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NANORUCER

"Mapping the NANOtechnology innovation system of RUssia for preparing future Cooperations between the EU and Russia"

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“Database of R&D organizations"
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List of Contents

Introduction

The main aim of the NANORUCER support activity is to pave the way for future cooperation between the EU and the Russian Federation in the field of nanotechnology and nanostructured materials research (NN) as formulated in the description of the NMP work programme topic addressed. The building of a database of R&D organizations in NN is an important part of this activity. The main purpose of this work package is the creation of an information platform for the assessment of the Russian sectoral R&D system in NN to be carried out in work package 4. Further, this analysis serves for the mapping of R&D organizations and identification their research focus and interest which will provide important information for developing collaborative projects between Russian and European scholars.

The activity in this work package is concentrated on the building of a database of R&D organizations in NN using different sources of information and tools for information gathering, filtering and verification. In addition the database will be enriched by various indicators, which could provide some in-depth view on the organizations' performance, their research focus, and the available facilities for providing R&D on a nanoscale. R&D organizations are mapped by nanofields, type of organization and regions of the Russian Federation.

In chapter I, "Database of R&D Organizations in NN", the main activities related to database development, including the analysis of information sources, the development of our methodological approach to information gathering, filtering, verification and mapping are presented. A brief analysis of the main characteristics of the database, which includes more than 700 organizations, is also presented in this part of the report.

This activity was complemented by a survey of R&D organization, which was used as a tool for gathering more detailed information about the research organizations' activities and for the verification of information retrieved from various secondary sources as well as for enriching the database with more detailed information. The survey was also used for building the Target database of organizations, which are oriented on collaborative projects with EU partners. These organizations were mapped by nanofields, sectors of science and regions of the Russian

Federation. In chapter II, “Target database of R&D Organizations in NN”, the structure and main characteristics of this database are provided. All in all the Target database includes more than 80 R&D organizations.

The main activities related to the survey preparation and implementation, as well as a brief overview of the main results of the survey are presented in chapter III, “R&D Organizations Survey”. The survey helped to gather information about research activities of organizations, their publishing and patenting activities, about their partners in the EU and other parts of the world as well as helped to identify drivers and obstacles on the way of fostering mutually benefitial collaboration between Russian and EU research organizations. This information will be analyzed in detail during the forthcoming work package 4, although some first evaluations are presented in chapters 2 and 3 of this report. The survey was also used to push bottom up activities in the formulation of fields and topics for possible future collaborative projects in NN between Russian and EU scholars. Finally, the survey helped to collect publications of Russian scholars.

This Work package is realized by the follow team: Nadezhda Gaponenko, Tatiana Chechenkina, Anna Gaponenko, Natalie Smirnova, Ivan Vorobiev, Dr. Axel Thielmann.

The report is prepared by Dr. Thomas Reiss and Dr. Nadezhda Gaponenko

I. Database of R&D Organizations in NN

The database of organizations in NN is developed (1) to provide information about research organizations, which carry out R&D on nanoscale; (2) to enable the mapping of R&D organizations; (3) to feed the assessment of the sectoral R&D system in NN of the Russian Federation (RF); (4) to help to develop a joint strategy and collaborative projects between the EU and the Russian Federation; (5) to build the information source for placing the main information about the Russian R&D organizations on the NANORUCER website in order to help Russian and EU scholars to build collaborations.

Database development included the following main stages:

- identification and evaluation of sources of information
- database structure development
- information gathering, verification and filtering
- information translation into English.

1.1. SOURCES OF INFORMATION

The main sources of information for the project were collected and listed in the NANORUCER Methodological Guidebook produced in November 2009 (Deliverable D1.1). However during the information gathering new sources were identified as well as sources of information were evaluate in terms of their contribution to the project and data limitation.

The sources of information can be classified in the following way:

I. Ministry of Education and Science of the RF

a) Federal Target Program of Science and Technology Development

b) Federal Portal on NN

II. Russian Academy of Sciences (RAS)

c) Program "Nanotechnology" of the Presidium of the RAS
d) Program of Basic Research of the Presidium of the RAS

III. RUSNANO Corporation

e) Catalogue of RUSNANO Corporation
d) RUSNANO Forum & exhibition 2009, the main report of the forum
e) RUSNANO Forum & exhibition 2008

IV. National Nanotech Network Portal

V. Regional programs and nanotech networks websites

f) Regional Program in NN of Republic Tatarstan
g) Catalogue of Nanoprojects of Udmurtia
h) Catalogue of Regional Center of Nanoindustry of Udmurtia
i) Nanonetwork of Ulianovsk region
j) Nanonetwork of Puchino (Moscow region)
k) Nanonetwork of Tatarstan Region
l) Nanonetwork of Tula Region

VI. Regional and federal level foundations

m) Russian Foundation of Basic Research
n) Sankt-Petersburg Regional Foundation of S&T Support

VII. EU sources

o) Nanoforum (www.nanoforum.eu)

VIII. Internet resources

p) Virtual Center of Nanotech Supporting (http://www.nlr.ru/ibores/nano/index.php)
r) Nanomarket (http://www.nanomarket.ru)
s) Nanometer (http://www.nanometer.ru/)

IX. Conferences, forums and magazines

t) Russian electronic magazine "Nanotechnology"
u) Fryasino Nanotech conference proceeding and advertising materials
v) Russian Society of Scanning Prob Microscopy and Nanotechnology

This brief overview of information sources shows that the project is based on the information of key Russian players in nanotechnology (Ministry of Education and Science of the RF, Russian Academy of Sciences, RUSNANO, National Nanotech Network), the emerging players (regional authorities and networks), EU information, developing Internet sources, and scientific community magazines and conferences proceedings. This diversity of information sources formed the background for the identification of organizations from different sectors of science, public and private, well known organizations with strong R&D capacity and emerging players, as well as organizations from all regions of the Russian Federation.

Our analysis of these sources indicates that their information capacity varies considerably and that there are certain overlaps between different sources.

The biggest source of information was the Federal Target Program of Science and Technology Development of the Ministry of Education and Science of the RF. The primary information of tenders in nanotechnology announced by the Ministry during the period 2005-2009 was collected. The tenders' participants (about 10 000 applications were sent to the tenders although many organizations participated in the tenders many times) represented all types of organizations and all regions of the Russian Federation. However, this source has a very important shortage with respect to the principle targets of the project. It provides information only about the name of organizations and mailing addresses, and for many organizations it was difficult or even impossible to find the contact information. Accordingly a number of organizations from this source could not be considered.

The Program "Nanotechnology" of the Presidium of the RAS was a very valuable information source as far as it provided the information about the key academic research institutes and 60 organizations out of Russian Academy of Sciences, which were active in nanoscale research. However the Program provided information only about the name of organization. Therefore additional searches needed to be carried out.

The most reliable and complete information (in terms of contact information) was found on the Federal Nanotech Portal, which contained more than 150 R&D organizations and on the Portal of the National Nanotech Network, which included about 160 R&D organizations. All other Internet sources of information, on the one hand, had some specific and valuable information about the organizations' activity (in particular, sites of RUSNANO and Nanometer). On the other hand, in most sources the information was neither complete nor updated, and rather often it was not verified. Information on the websites of regional nanotech networks remains scarce (for example, on the website of nanonetwork of Tatarstan Region as well as on the website of nanonetwork of Tula Region were identified only 10 organizations) however it was valuable for the project as far as it helped to identify the regional actors.

With the rising of status of nanotechnology in stakeholders' priorities and in society, the various Internet sources have started to grow fast. We could identify about 100 R&D organizations on the nanometer site, 120 organizations on nanomarket website, and 46 organizations on the virtual center of nanotech supporting website.

The analysis of advantages and shortages of information sources determined our approach for the collection, filtering and verification of information.

1.2. INFORMATION GATHERING, VERIFICATION AND FILTERING

To meet the targets of the NANORUCER project the collected information needed to be filtered, completed and verified. This was done in two rounds. First, the information retrieved from various sources was completed and verified using the website of organization and other Internet sources in the framework of round 1 and after that it was enriched and verified using different sources of information and tools during round 2.

1.2.1. Information Gathering, Filtering and Verification – Round 1

Information sources listed above and Internet sources were used for the gathering, filtering and verification of information in round 1. Two criteria were applied for the filtering of information: communication criterion and performance criterion.

The communication criterion requires the availability of basic information such as mailing address, telephone number and, in particular, email address as far as in information society collaborations are impossible without email address. The performance criterion requires that at least one project or publication in NN should be found as prerequisites for including the organization into the database. For the organizations retrieved from the tenders of the Ministry of Education and Science, programs of the Presidium of the RAS, Russian Foundation of Basic Research and regional programs as well as for the organizations, which had specialized units with the prefix "nano" in the name, these criteria were not used.

The main steps of information gathering, verification and filtering are formalized in Fig.1. These general steps were used for all types of organizations although they were slightly modified depending on the peculiarities of different types of organizations.

