 7. Propagating innovative approaches

1. Training impulse – assisting the employees within the scope of innovations.
2. Programme of lectures on entrepreneurship in marginalised areas.
3. Stimulating the consciousness of the students with respect to innovations by organising trips to the regional innovative enterprises.
4. Contests and scholarships for the talented and creative pupils and students.

Objective 8. Accumulation of social potential

1. Student discussion forum on entrepreneurship and innovativeness.
2. Lower Silesia Innovation Council.
3. Lower Silesia Economic Council.
4. Carrying out analyses of regional development by the Centre for Regional Studies and Analyses Bureau for innovative processes in Lower Silesia.
5. Regional foresight – creating conditions for implementing long-term market and technological strategies.
6. Lower Silesia Political and Economic Forum in Krzyżowa.

7. Strengthening ties between science and economy of the Region

A more efficient utilisation of the scientific potential for the pro-innovative development of Lower Silesia, which has been postulated a number of times in the Strategy, requires the following activities:

- indicating the leading sectors / scientific domains of Lower Silesia, which stand a chance for an adequate place within the framework of the European Research Areas with simultaneous possibilities of commercialising the scientific results and stimulating the pro-innovative development of Lower Silesia;
- achieving a new-quality integration of the scientific and economic environments and efficient forms of co-operation with the self-governmental authorities;
- formulating objectives important for the Region which are to be solved by the scientific and economic competence centres.
- significant subsidisation of the outdated and non-competitive scientific, research and service base in the Region.

1. Leading research fields in the Region as potential areas of innovation and new technologies

Development of the R&D sector in our Region is a result of both planned and spontaneous processes resulting from implementation of specific research programmes, localisation of enterprises with a considerable innovative potential in Lower Silesia (in the past) or the consequence of managing important natural resources. The most obvious examples of these strong sides of Lower Silesia are: energy sector, copper industry, ceramic industry and broadly understood electronics and chemistry. Less obvious for the non-academic circles is the fact of a considerable and sometimes even the leading role of the Region in such fields as: selected areas of materials engineering, bio-technology (designing and production of medicines and cosmetics), advanced medical technologies, technologies related with production of high-quality and safe food and advanced technologies in the scope of recycling. Yet these are the sectors where one can expect development of entrepreneurship, demand for innovations, creating new work places and formation of small and medium-sized enterprises competing in the country and in Europe. The optimal solution would be formation of consortiums (clusters) of enterprises in the SME sector from industries with high innovative potential on the one hand and scientific entities on the other. The ability to identify and promote disciplines in which Lower Silesia has the biggest development potential and is competitive on the national and European scale will be of key importance for the success of integration processes at the meeting point of science and economy.

At the end of the year 2003, in the course of preparing the programme of the Lower Silesia Centre for Advanced Technologies, an analysis was carried out which focused on the institution's accomplishments in the R&D sphere in the recent years. It demonstrated that the potential of scientific and economic circles of Lower Silesia allows for the development of scientific, research and implementation programmes in four basic fields:

- *Materials Science & Manufacturing;*
- *Information Technologies,*

- *Quality of Life,*
- *Energy.*

The terms draw attention to the compliance of these directions with the EU priorities, which significantly increases the possibilities of applying for co-financing the research and implementation and facilitates establishing links with the scientific units and R&D institutions in Europe.

Meeting the objectives listed above may require activating mechanisms of better adaptation of the directions of the conducted research to the real economic needs of the Region. On the other hand, it is necessary to stimulate formation and development of enterprises in fields where high competencies of scientific teams give a chance for creating innovations, new technologies or common research programmes.

2. Identification of potential areas of co-operation between the sectors of science and economy in the Region

a) Designing, manufacturing and application of advanced materials (Materials Science and Manufacturing)

For the last fifty years the research on materials has been shaping the image of Wrocław as a scientific centre with great importance on the national and international scene. On the basis of these experiences and the available potential the interdisciplinary research is conducted which serves manufacturing of advanced materials and development of nano-technology in such fields as: nano-electronics, opto-electronics, micro-systems, molecular electronics, photonics, non-linear optics and nano-magnetism. Works are also planned to be conducted on such materials as: molecular materials, including polymers, compounds and semiconductor structures, magnetic materials, composites, ceramics, porous materials and functional materials obtained through the zol-gel technology. The objective of the conducted research is in the majority of cases application of these materials and their structures in technology, medicine and environmental protection.

The subject matter of the currently conducted research and research planned in the next five years in the field of *advanced materials* makes it possible to formulate the following directions with technological significance:

- development of apparatus technology and nano-technology of apparatus structure;
- development of research on the application of the zol-gel technology for obtaining nano-structures and materials for specific use (including sensor materials);
- obtaining new functional materials (bio-materials, thermal electric materials, materials with high thermal conductivity, materials for storing hydrogen, etc.);
- development of research on nano-magnetism and “smart”- type materials;
- modelling and obtaining materials and layers for fuel cells;
- optimising the use and extending the existing apparatus base for developing surface engineering – new methods of obtaining and characterising materials with special characteristics and application, with particular attention given to the techniques of close interaction;
- introducing femto- and pico-second optical spectroscopy as a tool for research works on new materials and structures intended for practical application;

- development of composites with extreme endurance, physio-chemical and exploitation features.

b) Information technologies

The strategic directions of activities within the scope of information technology are concentrated around problems of constructing IT applications and systems assisting the work of offices and other organisations, including economic entities in Lower Silesia and which will contribute to the economic development of the Region, and which in consequence will improve the quality of life of its inhabitants. These directions make use of research entities which are well developed in the Wrocław environment, e.g. teleinformatics. Research directions in the field of teleinformatics and multimedia have a chance of implementation through construction of an integrated service and transmission platform in Lower Silesia. Within five years it is planned that the following enterprises and research projects will be undertaken:

- modern IT technologies in communication, health protection, security systems, economy, banking and education (e.g. e-Learning, e-Health, e-Government);
- modern teleinformatics technologies, including development of computer networks, development of inexpensive broad-band and common access to the Internet and new services related to it;
- development of intelligent IT systems supporting decisions within the scope of planning and production scheduling;
- mobile technologies and their applications;
- increasing security in using the Internet;
- modern IT technologies in software and computational techniques (e.g. GRID, technologies facilitating access and communication – distant experiment, distant operation);
- technologies and science regarding digital systems, intelligent systems and interfaces, built-in systems, etc.;
- development of the technology of the future (e.g. multimedia systems, Semantic-based Knowledge Systems, access to cultural heritage).

At the same time it is postulated that a rapid development of a medium-term document of the “e-Lower Silesia” type is necessary, which would constitute a regional mutation of the intentions included in studies such as “e-Europe” and “e-Poland.” Taking into consideration the potential that is available in the Region, the national priorities and emerging possibilities of financing works within the framework of Structural Funds, projects in *the information society* sector have a chance of activation already in 2005 – 2006.

c) Science and Technologies related to improvement of quality of life (Quality of life)

Strategic directions of operating in this sector are concentrated around health problems and the quality of life and they make use of research, which is very advanced in this environment. Directions of research which are related with defining environmental threats have a chance of implementation through construction of an appropriate monitoring system and threat reaction system, which is related to it. It is estimated that the demand for this type of systems on the part of industrial plants will be increasing. Directions connected with chemistry and medical bio-chemistry have lesser (even though it is not entirely unreal) chances of implementation, due to the fact that even introducing a given drug to the clinics requires considerable financial outlays. On the other hand, research results on the new methods of diagnosis may be introduced to hospital practice. Directions related with environmental engineering have the greatest chances for implementation. Research on the development mechanisms of some socially important diseases, e.g. neurodegenerative diseases such as Alzheimer, Parkinson and

prion diseases, as well as cancerous diseases is also of great significance. The scientific circles of the Region have wide experience in this field. Research projects in this field which are being currently implemented or are scheduled for implementation may be grouped as follows:

Healthy food production technologies:

- problems of quality, security and detection of threats in the entire production process;
- epidemiology and nutrition-related diseases;
- impact of animal nutrition and food on human health;
- environmental threats and their impact on health;
- healthier food products;
- alternatives for fighting micro-organisms in food products;
- consequences of remains of chemicals in the natural environment on human health.

