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Nanotechnology for Podlaskie 2020

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Type: Regional/technological foresight exercise

Organizer: Joanna Ejdys and Joanicjusz Nazarko, Bialystok University of Technology

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Purpose

The general purpose of the project was to elaborate a strategy of nanotechnology development up to 2020 based on the desired priority directions of the Polish Podlaskie province development oriented towards the application of nanotechnologies and the identification of the key nanotechnology research trajectories.

Nanotechnology to Boost Disadvantaged Region

The project *Technological foresight NT FOR* Podlaskie 2020. Regional strategy of nanotechnology development* was granted financial support from the EU Operational Programme "Innovative Economy 2007-2013" (Priority 1: "Research and development of modern technologies", Measure 1.1.: "Support for scientific research for establishment of a knowledge-based economy", Sub-measure 1.1.1: "Research projects using the foresight method").

The project attempts to promote breakthrough technologies in a situation where the development of the traditional economic sectors no longer contributes to regional economic growth. It is located in one of the least economically developed regions of Poland (and of the European Union) with a low level of economic welfare, little business competitiveness and a low intensity of innovation in technology and product development. The project is based on the *feed forward* logic, which assumes that it is possible to effectively anticipate future changes in an economic environment.

Such anticipation should allow to chart a development trajectory for a region that does not imitate others but heads in the direction where the leaders will be in the future. The goals of the programme are to

- elaborate a strategy of nanotechnology development for the Podlaskie province up to 2020,
- identify and map critical nanotechnologies up to 2020,
- identify the most important factors influencing the development of nanotechnologies,
- put forward scenarios of nanotechnology development and
- stimulate a process of regional vision-building involving the key stakeholders.

Nanotech Research Defined by Six Panels

Six panels defined the research priorities for the project:

1. Nanotechnologies in Podlaskie economy (RF1)
2. Nanotechnology research for Podlaskie development (RF2)
3. Key factors of nanotechnology development (RF3)

In addition to the three content-oriented panels, another three are focused on methodology: STEEPVL and SWOT Panel (SSP), Technology Mapping and Key

* *NT* stands for nanotechnology and *FOR* for foresight.

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Technologies Panel (TMKTP), Scenarios and Roadmapping Panel (SRP) (Fig. 1).

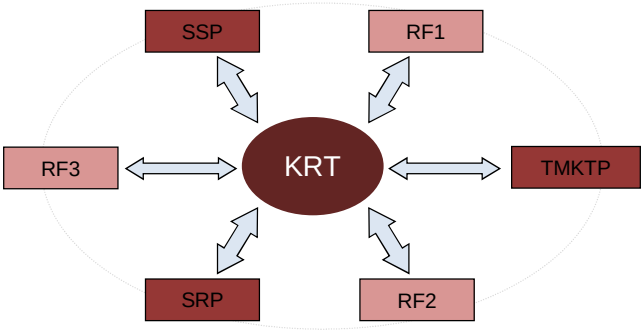


Figure 1: Panels interaction scheme

The results of the six panels are integrated by the Key Research Team (KRT), which also is a platform for interaction and knowledge transfer between the panels.

From STEEPVL analysis to Strategy

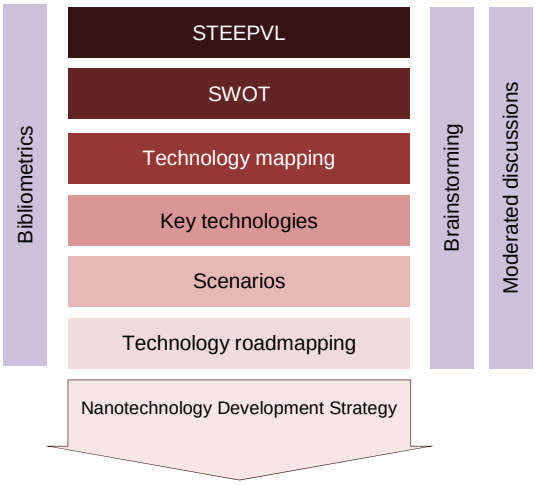
The methodology of the project is based on the intuitive logics school of scenario construction and comprises the following research methods and techniques: STEEPVL analysis, SWOT analysis, technology mapping, key technologies, the scenario method and roadmapping (Fig. 2). The main research methods are supported by brainstorming, moderated discussion and bibliometrics.

The factors influencing the selection of methods and techniques were the aim and duration of the project as well as the planned funding and availability of data, both quantitative and qualitative.

One of the innovative elements of the project is that it applies the concept of triangulation to expert recruitment in three ways: (1) ***Researcher triangulation*** in that the experts involved in the project represented a mix in terms of professional background, sex and age. Special attention was paid to the recruitment of women and young people (under 35) (at least 30%). (2) ***Data triangulation*** was achieved by involving experts representing different institutions as well as by consulting published sources reflecting a wide range of expert opinions (reports, books, journal publications and Internet sources on nanotechnologies). (3) ***Theoretical triangulation*** by including experts representing different research fields that are salient to nanotechnology development in Podlaskie province.