Stage 1. The main task of first stage is the filtering, verification of information about organizations identified in different sources of information and collection the general information about organizations: mailing address, Tel, Fax, website (if available), contact person's name, function, scientific degree and email address.

Two procedures were implemented at the very beginning of searching: it was checked

(a) whether the organization was already included in the database or not and

(b) whether the organization had a website or not.

The approach of information collection differentiates between organizations, which have websites and those, which do not have websites.

For the organizations with website the following steps were implemented: the field of performance of organization was analyzed using performance criteria; if there were not doubts

that the organization provides R&D on nanoscale, than the general information about organization was gathered (mailing address, phone, Fax, website) and after that staffs switched on the identification of contact persons' information.

For the organizations without website first was checked information about the organization's activity in 2009 in order to make sure that it was not transformed or bankrupted. Follwing using Google we searched the website of affiliated organization to find the general information about organization. Therefore for some organizations contact information and information about their activity came from the website of the Presidium of the Russian Academy of Sciences, Regional scientific centers of the RAS, websites of ministries, agencies, affiliated organizations, nanotech websites, and the like.

The next step of data collection and verification was the *identification of contact person and contact information*.

The decision about who will be included into the database as contact person was made considering the distribution of functions and responsibility within the administration of the respective research organization. For academic research institutes the scientific secretary of the institute was included into the database as contact person as far as the issues of collaboration with research organizations are in the field of his/her responsibility.

In universities the vice rector for research or vice rector for international collaboration takes responsibility for these issues. For the institutes which perform under the umbrella of ministries and agencies this role is played by the scientific secretary or the vice director or even the director general depending on the status of the institute. Accordingly we had to make this decision and selection on a case by case basis. The same approach was used for private research organizations.

Data limitation. The availability of contact information like email address became a problem for many organizations of all types and regions. In some cases there were no email addresses at all; in many cases on the website was only a general email address like info@nameoforganization.ru. Some regional universities provided email addresses only for universities' entrants or students. Google searches were used to find email addresses of contact persons. In many cases email addresses were found in presentations, publications, conferences, and other proceeding placed in the Internet. One has to note that in many cases identified email addresses, even those which were place on the website, were not in use or were outdated. The verification of email addresses was made in round 2.

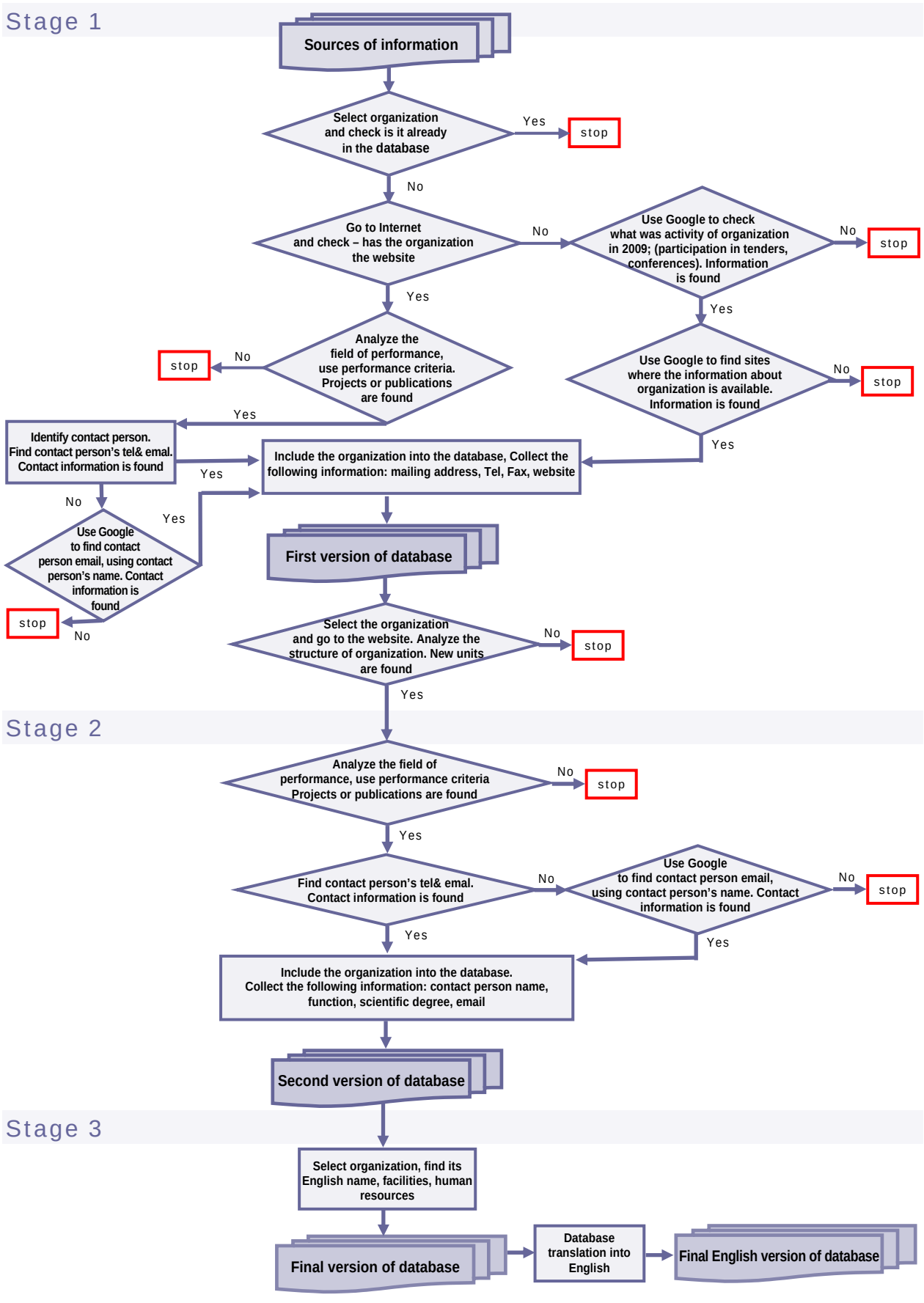


Fig.1. Information Gathering and Filtering

Stage 2. The task of stage 2 was the identification units of organization active in NN and collection information about these units.

Information gathering started with the analysis of the organizations' structure. The majority of organizations has on their website the icon "the structure of organization" or at least provide some basic structural information. As far as the project is oriented on the identification of organizations active in NN, the structure of research institutes was analyzed in terms of availability of research units like research centers, research institutes or regional branches. The approach was useful in particular for academic and university sectors. In academic research institutes specialized units were identified, focused only on nanoscale research as well as units, which have started to shift their research in favor of NN.

In universities such kinds of units were also identified. In addition, in well known universities, which have huge experience and expertise in nanoscale research, departments/faculties active in NN were identified. These universities are represented in the database by their NN relevant departments. For example, Lomonosov Moscow State University is represented in the database by the following departments (faculties): chemical, biological, physical, material sciences, mechanics and mathematics, as well as by several institutes and research& educational centers.

Developing the approach to the scanning of organizations of university sector we also took into consideration key specific characteristics of R&D organization's distribution across the regions of the RF, which impact the performance of research units of university sector, as well as emerging motivations of local authorities. Traditionally research capacities of the university sector were rather modest in all S&T domains, if compared to academic research institutes or research organizations of ministries and agencies. However, academic and branch science organizations are concentrated mainly in some regions of the RF and cities. University science is distributed across the regions of the RF more uniformly. That is why some regional authorities developing the regional innovation strategy relay more and more on their universities. With the rising up of the status of NN in stakeholders' priority and society some regions have started to develop regional strategies, programs, or at least increased funding on NN, what impacted regional universities and regional nanoscience. We could find out that not only units like institutes and centers but also smaller units like specialized nanolaboratories (in many cases the interdepartmental laboratories) were set up in universities or started to perform more active. These laboratories could become new emerging actors. One has to note that rather many of them have their own specialized facilities, and are active at conferences and among scientific communities. These specialized laboratories were also included into the database.

Data limitations. One has to note that rather often there were listed various research units on the website, including ones specialized on nanoscale research, however there was no information available about the field of their activity and contact data. Such kind of units could not be included into the database.

Stage 3. The final stage was the gathering of additional information about the institute. In order to provide an in-depth view into the institutes' status and performance we decided to identify indicators, which on the one hand, characterize the institute, at least in general, and, on another hand, are available on the website of organizations. It was observed that the information like foundation year and human resources was available for many research organizations. Human resources information was presented on the website in different ways: some organizations provided the complete information like number of staffs, number of R&D personal, number of PhD holders, number of staffs with post doctoral degree. Some organizations provided only some of these indicators. In any cases such information is valuable in terms of providing an idea about the research experience of organization and its human resources.

An important piece of information about the organization are the facilities available for nanoscale research, therefore we aimed at retrieving this information from the website of the organization (if available).