Biotechnology and pharmaceuticals:

- computer-aided design, modelling and testing of medicines;
- accelerating development of new, safer and more efficient medicines, vaccines and therapeutic biocides;
- development of new diagnostic methods;
- development and tests of new preventive therapeutic methods, immunotherapy;
- application of genomics in medical theory and practice;
- fighting disorders and congenital metabolism defects, nervous system diseases and cancerous diseases;
- examining the processes of human growth and getting old.

Environmental protection technologies:

- "clean" technologies – new energy-saving and environmentally safe production processes;
- developing methods of monitoring the environment, limiting hazardous components of industrial gases;
- moderating changes in water environment: new technologies of water purification, protection of soil and protection of ground waters;
- new technologies for treating sewage waters and removing noxious and toxic components and recovery of the components for re-usage;
- recovery technologies, utilisation of waste and waste management;
- limiting emission of noise and radiation;
- limiting production and storage risks.

Establishment of regional platforms is postulated (e.g. *Quality and Safety of Food Products*, *Clean Technologies*, etc.) in the form of scientific and economic networks. Such networks would co-ordinate activities in the relevant sectors and would prepare the scientific and economic units for participation in the 7th Framework Programme of the European Union.

d) Renewable and alternative sources of energy

The last decade was a period of searching for alternative sources of energy. This is required by the civilisation development of a number of present-day societies. The current intensive progress of science and technology is conducive to this search. The necessity of developing unconventional power engineering may significantly contribute to the development of Lower Silesia.

This in particular may result from such elements as:

- establishment of research and implementation centres, synthesising knowledge of a number of scientific disciplines and inspiring the researchers to new searches;
- establishment of a number of plants (of different scale) undertaking production in the area of energy technology and energy assisting institutions, as well as energy turnover;
- social stabilisation of the Region, resulting from decrease in unemployment, increase in affluence, improvement of the natural environment, etc.;
- development of international co-operation and integration with the neighbouring countries.

A clear accomplishment of the Region in this sector is preparation of the Lower Silesia Energy Strategy. The document should constitute a starting point for the preparation of detailed solutions and research and implementation projects in the field of renewable and alternative sources of energy.

The potential of the Region justifies undertaking research in the field of power engineering, in the following directions:

- obtaining and processing energy from renewable sources;
- development of alternative power engineering in comparison to coal engineering;
- streamlining energy consumption and recovery of energy from waste sources;
- preparation and promotion of positive scenarios of satisfying energy needs;
- development of micro-energetics;

It seems that the Region stands a chance of playing a significant role in the national research programmes and the national hydrogen platform, created with the intention of preparing Poland for participation in a relevant European platform, scheduled in the 7th Framework Programme.

Annex 1 Elements of innovativeness conceptual network

1. Phenomenon of innovativeness

In the world that existed five generations ago there was no electricity; cars, telephones, plastic materials, refrigerators, and aspirin, there were no flush toilets. In the world that existed three generations ago there were no airplanes, radio, television, computers, antibiotics, lasers and atomic bombs. Even one generation ago there were no personal computers and mobile phones. In the countries in which these innovations spread, the everyday life of people in the last century changed much more than in the preceding millennium. The levels of consumption, quality of life, education and health have radically improved. These processes stimulated development of market and democracy.

The attitude to life has also changed in the new conditions; in particular, a conviction has emerged that progress based on innovations was a natural and guaranteed thing. As a result, until recently innovativeness had been treated as a common environmental resource, and economic theories and politicians did not show any interest in exploring its nature. The situation was changed by the fact that in the last decades there have been practically no breakthrough innovations, similar to the scale of the previously listed accomplishments of the industrial revolution. Small improvements and combinations of already known solutions are dominant. It has to be underscored that this situation takes place despite great promises and generous financing of huge research programmes, oriented towards breakthrough in various fields, including obtaining thermo-nuclear energy, constructing artificial intelligence and finding a cure for AIDS.

Globalisation of economy is based, to a large extent, on the idea of *outsourcing*. Well-developed countries have ambitions to take care of innovations and marketing, i.e. earn their living on intellectual property, and move production to countries with cheap labour force. Human capital of high quality has a tendency to move in the opposite direction and supply the innovative systems of developed countries. Irrespective of the issues of social stability of such a solution it has to be noticed that it requires maintaining constant and considerable innovative advantage. Without such an advantage the rich countries will not sustain free competition with poor countries. Some symptoms of this phenomenon can already be noticed.

The environment is mainly interested in economic effects of innovations. From the perspective of one hundred years, relatively small funds spent on research at the end of the 19th century were probably the most profitable investment in the history of mankind. If the present day research structures achieved even a small part of this efficiency, innovative supply of economy would be assured. In the last years a number of attempts have been made to increase this productivity by replacing administrative methods by corporate methods, using management through objectives and indicators. The results are not satisfactory. It is not possible to construct efficient innovative policy without understanding the core of this problem.

2. Basic concepts

Definition of innovation

Innovativeness does not have a precise and commonly accepted definition yet. One can come across scores of proposals: dictionary, political, business, etc.:

- Innovation = Idea + Action + Productivity

- (1) the act of commencing something new for the first time, introducing something new;
- (2) creating a device or a process which is a result of studies and experiments;
- (3) creating something in the mind.

Innovation based on knowledge is: creation, exchange, evolution and application of a new idea to marketable goods and services, leading to the organisation's success, vitality of the national economy and comprehensive social progress.

In some definitions, the invention is treated as something separate from the innovation process; others underscore their integral relation. Generally, one can observe that the definition of innovation which is evolving currently puts less stress on the issues of technology and ordered activities, whereas the vitality of the system dynamics is accentuated more, with special stress on the flow of knowledge and interactive process of learning.

It is still assumed that innovative solutions (product, service or a process) have the following attributes:

novelty — they are new in general or they are new in a given context (industrial, territorial);

profitability — they bring greater benefits than the previous solutions;

attractiveness — a considerable group of customers prefers them to the previous solutions;

irreversibility — the attractiveness of the solution is not caused by a temporary trend.

It has to be noticed that certain features of innovation become obvious only after confronting the innovation with the market, and often it does not happen immediately, which additionally hampers innovation management.

Innovation typology

Table 1. Innovation typology — increase in investments uncertainty proportionally to the rank of innovations.

| Type | Characteristics | Executors | Is it known initially: | | |
|----------------|---|---------------------------------------|------------------------|---|------------------------|
| | | | What has to be done? | What is the deadline and what is the price? | 7. What is the profit? |
| Modernisation | Elimination of evident delays | specialists | yes | yes | yes |
| Imitation | transplanting somebody else's solution on one's own soil | experts | yes | yes | not really |
| Implementation | imitation taking into account peculiarities of the "soil" | interdisciplinary team of experts | rather yes | rather yes | rather yes |
| Association | combination of known solutions into a new entity | interdisciplinary team of specialists | rather yes | more or less | rather yes |

| | | | | | |
|-------------------------|---|-------------|--------------|------------|------------|
| Improvement | fragmentary improvement of initial solutions | researchers | more or less | not really | rather yes |
| Breakthrough innovation | radically new solutions, distant from the previous ones | innovators | no | no | no |

Different types of investments to which the innovation value has been assigned are characterised in Table 1. All the aspects related with the marketing and business phase have been omitted. It was conventionally assumed that the specialists have at their disposal internal knowledge in a given industry or field, the experts have external knowledge about the industry or a field in which they are employed and that the researchers generate new knowledge in their field on the basis of experiments, whereas the innovators are persons with specific talents.