Another innovative element of the project was a two-dimensional assessment of STEEPVL factors by (1) taking into account the influence and importance of factors and (2) applying factor analysis in order to reduce the number of factors considered that shape nanotechnology development.

Figure 2. Methodology of the project



Great attention was paid to methodology development in technology mapping, roadmapping and the identification and assessment of wild cards.

Scenarios of Nanotechnology Development in Podlaskie Province

The sequence of procedures described above resulted in four scenarios of nanotechnology development in Podlaskie province. They were constructed along two axes, one of which related to the level of R&D in the region and the other to the level of collaboration among the actors from business, science and administration (Fig. 3, page 3).

Basic characteristics of the scenarios are presented in Table 1. Further in the process, each scenario was enriched by a detailed description of the remaining 19 STEEPVL factors. Short descriptive visions were also written in each of the four cases.

	Scenario profile	Scenario name
S_1	High R&D Effective regional collaboration of business, science and administration	NANO: New Dimension of Podlaskie
S_2	High R&D Ineffective regional collaboration of business, science and administration	NANO-scattered Podlaskie
S_3	Low R&D Ineffective regional collaboration of business, science and administration	NANO Indifference in Podlaskie
S_4	Low R&D Effective regional collaboration of business, science and administration	NANO-enthusiastic Podlaskie

Table 1. Basic characteristics of the four scenarios of nanotechnology development in Podlaskie province

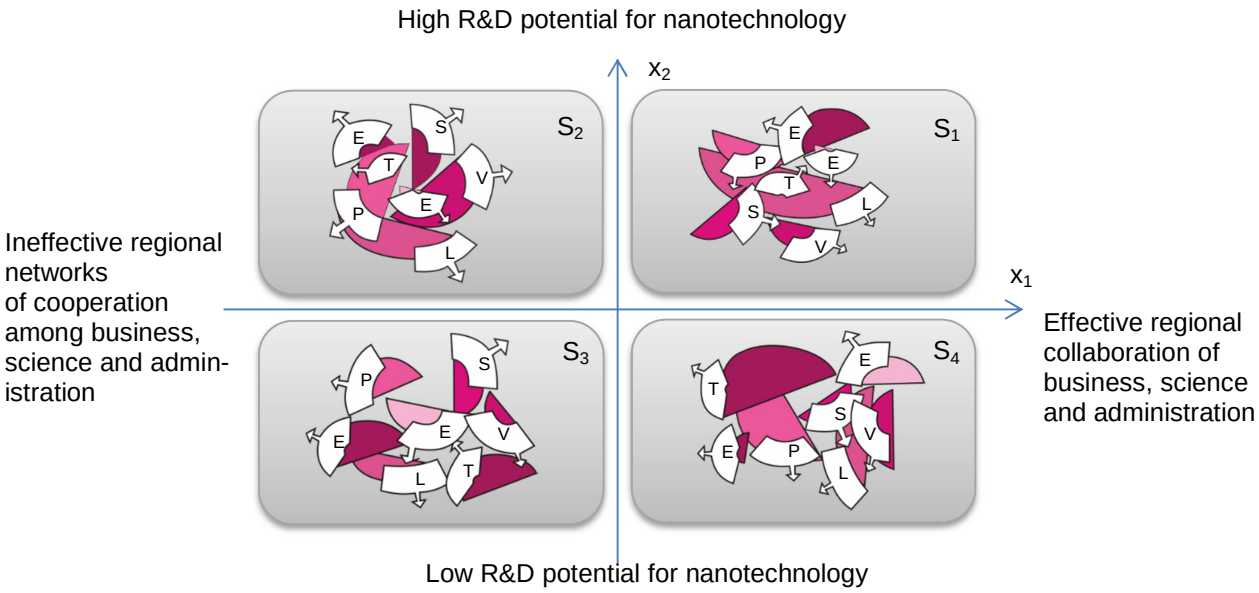


Figure 3. Alternative scenarios of nanotechnology development in Podlaskie province

Megatrends

Scenario formulation was preceded by identifying the detailed characteristics of megatrends influencing nanotechnology development. The following megatrends were considered relevant:

- technological progress,
- ageing population,
- increasing importance of alternative energy sources,
- intensified activities of states in the realm of security,
- new patterns of social inequality,
- shaping of the new economy,
- globalisation.

All megatrends were further divided into branching trends.

Priority technology groups

Additionally, the experts identified seven priority technology groups for the Podlaskie region:

- nanomaterials and nanosurfaces in medical equipment (T20),
- composite materials for dental fillings (T17),
- powder technologies in plastic, paint and varnish production (T31),
- surface nanotechnologies in biomedicine (T21),
- nanotechnology for cutting instruments and wood processing (T3),
- nanotechnology for specialised textiles (T24),
- nano-structuring of metals (T38).