Finally, the name of the organization in English was taken from the web site, if available. It is in particular important for the organizations well known abroad in order to avoid variations in translation, which usually emerge.

1.2.2. Verification of Information and Enriching the Database of R&D Organizations in NN – Round 2

To enrich the database and verify information in round 2 we used the survey of R&D organizations in NN, nanotech websites and information of the Ministry of Education and Science of the RF (see Fig.2).

The survey helped to verify the main indicators in the database of organizations in NN: contact information, status of organization, technological fields, and human resources. First of all the survey was used to verify email addresses. Wrong email addresses were identified already at the beginning of the survey; 56 letters returned back as far as they had wrong email addresses. The analysis of this list shows that some of these organizations did not have websites and email addresses were found on the websites of affiliated organizations. However, in many cases emails were found on the websites of the organization but were outdated. To some extent this reflects the digital gap and digital culture of the R&D system. New email addresses were found mainly

by calling to R&D organizations. In this way the contact information for the R&D organizations database was verified.

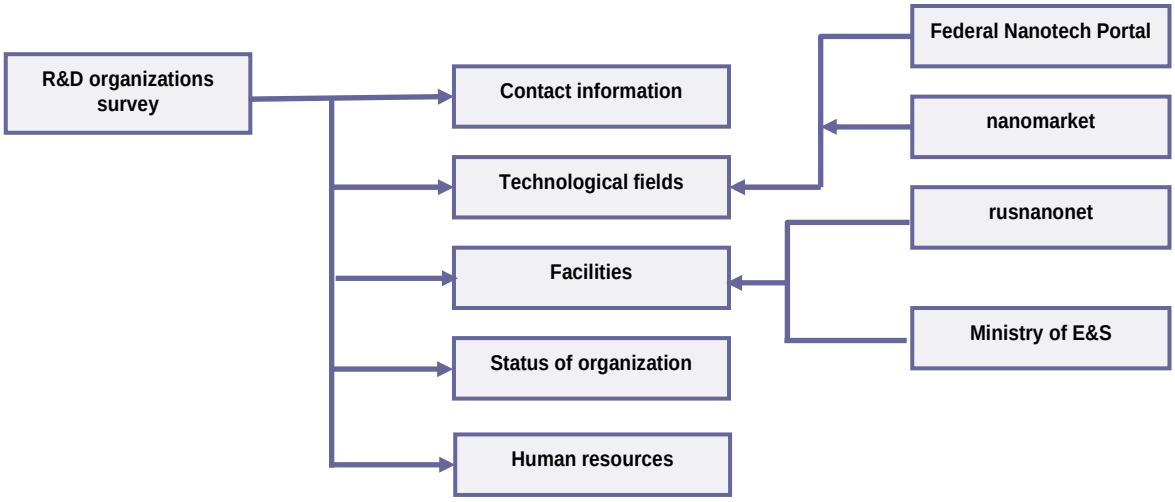


Fig.2. Information Verification and Enriching the Database of R&D Organizations in NN

To enrich information about R&D facilities, which was retrieved from the website of organization in Round 1, information from some other nanotech sites was used, mainly from the site www.rusnanonet.ru. In addition, the information of the Ministry of Education and Science about the unique facilities in NN was used (it was available for 10 organizations), and information from R&D organizations survey. At the end, using different sources of information, we were able to detect facility information for 178 organizations.

The survey was also used for the mapping of the organizations by technological fields; it helped to identify the emerging technological fields, which were not yet mentioned on the website of the organizations, or fields, which remained in the shade of main priorities of the organization. The survey information was in particular valuable for the mapping of organizations for which the information about NN activity was scarce. For such kinds of organizations we also used the information from the Federal Nanotech Portal, www.rusnanonet.ru, which provide information about the main spheres of activity for some R&D organizations.

For some institutes information about human resources was also obtained from the survey as well as information about the status of the organization; this information helped to provide more accurate mapping of the R&D organizations.

1.3. DATABASE STRUCTURE

The structure of the database was developed primarily to meet the goals of the project. On the other hand it was conditioned by the availability of information about the research organizations. The main requirements for the database are as follows:

(1) it should include contact information;

(2) organizations should be mapped by types (academic sector, R&D units of universities, organizations of ministries, agencies, and private sector R&D organizations);

(3) organizations should be mapped by the regions of the RF

(4) organizations should be characzerized by the main research focus in NN (nanomaterials, nanoelectronics, nanobio, nanooptic, nanoenergy, nanometrology, and basic research were also added as far as many Russian research organizations are focused on basic research).

Based on these requirements the database was arranged into the following directories:

D1 organization name
D2 contact information
D3 contact person
D4 location
D5 nanofields
D6 status of organization
D7 foundation year
D8 human capacity
D9 facility

"Organization name" contains two segments:

Org_Full_En - full name of organizations
Org_Brief _En - short name of organization

The contact information is structured into the following segments:

Address
Phone
Fax
Email
Website

For the organizations, which don't have websites, the web address of affiliated organizations or sites is provided, where the main information about organization was found.

The "contact person" information is presented in three segments:

Contact position
Title_En
Last_Name_En
First_Names_En
Middle_Name_En

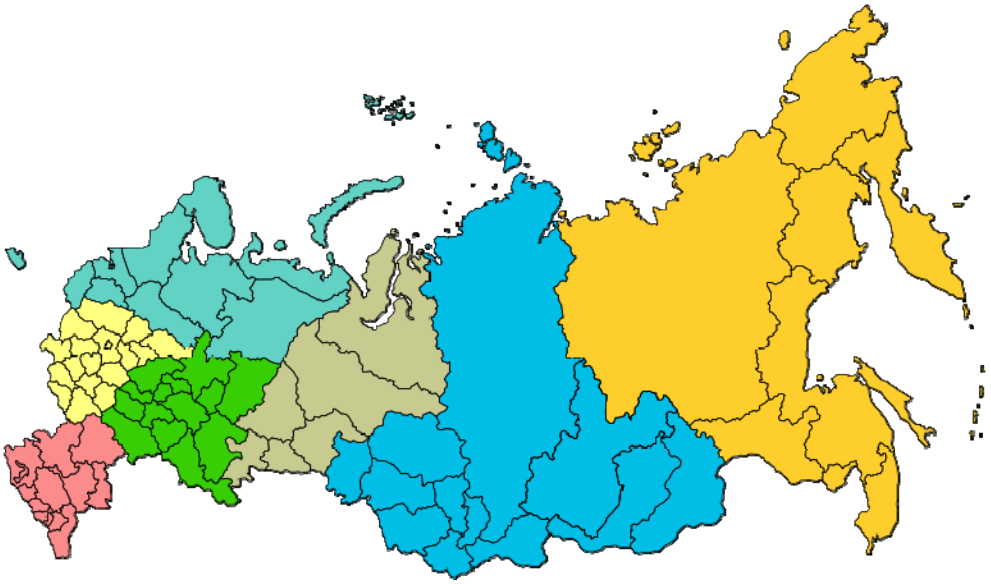
Location information is structured in the following segments:

Okrug (see Box 1 and Fig. 3)
Okrug code
City

Box 1. Federal okrugs

The federal okrugs (federal districts) are a level of administration for the convenience of the federal government of the RF. They are not the constituent units of Russia (which are the federal subjects). Each district includes several federal subjects and each federal district has a presidential envoy (whose official title is Plenipotentiary Representative). The official task of the Plenipotentiary Representative is to oversee the work of federal agencies in the regions, although in practice this oversight is extensive and of considerable consequence.

Federal districts' envoys serve as liaisons between the federal subjects and the federal government and are primarily responsible for overseeing the compliance of the federal subjects with the federal laws. Federal okrugs are also used for economic and statistical purposes as far as their parts sharing common economic trends, they reflect macrolevel breack down of activity across the regions of the RF.



Name of okrug (district)	Area (km²)	Population	Federal subjects	Administrative center
Central Federal okrug	652,800	38,000,651	18	Moscow
Southern Federal okrug	418,500	13,973,252	6	Rostov-on-Don
Northwestern Federal okrug	1,677,900	13,974,466	11	Saint Petersburg
Far Eastern Federal okrug	6,215,900	6,692,865	9	Khabarovsk
Siberian Federal okrug	5,114,800	20,062,938	12	Novosibirsk
Urals Federal okrug	1,788,900	12,373,926	6	Yekaterinburg
Privolzhskiy Federal okrug	1,038,000	31,154,744	14	Nizhny Novgorod
North Caucasian Federal okrug	170,700	8,933,889	7	Pyatigorsk

Fig. 3. Federal Okrugs (districts) of the RF

The following abbreviations are used for the federal okrugs of the Russian Federation:

Central Federal okrug – CFO
NorthWest Federal okrug – NWFO
Southern Federal okrug – SFO

Privolzhskiy (Volga Region) Federal okrug – PFO
Urals Federal okrug – UFO
Siberian Federal okrug – SibFO
Far Eastern Federal okrug – FEFO
Northern Caucasus Federal okrug - NCFO

For the federal okrugs the following codes are used:

CFO – 1
NWFO – 2
SFO – 3
PFO – 4
UFO – 5
SibFO – 6
FEFO – 7
NCFO – 8

Information about nanofields is structured in accordance to the main research areas:

t1 nanomaterials
t2 nanoelectronics
t3 nanobio
t4 basic research
t5 metrology
t6 optics
t7 nanoenergy
t8 other

Information about the status of organization includes the following segments:

Status code
Status segments

Status segments are used for the mapping of organizations and providing opportunities for the users to do various selections and calculations.