Sources of innovative ideas

At the foundation of each innovation there are some specific inspirations which initiated it. Identifying the relation between the type of inspiration and the chances for market success would constitute an important premise for innovative policy.

In the research carried out recently, the market success of new solutions was estimated in relation to causative motives¹. Six groups of motivations were distinguished:

- following the trends (continuation of the existing tendencies);
- mental creations (free intellectual game without greater relation with the reality);
- looking for needs (looking for solutions for well-known problems);
- market research (needs declared by the consumers);
- looking for applications (looking for new applications for the already known solutions);
- sudden revelation (stumbling across something that was not looked for, but the importance of which was recognised).

As it appears, the first two approaches produced three times as many successes as failures, and the following ones: two, four and seven times more successes than failures. The best results were brought by serendipity – 14 times more successes than failures. The examined sample was not numerous enough to draw far-fetched conclusions. Nevertheless, it seems characteristic that the motive most often taken into account in the evaluation of innovation chances turns out to be the least effective, and the most effective motive is beyond evaluation.

Codified and inexpressible knowledge

In the modern approach to innovativeness, the key role is attributed to the phenomena of transfer of knowledge and learning processes. The Age of Reason conviction that the entire knowledge can be managed separately from the people who own it, is being abandoned. Four types of knowledge are differentiated, referring to:

- facts (know-what);
- regulations (know-why);
- skills (know-how);

¹ Goldenberg J. Lehmann D., and Mazursky D., (2001), *The Idea Itself and the Circumstances of its Emergence as Predictors of New Product Success*, Management Science, 47, 69-84.

people (know-who).

The first two types of knowledge are open and codified knowledge. It can be transferred even without participation of people, for example by publishing it in books and magazines. Development of the Internet, a natural communication medium for this type of knowledge results in the fact that its market value will be decreasing rapidly.

The two other types of knowledge are inexpressible knowledge (also: silent or tacit). This knowledge is practically impossible to transfer in other ways but through direct interaction between people. Research in innovative circles and companies has shown that these types of knowledge play a primary role in the processes which generate new solutions.

This knowledge is a matter of participating in a group, which already has appropriate competencies. (...) The novices participate in such a community in a valid manner, but at the beginning slightly marginally. Learning is the result of work, not only an input factor to work. With the course of time the novices move towards the centre of the group through increasing their participation. (...) Learning to do something is at the same time learning how to exist and how to belong.²

The OECD experts believe that **the core of the innovation process can be the clash between the theoretical or codified knowledge with the tacit or practical knowledge.**

Human and social capital

The impossibility of making use of inexpressible knowledge in separation from people who own it lies at the foundation of the concept of human capital. It comprises the entirety of skills, experiences and knowledge assembled by individual people. Using the term “capital” has to make people aware that the competencies owned by employees have to be treated as resources, whose economic significance is equal to financial resources and also to indicate the investment potential and growth potential related to them.

In the current phase of globalisation two opposite processes are observed: financial capital of developed countries is invested in backward countries, whereas human capital of backward countries is invested in developed countries. The asymmetry relies on the fact that the poor countries do not draw any benefits from the invested human capital.

It is commonly expected that education should play a significant role in shaping human capital. Nevertheless, the evolution of educational systems which has been taking place in the last few decades does not fill with optimism. An increasing share of the procedural form of teaching is observed at the cost of interactive forms. This is conducive to transferring codified knowledge instead of inexpressible knowledge. This can explain why human capital which is shaped by “backward” educational systems turns out to be competitive at world markets.

The analysis of phenomena taking place in environments dealing with innovations indicates that even considerable resources of financial and human capital do not guarantee success. An additional factor, called social capital, is necessary.

The term “social capital” refers mainly to community social networks. Such networks are groups of people bound by various familiarities and mutual trust. Spontaneous and discretionary co-operation for the sake of common welfare allows reaching objectives which are unattainable in procedural way. The existence of appropriately rich resources of social capital is deemed to be a factor indispensable for proper functioning of democracy. Robert

² *Knowledge Management in the Learning Society. Educations and Skills*, Centre for Educational Research and Innovation, OECD 2000

Putnam, who is an authority in this field, says that since the 50's this capital has been subject to degeneration, at least in the U.S.

Reasons for that lie in the expansion of procedural relations on the one hand, which is motivated by the counteraction of spontaneous and discretionary co-operation of criminal structures. Nevertheless, a lot of factors indicate that this medicine may prove worse than the disease. On the other hand, employment requirements lead to individualisation of attitudes (the objectives are competitiveness and individual success), which violates the cohesion of basic social structures which used to shape this capital.

Innovative projects – especially those with significance – are and have to be high risk projects. Currently, they require financing from public funds. In these conditions it is critical to differentiate between projects submitted in good faith and projects focused only on obtaining funds in accordance with the provisions. The only factor which can considerably decrease the risk of innovative contracts is personal reputation. However, this requires selection of bodies which would be capable of evaluating reputation and decision mechanisms which will take reputation into account.

Regional innovative systems

High innovativeness is not a common phenomenon in time or space. Historically we deal with innovativeness centres, the most famous of which concentrated around ancient Athens, medieval Florence, 19th century England or currently the Silicon Valley.

The concept of regional innovative systems has been developed in the recent years, the aftermath of which is the necessity of passing Regional Innovative Strategies. This concept stresses the significance of geographical vicinity and agglomeration impacts as factors facilitating exchange of inexpressible knowledge, which is indispensable in innovative processes, and also offering other conveniences. Institutions and organisations grouped in particular regions show an inclination to learn and identify activities conducive to regional economic efficiency. The feeling of regional identity is also important, which may constitute nourishment for informal networks of connections and social capital related to them. One can find the following statements in the OECD publications:

The system most conducive to economic development is one in which local communities are strongly bound, and at the same time open to the world and in which the state is integrated with the civic society, yet remains autonomous.

Geographic proximity is conducive to interaction and trust. Politics which aims at supporting networks of industrial systems is implemented most efficiently on the regional level.

Regional politics proves itself best in the catalyst role – stimulating and co-ordinating. The starting point for regional industrial strategies is supporting group identity and trust. Through provision of forums for exchanging ideas and debates, the creators of policies are able to promote development.

Innovativeness clusters

Clusters constitute a specific form of spatial organisation of sectors of industry and services, which is nowadays considered as the most mature form of organising production. According to Porter (1990), cluster is a geographic concentration of mutually bound companies, specialist suppliers, units providing services, companies operating in related sectors and institutions related to them (e.g. universities, standardisation entities and industry associations) in individual sectors, competing with one another but also co-operating. Clusters which obtain proper critical mass (significant number of companies and other institutions

generating agglomeration effect) achieve competitive successes and display high innovativeness.

From the perspective of voivodship governments, clusters should be perceived as basic subjects of innovative policy.

Clusters localised in high technology sectors attract special attention, e.g.:

Silicon Valley (semiconductors and IT technologies);

Lombardy (teleinformatics and chemical industries);

Cambridge (bio-technology, computer industry and IT industry);

Austin, Montpellier, Penang (telecommunications, computer software and bio-technology).

Also clusters in traditional fields are very efficient, e.g. cluster of glass frames and wool processing in Italy or furniture cluster in Denmark.

Efficiently functioning cluster:

allowing access to relatively inexpensive, specialised production factors and is conducive to the increase of productivity of local enterprises;

due to spatial proximity of economic entities it stimulates and supports their innovativeness;

generates formation of new enterprises and thereby creates new workplaces;

generally increases the availability of specialist business assisting institutions, investments in infrastructure and income of the population.

Financing innovative companies

Practice has shown that SMEs have a special ability to develop innovation. However, they often do not possess the capital necessary to launch production and introduce products and technological innovations. In other words, speaking in financial terms, they do not have the possibility of financing the indispensable assets. In this respect new solutions will be necessary, both on national and regional scale.