The leading project experts attempted to embed the priority nanotechnologies into four scenarios by assessing the chances of each technology's development in the context of a particular scenario. The results of that exercise are presented in Fig. 4 (page 4).

According to the experts' opinions, five out of the seven technologies identified have very high chances of development under favourable conditions for R&D in nanotechnology and effective regional collaboration between business, science and administration, namely powder technologies in plastic, paint and varnish production (T31), composite materials for dental fillings (T17), surface nanotechnologies in biomedicine (T21), nanotechnology for cutting instruments and wood processing (T3), and nanomaterials and nanosurfaces in medical equipment (T20). In the S2 scenario (see Fig. 3), only nanotechnologies for specialised textiles (T24) have high development potential. The situation changes fundamentally in the scenarios S2 and S3 as there are no nanotechnologies with high chances of development under these circumstances. For each key technology identified, a roadmap of development was elaborated comprising various layers such as resources, R&D, technology and applications.

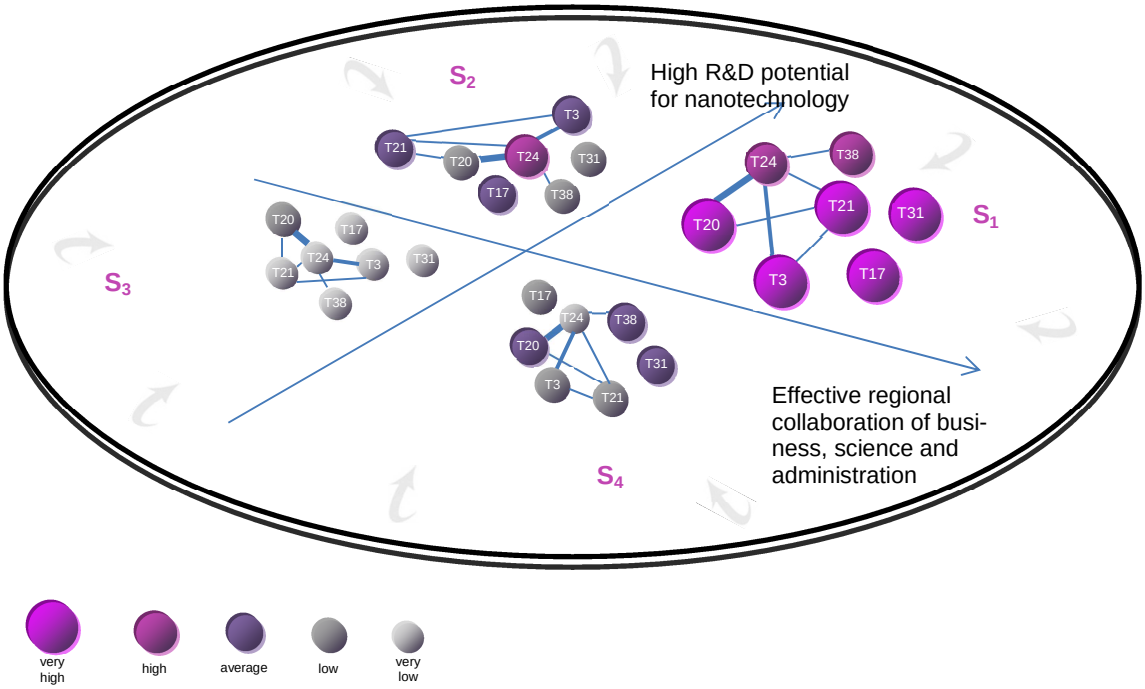


Figure 4. Experts' assessment of chances for the development of priority technologies in the context of different scenarios

Increasing R&D and Strengthening the Network

Technology foresight NT FOR PODLASKIE 2020. Regional strategy of nanotechnology development has allowed to identify the most important factors of the nanotechnology development in the region. In the course of the project, the participating experts identified key technologies that might contribute to creating a competitive advantage of the province.

The scenarios presented will be the basis for developing the roadmaps of nanotechnology development and eventually for formulating a regional strategy to that end.

As the results of the project have shown so far, increasing the region's R&D potential and strengthening the networks of entrepreneurs, scientists and authorities would create an environment most conducive to the development of nanotechnology in Podlaskie province. These two key factors therefore will be the vital elements of the nanotechnology development strategy to be formulated at a later stage.

The strategy, according to the project organisers, will set the direction for the introduction of nanotechnology into the economy of Podlaskie province and provide a sound proposal for a path towards the sustainable development of the region.

Sources and References

Feasibility study of *Technology foresight „NT FOR Podlaskie 2020". Regional strategy of nanotechnology development* [Studium wykonalności projektu *Foresight technologiczny* "*NT FOR Podlaskie 2020". Regionalna strategia rozwoju nanotechnologii*], Białystok 2008.