Status codes are determined as follows:

Academic research institutes – 1
Universities – 2
Organizations of ministries and agencies– 3
Organizations of branch science transformed during the privatization - 4
Private research organizations – 5
Other - 6

Information about the status of organizations is structured as follows:

s1 - Academic research institutes
s2 - Universities
s3 - Organizations of ministries and agencies
s4 - Organizations of branch science transformed during the privatization
s5 - Private research organizations
s6 - Other

Information related to human capacity is structured in the following segments:

SN - Staff number
R&D_P - R&D personal
PD_D - Post-doctoral degree holders
PhD_H - PhD holders

The year foundation consists of one segment (Found_year), where the year when the organization was founded, is included.

The facility field (Fac_F) includes the list of facilities available for providing nanoscale research.

1.4. R&D ORGANIZATIONS MAPPING

R&D organizations are mapped by type of organizations, regions of the Russian Federation (federal okrugs), and by nanofields.

To map the organizations by type of organizations the following procedures were used: "status code" was included into the cell "status". Using the code the software mapped the organizations in accordance to type of organizations; the tag "1" this way was included in one of cell in the field "status subsegment":

With the transformation of the status of R&D organizations of ministries and agencies problems emerged for their mapping. Some organizations, which transformed into joint stock companies, continued to be public R&D organization or semipublic ones, where the golden share remains in the hands of the government (federal or regional). However, some of these organizations became private companies. For the mapping these organizations we analyzed charters of joint stock companies (if available), which were found on the website of organization. In addition, information from the survey was used.

Another problem emerged with the private sector. The majority of private organizations combine both R&D activity and production of nanoenabled goods. Therefore it became problematic to identify which of them should be referred to as private R&D organizations and which of them might be considered like nanocompanies. The following procedures helped to select R&D active companies:

- the information from the website of the organization was analyzed; in some cases the organizations wrote that their main focus is R&D but they also produce nanoenabled product; in this case, organizations were included into the R&D database
- the structure of organizations was analyzed; the units like "scientific council" were used as indicator that the main focus of organization is R&D as far as such kind of units are typical for R&D organizations

- if the website of organization did not provide enough information for the mapping, we made additional Google searches to identify information about "the main code of economic activity of the organization"; by registration the organizations point out in their charter codes of economic activity and the main code of economic activity (main focus of organization); if the main code was marked as "research and development" then the organization was included into the database of R&D organizations
- the majority of private companies was registered as "research and production organizations" therefore they were filtered to the database of nanocompanies; from the list of these organizations only several ones were selected, which were active in scientific life, presented themselves in some nanotech websites as strong R&D groups, and had strong focus on R&D; their selection helped to avoid loosing strong organizations with strong R&D capacity, since the main task of the project is to identify possible collaborative projects with EU scholars.
- For the mapping of organizations by the regions of the Russian Federation the following procedures was used:

  the abbreviation of okrug was included into the cell "okrug";
  the code of okrug was written in the cell "Cod_okrug".

For the mapping of organizations by nanofields the tag "1" was pointed in one or more technological fields where research organization provides R&D on nanoscale. The mapping of organizations by nanofields was carried out on the base of information about research activity of the organization placed on their web site or on other nanotech sites. In many cases the information about the projects of organizations or publications of staffs was used. This mapping reflects the main focus of organizations in nanoscale research.

1.5. DATABASE OPPORTUNITIES

The database is well designed for the mapping of R&D organizations, the identification of organizations in specific nanofields and regions of the Russian Federation. It is built using Excel software since this software is wide spread and might be used easily by different users. Simple programs might be developed by users for their own specific needs.

To meet the main targets of the project the database was used for the mapping organizations by the regions of the Russian Federation, types of organizations and nanofields. It provides the opportunities:

I. to perform the following general evaluations

Identifying the number of organizations of different types (academic, university, and the like), which provide R&D on nanoscale;

Analyzing the number of organizations in different regions of the Russian Federation, which provide R&D on nanoscale;

Detecting the number of organizations, which provide R&D in specific nanofields;

II. to carry out the following more specific evaluations:

Identifying the number of organizations of specific type in specific region of the Russian Federation, for example, the number of academic research institutes in Central Federal Okrug

Identifying the number of organizations of specific nanofield in specific region of the Russian Federation, for example, the number of organization which provide nanobio research in the Far Eastern Federal okrug;

Analyzing the number of organizations of specific nanofield of specific type in specific regions of the Russian Federation, for example, the number of academic research institutes, which provide R&D in nanoelectronic in North-West region of the Russian Federation;

Analyzing the distribution of organizations of different type by the regions of the Russian Federation, for example, the distribution of academic research institutes accross regions of the Russian Federation;

Elaborating the distribution of organizations of specific nanofield across the regions of the Russian Federation, for example, the distribution of organizations, which provide R&D in nanobio by regions;

Analyzing the distribution of organizations of specific nanofield across different types of organization, for example, the distribution of organizations, which provide R&D in nanobio across the different types of organizations (academic sector, universities, organizations of the ministries and agencies, private sector);

For specific okrug, one can calculate the distribution of organizations per specific nanofield, and across of different type of organization.

1.6. SAMPLE ORGANIZATION RECORD

The Nano-Centre of Tomsk Polytechnic University was used to provide an example how the organizations are represented in the database of R&D organizations in NN.

Org_Name _Full_En	Nano-Centre of Tomsk Polytechnic University
Org_Name _Short_En	TPU Nano-Centre
Address	30, Lenun Ave., Tomsk, Russia, 634050
Phone	+7 (3822) 427242
Fax	+7 (3822) 426936
Email	khasanov@tpu.ru
website	www.tpu.ru/eng/nanoc.htm; www.tpu.ru/html/nano.htm
Contact person	
Title_En	Professor, Dr.
Last name	Khasanov
First name	Oleg
Function	Director
City	Tomsk
Okrug	SibFO
Okrug code	6
Technological fields	
T1	1
T2	1
T3	1
T4	0
T5	0
T6	1
T7	1
T8	0
Status code	2
Status segment	
S1	0
S2	1
S3	0
S4	0
S5	0
SN	21
R&D_P	20
PhD_H	10
PD_H	2
Found_year	1996

Fac_F	1. TEM JEOL JEM-2100F having Ion Slicer EM-09100IS (Japan), GATAN system (USA) 2. SEM JEOL JSM-7500F having microanalyser EDXS (Japan) 3. AFM, SPM nanolaboratory NT-MDT NTEGRA-Aura (Russia) 4. AFM, SPM training equipment NT-MDT NanoEducator (Russia), 10 devices 5. Nanoparticle Size Analyzer by laser diffraction Shimadzu SALD-7101 6. The Spark Plasma Sintering (SPS) Machine SPS Syntex Inc. Dr.Sinter lab (Japan) for sintering nano-crystalline bulk materials 7. Porosimeter Quantachrome Poremaster 33 (USA); provides the measurement of the pore size ≥7 nm with pore size distribution. 8. X-Ray diffractometer Shimadzu XRD-7000S (Japan) including: HTK-2000 Heating Chamber with accessories (vacuum and gas atmosphere control) providing temperature range 20…2200^{o}C Polycapillary Optics Attachment PCL-1001 'Long Fine Focus': X-ray Tube, PW2273/20 (Philips, Cu) , Micro-Measuring Attachment, MDA-1101 with video output Thin Film Analysis using Attachment, THA-1101 Large sample stage (R-Theta) providing analysis of large samples (350 mm diameter; 190 mm height) Stress Analysis Attachment SA-1101 Rotational Sample Stage, RS-1001 with option driver Theta-Theta Vertical Goniometer Cu Target, Broad Focus (BF) Type Min. Step Angle: 0.0002 deg. (2theta), 0.0001 deg. (theta) PDA-4+ Database Crystallite Size & Lattice Strain Software Crystallization Calculation Software 9. Nanohardness meter Shimadzu DUH-2115 (Japan) 10. BET-analyzer of specific area Sorbi (Russia); provides the measurement of the specific area (0.05…2000 m^2/g), mean size of nanoparticles (≥ 1 nm), pore volume (0.001 cm^3/g). 11. Helium pycnometer Quantachrome Ultrapycnometer 1000 (USA) 12. Microhardness meter LOMO PMT-3M (Russia) having digital CCD video-camera 13. Binocular optical microscope LOMO MMN-2 (Russia) 14. Testing machine ZIPO IP-500M (Russia) having standard digital dynamometer for testing bending strength 15. Powerful ultrasonic equipment: Ultrasonic generators IL 100-6/10, Russia (4 kW; 16…24 kHz); UZG 6.3, Russia (6 kW; 18…24 kHz); UZG 3, Russia (3 kW; 21 kHz). Magnetostrictive transducers PMS-15 , Russia (1.5 and 3 kW; 21 kHz) Ultrasonic bath 16. Pressing equipment including: Hydraulic press *WK 18* (Poland); the press force up to 100 tons; Digital sensor of microdisplacements *Mitutoyo ID-F125/150* (Japan); Digital manometer *DM 5001EU* (Russia); Computer interface Hydraulic press D2430B (Russia); the press force up to 100 tons; working area about 800 x 800 x 700 mm. 17. Vacuum furnace Nabertherm HTK-18 (Germany); temperature range up to 2200^{o}C, the chamber volume of 8.1 liters. 18. Furnace LAC VP 20/17 (Czechia); temperature range in air up to 1700^{o}C; the chamber volume of 10 liters. 19. The infra-red imaging SDS HotFinder-DXT (Russia).