Venture capital funds are one of the most important sources of financing innovations. These funds may be defined as equity capital, contributed for a limited time by external investors to SMEs, which have an innovative product or technology which has not been verified by the market. On the one hand, innovative projects generate high risk of failure; on the other – in the case of success – give the opportunity of obtaining high rate of return on the contributed capital. In practice, venture capital funds are a financial tool, which may comprise various legal forms of contributed equity capital.

Regional guarantee funds which are financial tools offering an opportunity of securing repayment of liabilities, resulting from procuring debt capital, most commonly in the form of bank credit. This instrument gives an opportunity of reducing the risk of economic activity related with creating and implementing innovations by enterprises, especially SMEs.

Public and private partnership — the core of these projects relies on the fact that private investors engage in implementing public investments for a long period of time. Partners have to take into account both the commercial and social dimension of a given investment. In Poland, public and private partnership is discussed mainly from the point of view of common investments of infrastructural character. Nevertheless, it can be assumed that principles of such partnership may be transferred to the area of regional support of innovation system for the benefit of all parties.

3. Innovation concepts

Linear model

After the successes of innovations produced in laboratories at the time of the First and the Second World War, a new concept of innovations generated by technical progress has emerged. It was acknowledged that scientific research produces innovations, whose popularisation leads to the growth of economy (in Poland the triad: science – technology – industry). The experiences of the last quarter of a century indicate that this model does not operate in accordance with expectations. Scientists around the world argue that economy does not make use of the results of their research and the businessmen complain that science does not provide solutions of appropriate market value. In consequence, it has been decided that relations between generating knowledge, its transfer, diffusion and commercial use are much more complex. The linear model is discarded today and the concept of innovative system is being brought back. This concept was developed in Germany one hundred and fifty years ago, and thanks to it at the end of the 19th century the country became the leading economic power.³

Mode 2

A very famous proposal for a new manner of producing knowledge was introduced by Gibbons⁴. In his opinion the linear model defined as Mode 1 will be replaced by Mode 2.

Mode 1 — traditional and based on universities. Production of knowledge takes place within the framework of disjunctive disciplines and is aimed at developing theories. The environment of researchers has a stabilised and hierarchical character. Managing research and evaluation of results belong to the experts selected by the researchers. The system is controlled by supply; it is expected that the obtained results will find their recipients, who will put them into practice.

Mode 2 — future, based on entrepreneurship. Production of knowledge takes place in teams assembled ad hoc and its aim is solving appropriately presented problem. The research environment has an interdisciplinary, heterogeneous and hybrid character; it is settled in networks, and its evaluation is carried out in accordance with measurable criteria. The system is controlled by supply – research is oriented towards solutions which are necessary.

Gibbon's concept accurately defines the core of the system based on linear model and the desired features of a system demanded by corporations. Unfortunately, even Mode 2 is not capable of producing breakthrough innovations. It is hard to consider intuitions leading to such innovations as appropriately presented problems and there is no way of evaluating their consequences. It is also not possible to programme research in an unknown direction and control its course.

Pursuit model

In the case of backward countries and regions, the idea of pursuing the leaders by means of copying solutions applied by them seems to be attractive. Efficient transfer of technologies and good organisational practices is of course an indispensable condition of economic development. On the other hand, attempts at imitating innovative projects of "first class" regions and countries should be avoided.

³ *Third European Report on Science & Technology Indicators*, European Commission 2003

⁴ M. Gibbons, *New Imperatives for Science Policy in Central and Eastern Europe*, in Kukliński A. (ed.) *Production of Knowledge and the Dignity of Science*, Euroreg, Warsaw, 1996

At the moment when it becomes clear what should be done, it is usually too late to join the competition. Even if joining the forefront of producers is achieved, it will take place after the period in which the novelty benefit can be expected. Commercial profits from innovations can be drawn only by those who have kept ahead of competition. Due to this, the best innovation strategy seems to be looking for opportunities in places where others do not notice them (an example of Nokia, where timber industry invested in mobile telephony). The distance between the U.S. and Europe which has been increasing since the 70's, may follow from the fact that Europe lost its innovative initiative and chose the pursuit strategy.

Pushing high-tech companies

At present, the pursuit model finds its expression in a popular recipe for creating innovative economy through developing the sector of *high-tech* companies. This sector comprises companies which make use of technologies based on accomplishments of technology of the last few decades, which in the last few years generated or were supposed to generate above-average profits. These are usually companies operating in the field of electronics, telecommunications, computers, bio-technology, pharmacy, avionics, photonics, etc. Such a nominal definition of the high-tech area has at least two evident drawbacks:

The speed of promoting innovations which proved to be profitable, especially based on electronics, is very high. As a result, the period of collecting novelty benefit is very short. It is easier to make money on introducing new high-tech solutions than on producing them or applying them in services. For example, a number of companies producing processors have been operating on the verge of profitability. Due to this, production and services of this type are shifted to the countries which have inexpensive and disciplined labour force.

A string of promising innovative ideas, e.g. in bio-technology somehow cannot achieve the intensive commercialisation stage, even though the announcements were made a long time ago. Nevertheless, it was possible to fortify these fields with protective patents, which hinder inclusion of outsiders.

It is necessary to notice that the nominal definition of "*high-tech*" is illogical. Sooner or later the fields which are new today will become traditional. This process takes place much quicker than it was expected. In particular, the IT and communication technologies, which a few years ago were considered the pushing force of progress in the approaching decades, even today have status similar to the power industry and water supply systems⁵. A much more inspiring definition would describe "*high-tech*" as a group of new and efficient technologies based on knowledge, irrespective of the area in which they were generated. This would provide an impulse for innovations in fields in which nobody really expects them.

Blocks of competencies and experimental economy

Gunnar Eliasson⁶ contests the linear model by assuming that university circles are not adequately creative to support truly innovative discoveries. Therefore, new business ideas should be searched for in experimentally organised economy, where one needs to be innovative in order to survive. Experimentally organised economy is characterised by the following factors: (1) obscurity (2) limited rationality (3) inexpressible knowledge. The plausible source of innovative solutions is *block of competencies*, understood as a configuration of actors initiating and stimulating growth of a particular industry.

⁵ N.G. Carr, *It doesn't matter*, Harvard Business Review, May 2003

⁶ G. Eliasson, *Industrial Policy, Competence Blocks and the Role of Science in Economic Development: An Institutional Theory of Industrial Policy*, in OECD Knowledge Management, Op. Cit.

A block of competencies is defined by its end products, i.e. a cluster of products on the market, and not by specific technologies of physical entries. Its primary function is selection of winning technical and economic solutions. Before a block of competencies becomes self-propelling, certain critical mass and diversity are necessary. Diffusion of competencies in economy requires people who have knowledge, and who move changing jobs. It is an open issue whether political actions can catalyse initiation of a block of competencies or whether it can be done by scientists. The best example of block of competencies is the Silicon Valley.

The Silicon Valley and Route 128 Models

In the 70's there were two innovative centres on international scale in the U.S.: the *Silicon Valley* in Northern California and *Route 128* in the vicinity of Boston. They were known for their creativity, entrepreneurship and sudden economic growth, propelled by university research and military outlays. At the beginning of the 90's, the Silicon Valley clearly took the leading position. This effect was attributed to cultural differences:⁷

In the region of Route 128 few corporations were dominant, which integrated a wide scope of production activities. Management was centralised, and the flow of information hierarchic. Borders between companies and local institutions and within the area of companies were defined and respected. Company secrets were observed in relations with customers, suppliers and competitors. The local culture strengthened the companies' tendencies to stabilisation and mutual reliance.

In contrast, the Silicon Valley was a network system, comprising thousands of small companies which were competing intensively and at the same time learning from one another through informal contacts and co-operation. Internal and external borders of the companies were fluid, and the primary role was taken up by horizontal flow of information. Work teams were loosely tied. Constant replacement of people between company departments, different companies, universities and other institutions was taking place.

As a result, the Silicon Valley was discovering itself time and time again, as its specialised producers were learning in groups and adjusting to their mutual needs in the constantly changing systems of rivalry and co-operation. Disjunctive and self-sufficient structures of Route 128 made adaptation difficult by isolating technological changes within the borders of corporations.

The people from the Silicon Valley are characterised by *readiness to change jobs, set up a new company, and first of all, to learn through mistakes*. Tolerance for failures is considered to be the main success factor of the Silicon Valley. It is said that *ruling out the possibility of failure means ruling out the possibility of learning*, and simultaneously constitutes a ban on success. Obtaining information takes place by means of the following principle: *I know somebody and they know somebody, but I do not know whom they know*. Blurring of borders between research and implementation and implementation and production is common: *we do not have a separate R&D laboratory, development works are carried out here, in the production hall*. Stage barriers (which are the core of the linear model) are constantly surpassed and they are subject to integration.

In the literature, the structure of relations in the Silicon Valley is considered as a model example of efficient innovative system, based on social capital: minimum hierarchy in operation, spontaneous interactions based on trust, co-operation based on social relations,

⁷ A. Saxenian, *Regional Advantage, Culture and Competition in Silicon Valley and Route 128*, Harvard University Press, 1994

regard for the innovator's personality and above all trial and error method applied in an intelligent manner as a main tool of cognition.

The situation described above has been subject to changes in the recent years. The shine of the Valley has been slightly dimmed after the catastrophe of IT companies. Route 128 has become a Mecca of *spin-offs* and it has taken over a number of elements of innovative culture of the Silicon Valley.

Idea of economy "based on knowledge"

The emergence of the idea of knowledge economy and knowledge management can be treated as a reaction to the crisis of previous innovation models. The characteristic feature of these approaches is reversal of perspectives. Instead of postulating what should work so that it is possible to manage the system comfortably, an effort is made to understand what works properly in efficient innovative systems and on this basis attempts are made to define efficient methods of organisation and management. The OECD materials devoted to these issues⁸ include the following statements:

Production of knowledge is a black box, the interior of which is impenetrable;

Knowledge management is resistant to engineering and planning procedures. Knowledge is "slippery" and closely knit with people who own it.

Tendency for top-down innovation management belongs to the most irresistible and the most dangerous. Warning from the industry is clear.

When the directors know only a fraction of what is known by their subordinates, and it is not possible to transfer inexpressible knowledge to the top, co-ordination by hierarchy is inefficient.

Organisations based on knowledge are characterised by: (1) intensive use of knowledge (not only information), (2) members having special knowledge, who are difficult to replace.

There is no defined border between production of knowledge and its application – both these functions are intertwined, both in theory and in practice.

The following factors are characteristic for companies achieving success: tension between freedom and control which is constantly and openly sustained, social cohesion preserved in the atmosphere of a "small company", people from different departments are brought together for common projects, hierarchies are ignored for the sake of stimulating co-operation, the young provide ideas, the older provide organisation, the composition of the group is often changed (without violating continuity), borders inside the company and between other companies are often blurred.

High class research is often found in smaller and more informal organisations. Due to this fact, large corporations externally join smaller companies and research institutions (bio-technology).

In comparison with huge hierarchic structures, the networks can search for changes in the environment in a more efficient manner.

The basis of team research organisation is the understanding that co-ordination is best achieved by direct participation of individual specialists.

Innovative efforts almost always include a large component of trials and errors and learning through repeated attempts.

⁸ OECD Knowledge Management, Op. Cit.

It may be easier to measure conditions conducive to creating knowledge than the knowledge itself. If there is no possibility of failure, there is no possibility of learning. Successful people usually experience more failures than losers.

An obstacle on the way to knowledge is a fact that the communities of users appreciate specific, short-term research rather than blue sky research.

Annex 2. Challenges, which have to be met

In order for an efficient regional innovative system to be created in Lower Silesia, it is necessary to address serious challenges. Most of them do not have a specific character. Some of them are faced by the whole Europe, some of them by all regions of Central Europe or Poland. However, even the most general ones will manifest themselves on our soil in a specific form. The list of challenges is far from complete and the authors of the strategy have concentrated on two types of challenges: challenges, which may impact the implementation of strategies in a decisive manner and those which escape attention due to various reasons, even though they deserve it by all means. Some of the challenges which translated directly into strategic directives were taken into account in various places of the proper text of the strategy.

A description of each of the groups of challenges is completed with short remarks regarding potential remedies. Some of them were taken into account in the proper text of the strategy; others lie beyond its limits and refer to widely-understood policy of the Region. In some cases the proposed remedies are not sufficient, but formulating them may contribute to discussions which may bear fruit in the form of innovative ideas.

Anyway, problems have to be noticed and met half-way. Those who do it best will be the winners in the inter-regional competition. Why should it not be Lower Silesia?

Demographic challenges

Demographic problems afflict the whole Europe. Decreasing number of births and a dramatic increase of people in retirement age create numerous threats which are widely discussed. Two are particularly important from the point of view of this document:

Decreased number of potential innovators may be even greater than it follows from changes in birth rate. Decreased fertility rate afflicts primarily these groups in the society which not only can transmit the appropriate genetic pool to the future generation but also, through education, have proper impact on crystallising talents;

Anti-innovative turn in economy and politics — increasing number of people in retirement age will cause political and economic tensions (failure of retirement and care programmes). If the difficult reform of social policy and its financing fails, huge funds will have to be allocated for its continuance, with detriment to the financing of development processes.

Remedies: maximum utilisation of the existing, pro-innovative economic conditions, monitoring problems and proposed solutions (so far they have not been visible) and their regional implementation; pro-innovative turn of our economy so that it is difficult to revert the launched processes, well thought-out immigration policy, allowing for “sucking in” talents beyond the European Union.

Migration challenges

Talented and creative people and results of their work are less bound to a particular place than at any other time in history. However, it is not enough to educate innovators, it is necessary to convince them to remain in the Region and create appropriate conditions so that their work brings benefits for Lower Silesia. These problems have a two-fold nature:

brain drain — in a globalised world talents move in the direction of centres providing better work conditions (almost 40% of American scientists and PhD engineers were born outside the U.S.) – sucking in of talents by external centres will escalate as the demographic problems intensify and as economic emancipation of China and India progresses;

intellectual capital outsourcing — it is possible (and even already visible) that external companies will localise innovative tasks in Lower Silesia, yet the advantages will be taken in distant parts of the worlds, where profits are created and new work places are generated. This is better than nothing, yet innovative support of local economy would provide more advantages.

Remedies: improving work conditions for innovators in Lower Silesia, creating positive emotional bonds with the Region, compensating lower wages, assisting the processes of rooting external companies in the Region.

Competence challenges

There will be no innovations, especially technological ones, without persons with competencies allowing for identification of new possibilities, accurate formulation of problems and experimental verification of ideas. In relation to this, the contemporary education, concentrated more on educating imitators than creators, has to be accused of:

intellectual minimalism — the rank of mathematical education was lowered and the teaching of natural and humanistic subjects was formalised with detriment for teaching disciplined intuition and imagination;

loosing talents — engagement with weak students leaves little time for working with good students. It is much rarer than fifty years ago that students, who managed to master the required skills, finish school quicker.

Remedies: developing the “*zDolny Śląsk*” programme, conducting a public debate on the desirable education model, assisting initiatives directed at intensive education of talents.

Motivation challenges

Apart from curiosity of the world and the occurring phenomena, the innovative attitudes were supported by the passion of their creators and a conviction that by their work they were serving higher aims. The basic obstacles nowadays are:

curiosity deficit — in a situation where answers are obtained even before a question was asked (flood of information), the habit of searching on the Internet is replacing the research reflex (coupled with a conviction that everything can be found there) – it is difficult to cultivate attitudes conducive to innovations;

consumer attitude — the wish to obtain immediate remuneration for a completed work or activity, which is not conducive to undertaking long-term and risk-burdened efforts, which often precede valuable innovations.