1.7. DATABASE MAIN CHARACTERISTICS

The database of R&D organizations in NN provides a comprehensive overview of research organizations of the RF, which carry out R&D on nanoscale. Over 700 organizations are included from the large well known research institutes with long-term traditions and competence of nanoscale research to small, fast-emerging research units. The database contains information about different types of organizations located in all regions (okrugs) of the Russian Federation. With the growing visibility of NN a number of organizations with the prefix "nano" in their name have started to emerge. We identified 89 organizations, which had "nano" in their title.

Break down of organizations by type. Organizations are classified by one of six key areas: academic research institutes, university sector, organizations of ministries and agencies, organizations of branch scince transformed during privatization, private research and development organizations, and others (those, which do not meet requirements of main areas).

Fig. 4. provides an impression about the distribution of organizations by key areas. The academic sector includes more than 200 organizations, that equals 28% of the whole pool. It is represented by the organizations of the Russian Academy of Sciences (RAS), the Russian Academy of Medical Sciences (RAMS), the Russian Academy of Architecture and Building (RAAB), Russian Academy of Agricultural Sciences (RAAS) and in the regional context by the research institutes of all regional branches of the Russian Academy of Sciences (Ural Branch of the RAS (UBRAS), the Siberian Branch of the RAS (SBRAS), the Far Eastern Branch of the RAS (FEBRAS)) as well as by the regional scientific centers of the RAS.

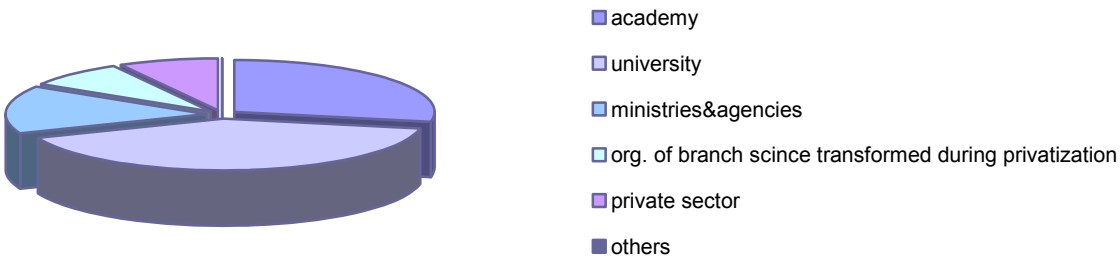


Fig. 4. Distribution of R&D Organizations by Type

One has to note that the academic sector includes both well known research institutes in the Russian Federation and abroad, and recently founded institutes specialized on nanoscale research or units of academic research institutes.

The university sector includes well known universities and those which make first steps in nanoscale research as well as institutes, research centers, research & educational centers, laboratories which perform under the umbrella of universities. It contains information on over 280 organizations. All universities, except one, are public universities. In the regional context organizations of this sector are located in all regions of the RF with dominance of Central Federal okrug.

The third sector – organizations of ministries and agencies includes state research centers, which got this status in the middle of 90s of the last century and are oriented mainly on applied studies and public research organizations, which perform under the umbrella of federal ministries and agencies or under the umbrella of regional authorities. This sector contains information about 100 organizations.

The fourth sector - organizations of branch science transformed during the privatization includes research organizations, which during the soviet times referred to the branch science but with the transformation of the economic model of Russia were transformed into joint stock companies, where the government has 100% or a golden share; one can find among these organizations well known organizations of the State Atomic Energy Corporation "Rosatom" or the Russian Federal Space Agency. These organizations, if compare them with third sector organizations, are more oriented on the market; they are for-profit oriented organizations, and it is written in their charter.

The fourth and the third sectors include also scientific and production complexes/centers/enterprises; during the 80s of last century the government of the Soviet Union made the decision to bring under a common umbrella strong or even unique research organization and production companies to facilitate knowledge production, transfer and commercialization and to provide leadership in some branches; these organizations have unique research capacity in different branches like electronics, nuclear energy, space, and the like. As far as the project is oriented on the development the collaborative projects between the RF and EU, the scientific and production complexes are included into the database in order not to loose strong and even unique science. The fourth sector contains information about 60 organizations. The private sector numbers 60 organizations. It includes private non-profit and for-profit organizations, which provide R&D on nanoscale; one may observe their concentration in Central Federal okrug.

Distribution of organizations across the regions of the RF. The database contains organizations from all regions (federal okrugs) of the RF. Fig.5 gives overview of the

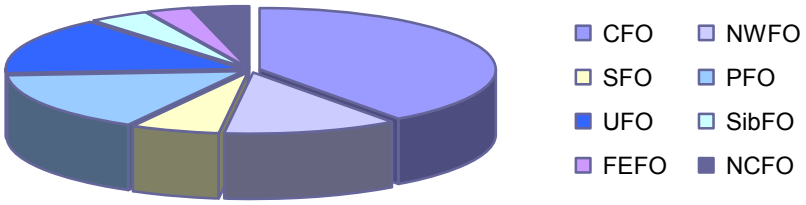


Fig.5. Organizations Break Down by Regions of the RF (by Federal okrugs)

distribution of organizations across the regions of the RF. One may observe the concentration of organizations in the Central Federal okrug (49%) what is conditioned by Moscow's and the Moscow region's role in science. The concentration of nanoscience in this region is on line with general trends of regional distribution of Russian science and has its historical roots.

Distribution of organizations by nanofields. The database includes organizations, which provide R&D in all outlined nanofields (see Fig.6.). Many of them play in two or even more nanofields at the same time. One may observe the dominance of nanomaterials as far as in Russia, like in many other countries and regions of the world, nanoscale research started in this field.

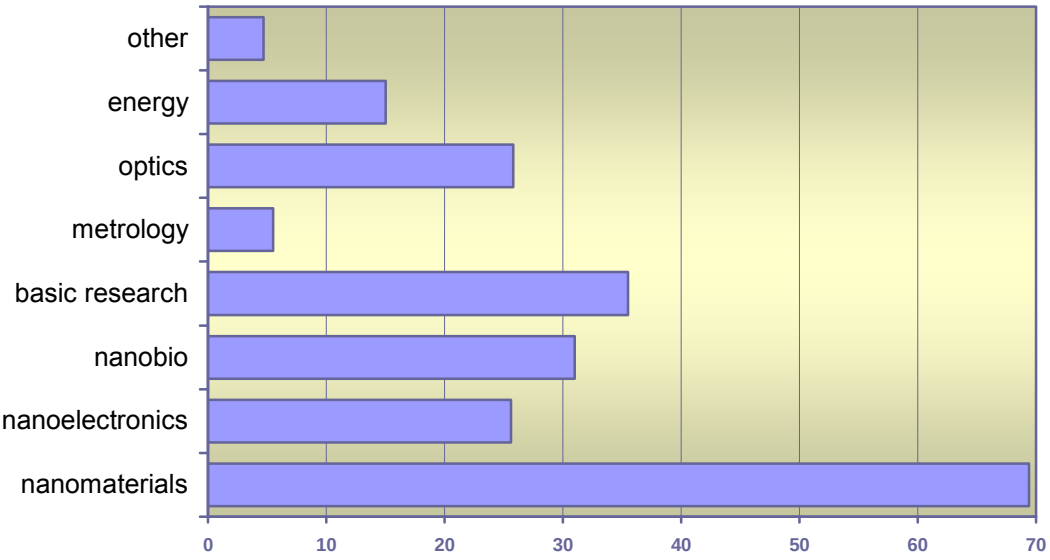


Fig. 6. Distribution of Organizations by Nanofields

Digital characteristics. To characterize the organizations of database in terms of availability of information about their performance in the Internet the following indicators were used:

number of organizations which have web site;
number of organizations which have web site in English or more foreign languages.