Remedies: promoting other life-styles than consumer type and models of success, including restoring the creators and inventors with the status or role models for children and youth.

Cultural challenges

Certain cultural models are conducive to the spreading of innovative attitudes. The following aspects have negative impact:

segmentation of spheres of life and creativity — closed circles and isolated competence areas (along with jealously protected positions of outstanding personalities) is not conducive to creative flow and intermingling of ideas and problems;

provincial complexes — the innovators should address problems which interest them, despite their status and background; complexes (noticeable in Lower Silesia, but also in other

regions) cause the fact that marginal problems are undertaken, and fragmentary contributions achieve the rank of a virtue.

Remedies: supporting integration programmes among different environments, popularising the history of research and innovative accomplishments, especially in Lower Silesia.

Procedural challenges

Certain institutional activities may be conducive to innovativeness in the regions; others hinder it in an efficient manner. At present, it is necessary to overcome obstacles in the following areas:

difficulties with establishing and conducting SMEs — innovations are born and develop mainly in small enterprises, often established with the aim of exploiting some innovative idea; administrative and capital difficulties related with operating such companies are one of the main reasons hindering or even discouraging from making an effort to put the idea into life, and in consequence – to create new ideas;

lack of compliance between legal and financial procedures and the needs of enterprises — certain solutions, which may cause little harm in standard situations, may hinder innovative enthusiasm; it refers to the sphere of taxes and customs procedures;

stiffness and formalisation of innovative process — the adopted linear model of creating innovations results in the fact that only innovators occupying a clear place in the system may count on interest, i.e. either employees of scientific and research institutions or enterprises which make use of a given idea. There are no mechanisms for procuring ideas from outsiders;

costly and time-consuming procedure of providing benefits from utilisation of creative ideas – in globalised economy it is important to reserve property rights in an international system, which often entails large financial outlays and a lot of time. This discourages creative persons. The effect is often renouncing the effort or ceding it onto others – it is often connected with loss of intellectual property rights, and as a rule it leads to discounting benefits from a new solution beyond the borders of the Region; it is not known how many (yet the number is not small) of Lower Silesia accomplishments, e.g. in IT technology, are sold around the world under the trademark of renowned companies, without indicating the source or the author of the idea;

defects in flow of information — persons who need new solutions or who want to make use of the unique resources of competencies in the Region do not have an easy access to information about them.

Remedies: review of procedures and administrative structures in the Region from the perspective of removing barriers for establishing and operating a small or medium-sized enterprise, special procedural paths for innovative companies, financial and organisational assistance in obtaining protection for intellectual property rights, influencing legislative activities at the national or even European level by Lower Silesia MPs and other politicians connected with the Region, procedural assistance for innovative companies, creating favourable atmosphere in public opinion, creating an Internet site for innovative persons and enterprises, developing commercial encasement around universities (spin-off type companies).

Annex 3. Summing up the results of research

Summaries of results of research projects carried out within preparatory works for Lower Silesia Innovation Strategy are presented below.

1. Innovative potential of scientific, research and development institutions in the Lower Silesia Voivodship

The objective of research undertaken between March and May 2004 was identification of resources of R&D institutions in the Region from the perspective of intensifying co-operation and transferring technologies to the SME sector. Forty-nine institutions from the area of the entire Voivodship took part in the research, which, with respect to the generic structure, constituted 75% of the R&D sector in the Region.

The research that was carried out indicated a complex potential of R&D companies operating in Lower Silesia. The basic indexes of the R&D activity locate the Lower Silesia Voivodship on the 4th or 6th place among other Polish regions. Taking into account the fact that the Voivodship's contribution in generating GDP is 78%, the Region is underestimated with respect to the R&D activity.

Analysis of the collected material has confirmed the hypotheses previously formulated within the scope of: aging of personnel, problems in communication and flow of information from the SMEs to the assisting institutions. It is necessary to underscore the Region's sustaining weakness in its capability to commercialise the results of research and to co-operate with the business sector. Attention has to be drawn to greater opening and flexibility in searching for business contacts, as well as a lower level of income not related with scientific, research and development activity of the Lower Silesia R&D institutions in comparison with other regions of the country. The institutions point out to problems related with accessing the potential recipients of research results. Promotion techniques that are used leave a lot to be desired.

The results of the research indicate that the heads of scientific institutions are reluctant towards "business attempts" of their employees. A small technology company has not yet been discovered in Lower Silesia and in Poland as one of the most efficient forms of transfer and commercialisation of technology. Companies established by research participants on the basis of new technical knowledge collected in the course of scientific and research works make it possible to check market potential in a flexible way with relatively low risk. It has to be emphasised that lack of appropriate procedures which make it possible to protect the institution's interest and the potential future profits from successful projects. The current situation results in an "academic grey zone"; the directors of a number of institutions attempt to defend themselves by the so-called "statements of loyalty."

The analysis that was carried out indicates the necessity to undertake the following activities within the framework of Regional Innovation Strategy:

strengthening scientific and research potential and development of new organisational forms;

developing contact networks of various partners of innovative activity: R&D institutions, support institutions, SMEs, large companies, self - governments and public entities;

constructing a system of gathering and popularising information about research and solutions ready for commercialisation;

activation and promotion of technological entrepreneurship within the framework of R&D institutions.

2. Non-commercial institutions of business environment in the Lower Silesia Voivodship

The objective of research carried out between May and June 2004 was to define resources, potential and development directions of assisting institutions in the Lower Silesia Voivodship. 120 institutions were identified initially, out of which 50 complied with the initial condition of activity carried out within the scope of supporting entrepreneurship, technology transfer and local development; the research was carried out in 41 institutions. The identified institutions constitute approx. 9% of all support institutions in Poland.

The research has shown that the support institutions slowly become a significant element of business environment in the Region. The process of constructing non-governmental support sector takes place in a systematic, yet slow manner. The voivodship cannot be considered the leader on the national scale, yet it is possible to indicate a number of pioneering and highly-estimated initiatives (Wrocław Technological Park, Venture Capital funds). Organisations of employers are characterised by special dynamics, which testifies to the openness of business circles in the Region onto self-organisation and self-support activities, and the operation of the institutions is not limited to protection of interests but it extends onto building services which increase business competencies of local companies.

It has to be emphasised that the number of institutions operating on the entire area of the Voivodship is quite substantial. Nevertheless, it is also necessary to draw attention to the fact that the level of organisational advancement and strategic thinking is low (only one in three institutions has a long-term development plan – e.g. incubators, loan funds, technology transfer centres - certificates and standardisations of provided services). Training, consulting and information activities are developed best. Practically all of the examined institutions have these types of services in their offer. Short-term character, especially in the case of training activities undertaken at the moment of obtaining external co-financing, has to be stressed.

Activities related with supporting innovativeness and technology transfer are a rarity. Apart from single instances, the examined institutions are not prepared for activities in this field, and at the same time they do not show much interest in pro-innovative initiatives. It is partly due to dominant co-operation with traditional enterprises, in which modernisation pressure is not as urgent as in modern industries.

A low level of consolidation of the environment of assisting the institutions and the lack of leaders on the regional scale also has to be brought into attention. Individual entities rarely undertake common projects, no sub-regional or regional co-operation or experience exchange platforms have emerged.

The analysis that was carried out indicated the need to undertake the following activities within the framework of the Regional Innovation Strategy:

development of regional flexible co-operation network and co-ordination of contacts between support institutions and public administration, R&D sector, SMEs, large companies and other organisations;

constructing information dissemination system (e.g. a regional Internet portal), informing about the offer of support institutions and their activities for the development of the Region;

assisting development of new specialised forms of activating technological entrepreneurship in the Region;

creating entrepreneurship assistance programmes, innovativeness assistance programmes and development of small and medium-sized enterprises on local level.