About 20% of all organizations did not have website (see Fig.7.). Russian statistics does not provide such kind of information, however these proportions are on line with the results of a survey of academic research institutes provided by ISS of the RAS in 2008. Only 39% of R&D institutes present information about their activities in English and/or other languages in World Wide Web.

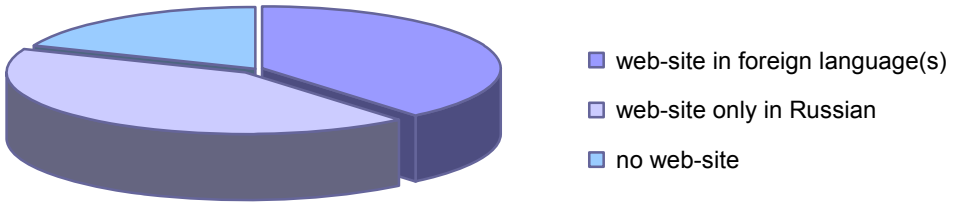


Fig. 7. Digital Characteristics

II. Target Database of R&D Organizations Oriented on Collaborative Projects with EU Scholars

The target database was developed to support the main targets of the NANORUCER project, namely to identify organizations which are oriented on collaborative projects with EU partners, and could be active in the 7th and 8th Framework Programs. The information for this database was withdrawn from the survey of R&D organizations active in NN (see Part III "R&D Organizations Survey"). The organizations of Database meet the following characteristics: most professional, strive to have collaborations with EU scholars, opened and collaborative, mobile.

2.1. DATABASE STRUCTURE

The database was arranged in the following directories:

D1 organization name
D2 contact information
D3 contact person
D4 location
D5 foundation year (Found_year)
D6 NN year (NN_year)
D7 organization type
D8 research area key word
D9 technological fields
D10 application areas
D11 human resources
D12 facilities

The directories D1, D2, D3, D4, D5, D12 do not differ from the directories of database of R&D organizations in NN; one has to note only one peculiarity – the contact person for international collaboration was nominated by the organizations themselves although one has to note that rather often it did not differ from the contact person in the database of R&D organizations in NN.

The information about type of organization is structured as follow:

Academic research institutes – 1
Universities – 2
Organizations of ministries, agencies and other public and semipublic organizations – 3
Private research organizations – 4
Other - 5

The D6 Directory – the year when organizations started to do research on nanoscale (NN_year) - is a very strong indicator of the organization's experience and expertise in NN.

The technological fields are structured in the following way:

q1- Nanomaterials
q2- Nanomagnetics
q3- Nanomechanics
q4 - Nanoelectronics
q5- Nanooptics & photonics
q6 - Nanobiotechnology
q7 - others

In the target database the technological fields and application areas are outlined in a more detailed way to provide a fine mapping of the organizations. The directory "application areas" is structured into the following segments:

a1- Healthcare and medical devices
a2- Pharmaceutics
a3- Chemicals
a4- ICT and consume electronics
a5- Construction
a6- Manufacturing, equipment, tools
a7- Further consumer products (e.g. textiles, food)
a8- Energy
a9- Safety
a10- Environment
a11- Transport, mobility
a12- Others

The directory D11 Human resources includes not only the total number of staff but also the number of staff active in NN and the break down of this indicator into more specific indicators. The directory is structured in the following segments:

Staff_a - the total number of staff of organization in 2009
Staff_b - total staff in NN R&D
Staff_c - R&D personal
Staff_d - PhD holders
Staff_e - Staffs with post-doctoral degree
Staff_f - PhD students
Staff_g - International staff

The indicators in this directory provide valuable information for the evaluation of NN activity of R&D organization.

R&D organizations are mapped in the database by type of organization, region of the RF, technological fields and spheres of application, using the information from the survey.

2.2. SAMPLE ORGANIZATION RECORD

Nano-Centre of Tomsk Polytechnic University was used to provide an example how the organizations are represented in the Target Database of R&D organizations in NN and to show the differences between these databases. In the target database the organizations are mapped in more detailed way, and it has very valuable indicators like the year when the organization started to provide R&D on nanoscale as well as R&D personnel involved in nanoscale research.

Org_Name _Full_En	Nano-Centre of Tomsk Polytechnic University
Org_Name _Short_En	TPU Nano-Centre
Address	30, Lenun Ave., Tomsk, Russia, 634050
Phone	+7 (3822) 427242
Fax	+7 (3822) 426936
Email	khasanov@tpu.ru
website	www.tpu.ru/eng/nanoc.htm; www.tpu.ru/html/nano.htm
Contact person	
Title_En	Prof.
Last name	Khasanov
First name	Oleg
Function	Director
City	Tomsk
Okrug	SibFO
Okrug code	6
Technological fields	
T1	1
T2	0
T3	0
T4	0
T5	1
T6	1
T7	0
Application areas	
A1	1

A2	0
A3	0
A4	1
A5	1
A6	1
A7	1
A8	1
A9	1
A10	0
A11	1
A12	0
Status code	2
SN	21
R&D_P	20
PhD_H	10
PD_H	2
Found_year	1996
NN_year	1980
Keywords_En	Functional and structural nanoceramics
Fac_F	1. TEM JEOL JEM-2100F having Ion Slicer EM-09100IS (Japan), GATAN system (USA) 2. SEM JEOL JSM-7500F having microanalyser EDXS (Japan) 3. AFM, SPM nanolaboratory NT-MDT NTEGRA-Aura (Russia) 4. AFM, SPM training equipment NT-MDT NanoEducator (Russia), 10 devices 5. Nanoparticle Size Analyzer by laser diffraction Shimadzu SALD-7101 6. The Spark Plasma Sintering (SPS) Machine SPS Syntex Inc. Dr.Sinter lab (Japan) for sintering nano-crystalline bulk materials 7. Porosimeter Quantachrome Poremaster 33 (USA); provides the measurement of the pore size ≥7 nm with pore size distribution. 8. X-Ray diffractometer Shimadzu XRD-7000S (Japan) including: HTK-2000 Heating Chamber with accessories (vacuum and gas atmosphere control) providing temperature range 20…2200oC Polycapillary Optics Attachment PCL-1001 'Long Fine Focus': X-ray Tube, PW2273/20 (Philips, Cu) , Micro-Measuring Attachment, MDA-1101 with video output Thin Film Analysis using Attachment, THA-1101 Large sample stage (R-Theta) providing analysis of large samples (350 mm diameter; 190 mm height) Stress Analysis Attachment SA-1101 Rotational Sample Stage, RS-1001 with option driver Theta-Theta Vertical Goniometer Cu Target, Broad Focus (BF) Type Min. Step Angle: 0.0002 deg. (2theta), 0.0001 deg. (theta) PDA-4+ Database Crystallite Size & Lattice Strain Software Crystallization Calculation Software

9. Nanohardness meter Shimadzu DUH-2115 (Japan)
10. BET-analyzer of specific area Sorbi (Russia); provides the measurement of the specific area (0.05…2000 m2/g), mean size of nanoparticles (≥ 1 nm), pore volume (0.001 cm3/g).
11. Helium pycnometer Quantachrome Ultrapycnometer 1000 (USA)
12. Microhardness meter LOMO PMT-3M (Russia) having digital CCD video-camera
13. Binocular optical microscope LOMO MMN-2 (Russia)
14. Testing machine ZIPO IP-500M (Russia) having standard digital dynamometer for testing bending strength
15. Powerful ultrasonic equipment:
    Ultrasonic generators IL 100-6/10, Russia (4 kW; 16…24 kHz); UZG 6.3, Russia (6 kW; 18…24 kHz); UZG 3, Russia (3 kW; 21 kHz).
    Magnetostrictive transducers PMS-15 , Russia (1.5 and 3 kW; 21 kHz)
    Ultrasonic bath
    16. Pressing equipment including:
    Hydraulic press WK 18 (Poland); the press force up to 100 tons;
    Digital sensor of microdisplacements Mitutoyo ID-F125/150 (Japan);
    Digital manometer DM 5001EU (Russia);
    Computer interface
    Hydraulic press D2430B (Russia); the press force up to 100 tons; working area about 800 x 800 x 700 mm.
17. Vacuum furnace Nabertherm HTK-18 (Germany); temperature range up to 2200oC, the chamber volume of 8.1 liters.
18. Furnace LAC VP 20/17 (Czechia); temperature range in air up to 1700oC; the chamber volume of 10 liters.
19. The infra-red imaging SDS HotFinder-DXT (Russia).

2.3. TARGET DATABASE MAIN CHARACTERISTICS

The target database of R&D organizations covers research organizations of the RF, which carry out R&D on nanoscale and are oriented on the collaboration with EU partners. Over 80 organizations are included from the large well known research institutes to emerging fast developing and very active centers. The database contains information about different types of organizations located in all regions of the Russian Federation, providing R&D in all technological fields.