3. Innovative needs of enterprises from the SME sector in the Lower Silesia Voivodship

1. The Lower Silesia SME sector is much diversified as far as innovative activities and the manners of implementing innovations, contacts with the environment, evaluation of barriers and presented postulates are concerned. This indicates the necessity of working out a strategy for differentiating the offer of services for innovations and technology transfer for various SME groups (size of companies, localisation – rural and urban areas, sector of activity, innovative activity). The proposals in this field are as follows:
2. formulating the package of basic activities which mainly comprises support for innovative consciousness of companies;
3. formulating offer of standard services regarding assistance for innovative activity (widely understood) of average progress stage;
4. formulating offer of highly specialised services, addressed to the group of companies which are well or very well advanced technologically, which aims at streamlining transfer of knowledge and assistance in promoting new solutions – these activities should have industry character.
5. there is a necessity to assist the development of widely understood innovative environment. Activities undertaken in this respect should be directed at promoting co-operation between enterprises and between enterprises and regional institutions.
6. there is a clear underdevelopment of organised (institutional) system of innovations and technology transfer to SMEs, which significantly hinders the access of the Lower Silesia companies to various types of services for the benefit of innovation. The consequence of this state of affairs is development of informal, personally linked enterprises with the R&D sector and other institutions.
7. in the Lower Silesia region the companies have not reported any serious problems with the accessibility of training offer, as well as information of a general character. However, the access of the Lower Silesia SMEs to specialist training and information is considerably limited – a large majority of innovative companies is looking for them outside the Region (mostly in the Warsaw agglomeration or abroad, including Germany).
8. financial weakness of the SME sector greatly limits utilisation of services within the scope of training, information and consulting, which also constitutes a considerable limitation for possibility of co-operation with the institutions of the R&D sphere.
9. very weak position of the institutions of the R&D sector as a partner in innovative processes is very strongly visible in the Region. Also the position of consulting and training infrastructure, promotion and information supporting SMEs as partners of enterprises is very weak in the Region – there are various institutions with limited experience and inadequate competencies in the field of innovations and technology transfer.
10. bureaucracy and over-eagerness of the public administration clerks, low competencies in the field of innovations and corruption are considered by the majority of SMEs as a serious obstacle for undertaking innovative economic activity.

11. limited conditions of regional demand: the Lower Silesia SMEs have to deal with a relatively small regional (and also national) purchasing power for products / services of innovative character, which limits production scale and its economic profitability. This situation is slightly moderated by the proximity of German and Czech border.
12. large companies of the Lower Silesia Voivodship, including international ones, have a huge personnel and technical potential (know-how resources), still utilised very weakly to the benefit of regional development, especially in the context of the SME sector.

4. Initial analysis of the potential for enhancing innovation in Lower Silesia

In the first section — Issues of Assisting Innovations — certain issues important for the process of assisting innovations, for building the so-called innovation space, particularly significant in creating innovative capabilities of small and medium-sized enterprises, have been discussed. The areas (5 areas), types (15) and forms of assisting innovations (45) were defined which subsequently served for constructing a tool for initial evaluation of innovations' assistance by the entities of Lower Silesia. Moreover, the problems and obstacles encountered by SMEs in their innovative activity have been discussed, as well as tendencies which take place within the framework of innovation assistance. This part is completed with a review of known instruments and institutions of innovations' assistance with a division into non-commercial and business institutions.

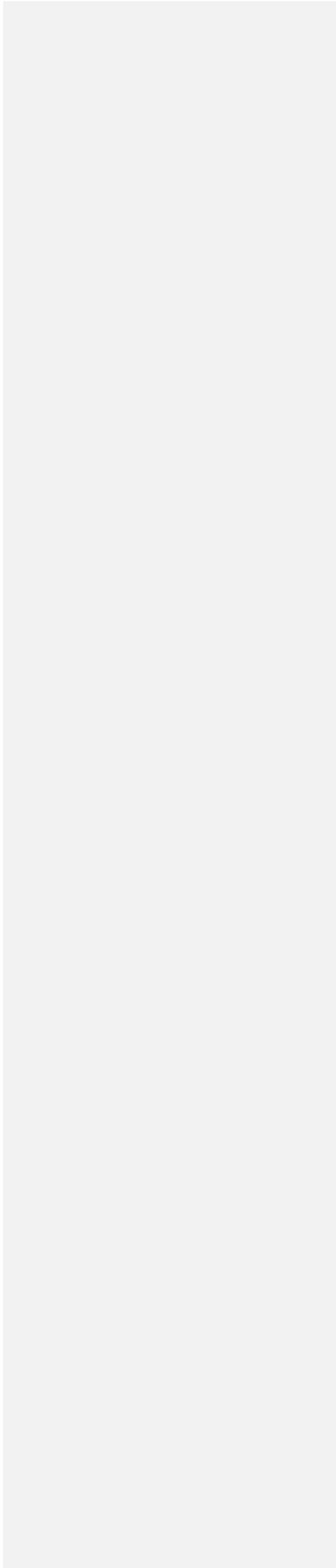
The second section: **Initial Evaluation of Innovation Assistance Potential** (results of work of the WGR 3 group), includes an initial analysis of innovation assistance potential by 62 identified entities. The analysis was carried out on the basis of available information sources (databases of self-governmental authorities, registers of the National SME Services Network - KSU, Polish Classification of Services - PKD, IRC and EIC, the institution's own publications, questionnaire, the Internet, knowledge and direct contacts of the members of the working group and the expert) and a prepared table (Excel sheet), in which the rows constitute the integrated entities of Lower Silesia and the columns, defined on the right-hand side, the types and forms of innovation support.

On the basis of this table and the available sources, the members of the working group and the expert have carried out independent analyses of the same of group of entities. On this basis and after individual consultations with the group members, a collective table was prepared (Annex 1), averaging and correcting individual answers. On the basis of synthesis of obtained results (Annex 2), the levels of coverage of the defined support areas by the identified entities were evaluated. It turned out that the best coverage level is in the sector of **information and communications**. There are considerable deficiencies in the area of **finances**, especially with respect to the financing of innovative projects and generating preferential credit and tax conditions; the knowledge area is characterised by a lack of provision of general knowledge on innovative processes and projects. Among the identified support forms, consulting is developed best in all of the five areas.

Another result of analysis (Annex 3) is the evaluation of the scope (diversity) and engagement level of the analysed entities in the support of innovations. It turned out that 15 entities (24% of the examined population) covers with its activity more than 50% of examined areas, and 25 entities (40%) cover from 33% to 49% of support areas.

Treating all the entities and instruments assisting innovations as a certain sub-system of innovation space, SWOT analysis was carried out for this sub-system indicating its weak and

strong aspects, and at the same time formulating chances and threats which may emerge with further extension of this sub-system.



Annex 4. Selected proposals of activities to the benefit of implementing the Regional Innovation Strategy

1. Activities integrating scientific and research and development (R&D) potential in the Region

1. Agreement for innovations. A large number of tertiary-level schools, institutes of the Polish Academy of Sciences, departmental institutes and entities operating for the benefit of pro-innovative development of the Region (agencies, centres, parks, incubators) requires co-ordination of activities. The character of activities in this field should maintain the advantages related with relative independence of each of the entities and at the same time fully utilise the potential resulting from integration. Specifying co-ordinating intentions would be premature today. Nevertheless, it can be assumed that agreements determining the role of each institution in implementing Knowledge-Based Economy in Lower Silesia will be necessary, as well as specific tasks in short and medium-term plans of pro-innovative actions which take up the form of the so-called platforms or projects. An example of such an agreement is "Agreement on establishing partnership for implementing project: Development of Regional Innovation System (Porozumienie w sprawie ustanowienia partnerstwa dla realizacji projektu: Rozwój regionalnego systemu innowacji), within the framework of activity 2.6 of the **Integrated Regional Development** Programme. Five tertiary-level schools from Wrocław and five Agencies for Regional Development from Lower Silesia participate in the agreement. Its objective is to prepare operation model and a comprehensive, regional system of informing about services, research and development offers, possibilities of obtaining licenses, etc., establishing networks of knowledge and technology transfer and carrying out training programmes for such centres.

2. Full implementation of initiative "Lower Silesia Centre for Advanced Technologies" is one of the key elements which will have a long-term impact on the possibilities of utilising European funds for science and innovations by the Region. The Centre stands a chance to become an integrating entity (beyond the divisions visible today) for the academic circles of Lower Silesia and generating important initiatives and R&D projects. The first stage of organising the Centre which relied on attracting several prominent professors of Wrocław universities and preparing a research programme has been completed successfully. Yet in order to implement the full programme and efficiently compete on the national scene for European funds decisions have to be made urgently on the legal status of the Centre and the role which it should play in our environment. This decision lies in the hands of the College of Presidents (the support of state and self - government authorities of the Region is also important). The most important decisions should refer to the following issues:

- defining the Centre's legal status;
- organising communal research infrastructure.

3. Integrated scientific and implementation programmes. It is necessary to prepare methodology (it might even be said: politics) of generating extensive research and scientific programmes (platforms) in the Region, whose impact would modernise and increase the competitiveness of Lower Silesia. There is no tradition of generating scientific policy of the Region. This is a consequence of both inappropriate understanding of independence and self-rule of the academic circles, its organisational fragmentariness, as well as lack of habit and skills on the part of regional authorities to formulate expectations of the inhabitants of

Wrocław and Lower Silesia with respect to the participation of science in solving key social and economic problems. Projects and partial tasks would be prepared within programmes, which, depending on their character, would be financed by the EU Framework Programmes, Structural Funds, national funds (commissioned and earmarked projects of the State Committee of Scientific Research), regional funds or through individual economic entities. The manner in which the consortia would supervise and coordinate the institutions which have proper competencies for their scope and which are the beneficiaries of the implemented solutions is still to be discussed. The list presented below includes programmes whose regional suitability has been identified and for which consortiums are currently being established which represent regional authorities, science and industrial or service enterprises. This list is provided only as an example:

- "Organisation of tele-medical services and supporting management of health protection units in Lower Silesia";
- "Clean technologies and recycling";
- "Quality and safety of food";
- "Internet information platform of specialist services, technologies and innovations";
- "Foresight in the Region".

4. Scientific and economic network The term "network" is associated by the Polish scientific circles first of all with the activity of research teams within the scope of the 5th and 6th Framework Programme of the European Union or similar scientific structures created in the last period in Poland. Meanwhile, the top regions of Europe have a mature form of relations between scientific, economic and self - government partners in the form of scientific and economic networks. This form of relations was practically verified in the course of the last decade and it is a voluntary association of academic and economic partners within area included under a 200 km radius. The scientific and economic network has a branch character, e.g. plastics (production, processing, products), tele-communications, IT, bio-medicine. The natural binding agent which unites the network partners are common interests. The university partners are institutes representing a particular branch, usually the leading role is played by two or three professors. The partners of the economy sector are both one-man companies (e.g. craftsmen), as well as others, even medium-sized companies. Industrial tycoons are not members of the network.

Among the basic tasks of the network are:

- ensuring technology transfer from universities and research institutes to economy in order to ensure high level of industry in the Region;
- developing extended system of increasing qualifications (post-graduate studies, courses);
- indicating development trends (new structures, materials, technologies);
- organising internships and diploma trainings for students and creating conditions which provide particularly talented students with an opportunity to make career in the regions (counterbalancing the outflow of valuable graduates to other EU regions);
- lobbying the authorities to create favourable conditions for the development of a given industry in the Region.

Solution in the form of a network is beneficial for all the parties. The regional authorities in the EU are greatly interested in the creation of networks. The alternative is controlling development of each industry by the clerks of economic departments. This solution would be dangerous due to the natural lack of necessary competencies in these spheres. Also the academic circles are interested in the creation of networks, because it is the way to obtain real

connections with economy and the resulting benefits. On the other hand, the economic circles have a constant flow of innovations, possibilities of increasing qualification and opportunities of effective lobbying. It has to be underlined that scientific and economic networks are not supposed to replace the existing trade and economy chambers. These organisations often have long traditions and operate in a different rhythm and do not react to the market changes of industries in a very quick manner. A network however can be solved easily or transformed, depending on the types of changes on the market.

5. Beyond-regional and international scientific and research units. Poland, after accession to the European Union, due to its population potential, may apply for a large scientific centre of European character. A question has to be asked whether a centre of the type of **Joint Research Centre – JCR** could be established in Wrocław. In other words: can we afford such efficient activity of the scientific and parliamentary lobby to obtain approval and funds for such an investment? Another example which has chances for quick implementation is the initiative of creating a research unit with the working name “Lower Silesia and Saxon Centre of Environmental Protection.” The possibilities and the purposefulness of establishing international scientific and economic networks also has to be taken into account, e.g. the area of Saxony, Lower Silesia and the North of the Czech Republic.

2. Activities levelling the existing “digital division” between Lower Silesia and the best developed regions of Europe and the world

In order to utilise the potential of the Region and level the existing “digital division” between Lower Silesia and the best-developed regions of Europe and the whole world, it is necessary to concentrate on the following areas in the short and medium period:

- First of all, it is necessary to aim at increasing the accessibility and further development of broad-band and safe IT infrastructure, which is still lacking in the Region, by extending the efficient IT networks, covering individual cities and towns of the Region in the broadest extent, and the entities and institutions localised in them, also providing the largest possible number of inhabitants with the access to the network (including those who live outside the main agglomerations of the Region). The infrastructure of broad-band access to the Internet is of primary importance. Development of the necessary infrastructure should take place with close cooperation of the Region’s authorities with the industry entities and institutions (including Wrocław University of Technology, operators, integrators, etc.) and be based on flexible and optimum selection of technologies and solutions in given conditions. The developed infrastructure would constitute a key communication medium in the Region and a solid basis for development of services, systems and applications used by specific groups of recipients in Lower Silesia, including offices, scientific and educational institutions, or companies.
- It is necessary to aim at improving the use of modern IT solutions, applications and systems in the operation of the public entities of the Regions, institutions of business environment and entities which influence or participate in the process of creating and implementing innovations. Making use of the above modern IT tools, such as electronic systems of flow of documents, management-aiding systems, systems of quick and safe transmission or data archiving, etc. may very clearly influence the improvement of efficiency, reduce costs and increase the quality of work of these institutions and

entities. Implementation of these types of solutions is especially desired at the level of self - government and state administration offices which operate in the Region and which provide a number of very important public services for the inhabitants and entities. A practical solution which could successfully improve efficiency and standard and facilitate the operation of the offices, and thanks to this also the customer service, is implementation of the so-called e-Government at the level of the Region (i.e. a system of electronic offices). This solution would significantly improve the environment and the climate for creating and implementing innovations in the Region and increasing its competitiveness.

- Even though private entities and scientific institutions do much better than the administration with using modern technologies, services and IT solutions in its activities and at work, support at regional level would also be recommended in this field. Special attention should be devoted to supporting initiatives and projects related with development and utilisation of: remote learning (e-learning), e-work, e-health or some forms of e-business, which can greatly impact the increase of innovativeness and competitiveness of the Region.
- The need to provide coordination at the regional level (and not only with respect to individual entities or institutions) is a very important issue for preparing and implementing the majority of the above-mentioned projects. Coordination and approval of the main premises for these types of projects (first of all for the e-government) would make it possible to reduce costs and time of such implementation and to obtain a clear synergy effect. In this field the key role should be played by the Office of the Marshal of the Lower Silesia Voivodship.