The database includes about 10 organizations, which were founded at the end of 19th century or during three first decades of 20th century; these organizations have long- term traditions of R&D activity. About 20 organizations represented in database started nanoscale research during 80s of last century and some ones even earlier. Database includes organizations well known in Russia and abroad with high citation index like L.D. Landau Institute for Theoretical Physics of the RAS, A.M. Prokhorov General Physics Institute of the RAS as well as organizations, which in the National Nanotech Network are responsible for the development of some nanofields, like A.A. Bochvar high-technology Research Institute of Inorganic Materials, Moscow Institute of Electronic Technology (Technical University) or Central Research Institute

of Structural Materials “Prometey”. Many organizations are members of National Nanotech Network.

Database contains organizations of all type with some domination of academic research institutes and university science (see Fig.9). Academic sector is represented by strong institutes like Institute of Microelectronics Technology and High-Purity Materials of the RAS in Chernogolovka (Moscow region), L.D. Landau Institute for Theoretical Physics of the RAS, A.M. Prokhorov General Physics Institute of the RAS, Kutateladze Institute of Thermophysics of the Siberian Branch of the RAS, Khristianovich Institute of Theoretical and Applied Mechanics of the Siberian Branch of the RAS, Emanuel Institute of Biochemical Physics of the RAS. About 15 organizations of this sector started nanoscale research during the 80s of last century.

University sector includes strong Moscow universities like Moscow Institute of Physics and Technology, Moscow Power Engineering Institute (Technical University), Moscow Institute of Electronic Technology (Technical University), I.M.Gubkin Russian State University of Oil and Gas as well as strong regional universities like National Research Tomsk Polytechnic University, Kazan State Technological University, Ryazan State Radio Engineering University, and others. About 10 universities started research on nanoscale during the 80s of last century. One has to note that this sector is also represented by emerging but very fast developing specialized centers like Research-educational and innovative Centre “Nanostructured Materials and Nanotechnologies” of Belgorod State University.

Branch science includes well-known and strong organizations like Central Research Institute of Structural Materials “Prometey”, A.A. Bochvar High-Technology Research Institute of Inorganic Materials, “Kompozit” (JSC), State Scientific Center Research Institute of Atomic Reactors, Institute for Rare-Metals Industry GIREDMET, and the like. For example, Central Research Institute of Structural Materials “Prometey” started research on nanoscale in 1986; in 2009, there were about 1500 staffs in organization and about 380 staffs provided R&D on nanoscale.

Private sector is represented by fast developing organizations like Scientific Technical Centre «TATA» (LtD), Scientific-Technological Center «Bakor» (JSC), Scientific and Technical Centre “VLADIPOR”, “INKOMMET” (JSC), and others. Some organizations of this sector, for example, Scientific Technical Center “TATA” already have got partners in EU and USA.

The majority of organizations is active in publications and sent us their list of publications. 14 organizations have got their own specialized magazine (Image Processing Systems Institute, Scientific Institute of Paint Coating with Machine-Building Factory "Victoria", Saint-Petersburg State University of Technology and Design, Scientific-Educational

Center "Baromembranace and Electromembranace Biotechnologies", Institute for Nanotechnologies of International Conversion Foundation, Institute of Applied Mechanics, Institute for Analytical Instrumentation of RAS, Moscow Institute of Electronic Technology (Technical University), Photochemistry Center of the RAS, A.A. Bochvar High-Technology Research Institute of Inorganic Materials, Central Research Institute of Structural Materials "Prometey", Centre of Powder Materials Science at Perm State Technical University, Ivanovo State University, Scientific Technical Centre «TATA» Ltd.).

Many organizations suggested the topics for collaborative projects in 7th and 8th Framework Program. Majority of organizations are well-equipped.

About 50% of organizations have got partners for collaborative research in EU, about 30% of organizations have partners in USA, and more than 20% have partners in Asia Pacific region. Most active Russian scholars collaborate with CNRS and Max Plank institutions (see Fig.8.)

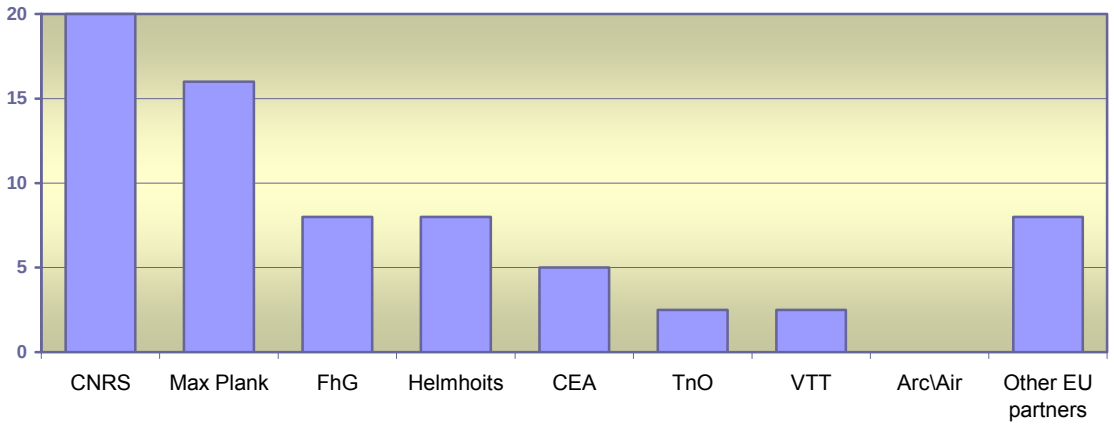


Fig. 8. Characteristics of Cooperation with the Leading EU Research Organizations

Many organizations participated in international programs; about 20% had projects in European Union Framework Programs, about 8% had projects with NSF (USA), and other partners around the world. About 16 organizations has experience of participating in the following European programs: ARCUS, BOF, BRIDGE (2), CNRS (4), DAAD (3), DFG (2), GB Royal Society, GDRE , INTAS (3), ISTC, ITER, NATO SfP Programme, NOW, PICS, TEMPUS IV. Many organizations cooperate with colleagues from different European universities within the scope of bilateral agreements.

III. R&D Organizations' Survey

The survey is designed to: (1) provide information for the assessment of the sectoral innovation system of the Russian Federation; (2) to build the target database of organizations oriented on the collaboration with EU scholars in NN; (3) to collect information about these organization to place it on the NANORUCER website to facilitate collaboration between Russian and EU scholars; (4) to push bottom up activities in the formulation of fields and topics for possible future collaborative projects in NN between Russian and EU scholars.

3.1. SURVEY PREPARATION

Survey preparation included the following activities: preparation of questionnaire, invitation letters, database structure development, and sending out the questionnaire and invitation letters to respondents.

3.1.1. Questionnaire

The following steps were done to prepare the questionnaire for the survey:

(a) an English version of the questionnaire was developed and discussed with members of the NANORUCER advisory board, any suggestions of board members were included into the questionnaire

(b) the final version of questionnaire was translated into Russian;

(c) the questionnaire Word version was structured into specific fields in order to transform automatically the filled-in Word version of questionnaire into the EXCEL version for the building of the database of survey and provide the calculations

(d) Internet version of questionnaire was developed as far as the decision was made to give the respondents a chose to fulfill the questionnaire on the website or to send the fulfilled version by email.

Box 2. Globalpark EFS Survey

EFS Survey is a web-based software solution by Globalpark AG for organizing, implementing and evaluating online questionnaires. EFS Survey is an advanced Web application that can be operated from anywhere with any commercially available browser. Therefore, the user does not necessarily need to install a software on their computer, but can create, change or monitor surveys via any Internet access. The use of commercially available browsers as human interfaces has the invaluable advantage that virtually everyone worldwide who is familiar with the Internet will be able to operate EFS Survey. All functionalities required to successfully conduct electronic, Internetbased survey research are available in one place.

Globalpark Enterprise Feedback Suite 7.0, 2010

The ESF software (see Box2), provided by Fraunhofer ISI, was used for the development of the Internet version of the questionnaire.

3.1.2. Invitation Letters

The content of the invitation letter was discussed with the NANORUCER advisory board and the scientific officer of NANORUCER. Based on this personalized invitation letters were prepared for the respondents. The invitation letters were made automatically using the database of R&D organizations in NN and the Microsoft Word function "Letters and mailing".

3.1.3. Survey Database Structure

The database was arranged in the following directories:

D1 General information
D2 Characterization of NN activities
D3 Resources
D4 Activities
D5 Bottlenecks and possible solutions

The directory "General information" was structured into the following segments:

D1a organization name
D1b contact information
D1c contact person
D1d location
D1e foundation year
D1f NN year
D1e type of organization

The Directories D1a, D1b, D1c, D1d, D1e, D1f do not differ from the corresponding directories of the Target database of R&D organizations in NN.

The directory "D2 Characterization of NN activities" was structured into the following segments:

D2a the main type of research activities

D2b research area key word
D2c technological fields
D2d application areas
D2e collaborative projects

The directories D2a, D2c, D2d did not differ from the corresponding directories of Target database of R&D organizations in NN. The D2b was divided into two subsegments:

q7_1 - "theoretical research"
q7_2- "experimental research"

The directory D3 "Resources" is divided into the following subdirectories:

D3a significance of NN activities
D3b Human capacity
D3c Funding
D3d Facilities

The subdirectory D3a "significance of NN activities" is divided into the following segments:

q12_1 - extremely important
q12_2 - very important
q12_3 - moderately important
q12_4 - slightly important

The subdirectory 'human capacity" is divided into the following segments:

Staff number
Staff breakdown
R&D Staff Orientation
Staff trends
Students number
Students trends

"Staff number" includes two sebsegments:

q13a - total number of staffs in 2009
q13b - Average age

The segment "Staff breakdown" consists of the following subsegments:

q14 - Total staff in NN R&D
q14_1 - Number of staff with post doctoral degree
q14_2 - Number of PhD
q14_3 - Number of PhD students
q14_4 - Number of international staff in NN R&D

"R&D Staff Orientation" includes two subsegments:

q15_1 - Theoretical research (share of staff)
q15_2 - Experimental research (share of staff)

The segment "Staff trends" is divided into three subsegments:

q16_1 - Number increased
q16_2 - Number remained constant
q16_3 - Number decreased

"Students number" (q17) includes the number of students, providing R&D on nanoscale. "Student trends" (q18) indicates students' trends.

The subdirectory "Funding" is divided as follows:

Funding sources (a)
Funding sources (%)
Budget 2009 (q20)

Funding sources (a) includes the following subsegments:

q19a_1 - MS&E and Federal Innovation Agency
q19a_2 - other federal ministries and agencies
q19a_3 - Russian foundations
q19a_4 - regional budget
q19a_5 - budget of the Russian Academy of Sciences
q19a_6 - private sector
q19a_7 - European Commission
q19a_8 - other international programmes & foundations
q19a_9 - other sources (please write down)

These segments include information about the sources of nanoscale research funding.

Funding sources (%) includes the following subsegments:

q19b_1 - MS&E and Federal Innovation Agency
q19b_2 - other federal ministries and agencies
q19b_3 - Russian foundations
q19b_4 - regional budget
q19b_5 - budget of the Russian Academy of Sciences
q19b_6 - private sector
q19b_7 - European Commission
q19b_8 - other international programmes & foundations
q19b_9 - other sources (please write down)

These segments include information about the share of different sources of finding of nanoscale research in 2009.

The directory "Facilities" is divided into the following subdirectories:

Equipment (q21_En)
Share of equipment
External facilities

The subdirectory "Share of equipment" includes the following segments:

q22_1 - Imported
q22_2 - Home produced

The subdirectory "External facilities" is structured as follows:

q23_No – use of external facilities
q23_Y1 - large scale facilities
q23_Y2 - joint research
q23_Y3 - industrial facilities

q23_Y4 - others
q23_Y4 - details
q23_R1 - Russian centres of collective use
q23_R2 - facilities of the RAS
q23_R3 - facilities of Russian universities
q23_R4 - facilities of Russian corporations
q23_F1 - facilities of EU organisations
q23_F2 - facilities of USA organisations

The directory "Activities" is presented by three subdirectories:

Scientific activities
Activities related to technology development and transfer
Networks

The subdirectory "Scientific activities" includes the following segments:

q24 - Publications trends
Co-publications
Conferences
Q28 - Magazines

"Co-publications" is divided into the following sebsegments:

q25_1 - RAS
q25_2 - Russian universities
q25_3 - R&D units of private sector in Russia

"Conferences" includes the following subsegments:

q27_1 - international
q27_2 - all Russian
q27_3 – local

The subdirectory "Activities related to technology development and transfer" is structured as follows:

q29 - Patents
Patents break-down
Spin-offs
N_of_spin_offs
List_of_spin_offs
Networs
International projects

The segment "Patents break-down" is divided into four subsegments:

q30_1 - Russian Patent Office
q30_2 - American Patent Office
q30_3 - European Patent Office
q30_4 - Japanese Patent Office

"Spin-offs" includes two subsegments: q31 (yes or nor spin-offs), q32 - number of spin-offs, q33 – list of spin-offs.

The segment "Networks" is structured as follows:

q34R_1 – Russian universities
q34R_2 - Russian SME
q34R_3 - Russian technoparks
q34R_4 - institutes of RAS
q34R_5 - Russian business incubators
q34R_6 - Russian VC companies
q34R_7 -other Russian public research institutes
q34R_8 - Russian centres for collective equipment use
q34R_9 - Russian large firms
q34R_10 - Russian others
q34EU_11 - EU universities
q34EU _12 - FhG
q34EU_13 - Max Plank
q34EU_14 - Helmholts
q34EU_15 - CEA
q34EU_16 - CNRS
q34EU_17 - NnO
q34EU_18 - VTT
q34EU_19 - Arc\Ait
Other EU partners' list
q34US_1 - US univer.
q34A_1 - Asia_univer.
q34O_1 – other univer.
q34US_2 - US public
q34A_2 - Asia_public
q34O_2 – other public
q34US_3 – US large
q34A_3 - Asia large
q34O_3 – other large
q34US_4 - US SMEs
q34A_4 - Asia SMEs
q34O_4 – other SMEs
q34O - Other regions

"International projects" includes the following subsegments:

q35_1 - EC
q35_2 - EUREKA
q35_3 - Other EU
q35_4 - NSF
q35_5 - Other US
q35_6 - Other regions

The Directory D5 "Bottlenecks and possible solutions" is divided into the following subdirectories:

Problems in knowledge production
Changes in knowledge production

Problems in knowledge transfer
Changes in knowledge transfer
Problems in collaboration with EU
Drivers in collaboration with EU

The subdirectory "Problems in knowledge production" is divided into the following segments:

q36_1 - low demand at the home market
q36_2 - lack of required facilities
q36_3 - insufficient funding
q36_4 - R&D multi-disciplinarity and lack of multidisciplinary networks
q36_5 - lack of qualified personnel
q36_6 - other

The subdirectory "Changes in knowledge production" includes the following segments:

q37_1 - Russian President initiatives
q37_2 - Federal Target programme, developed by the MS&D
q37_3 - private sector growing demand
q37_4 - aggravation of problems in economy, environment and health, which might be solved only by NN
q37_5 - Russian Academy of Science Programme in NN
q37_6 - cooperation with EU institutes providing special equipment or know-how
q37_7 - National Programme of Infrastructure development
q37_8 - others

The subdirectory "Problems in knowledge transfer" includes the following segments

q38_1 - lack of information about R&D
q38_2 - lack of incubators and VF
q38_3 - lack of funding for R&D commercialisation
q38_4 - lack of experience of researchers to commercialise their R&D
q38_5 - administrative barriers to enter the home market
q38_6 - lack of interests of researchers to commercialise their R&D
q38_7 - insufficient defence of intellectual property right
q38_8 - lack of interest of researchers to apply for patents
q38_9 - others

The subdirectory "Changes in knowledge transfer" is structured as follows:

q39_1 - growing demand at home market
q39_2 - venture investments growth
q39_3 - growing competition at home and world markets
q39_4 - programme of business incubators development launched by the Ministry of Economic Affairs
q39_5 - public support for R&D commercialisation
q39_6 - new generation of scholars, which will be more mobile and entrepreneurial
q39_7 - Rusnanotech initiatives
q39_8 - cooperations with EU institutes providing special equipment or know-how
q39_9 - others

The subdirectory " Problems in collaboration with EU" consists of following segments:

q40_1 - language problems
q40_2 - lack of interest of Russian scholars
q40_3 - lack of information about projects of EC
q40_4 - insufficient funding
q40_5 - lack of understanding of rules, accepted in EU
q40_6 - intellectual property rights problems
q40_7 – others

Subdirectory "Drivers in collaboration with EU" includes the following segments:

q41_1 - initiatives of EC to foster collaboration
q41_2 - growing collaboration between Russian and EU scholars in a self-organising way
q41_3 - initiatives of Russian authorities to foster collaboration
q41_4 - worsening of common European problems like natural disasters, new diseases, climate change, which might be solved only by NN
q41_5 - initiatives of Rusnanotech to foster collaboration with EC and EU Member States
q41_6 - others

3.1.4. Sending out the Questionnaire

Three attachments were sent to respondents:

(1) questionnaire;

(2) personalized invitation letter;

(3) supporting letter of the EC signed by Director Mr. Bose (see Annex European Commission Supporting Letter).

The program "The Bat" was used for the automatic sending out the survey information.

3.2. THE MAIN CHARACTERISTICS OF SURVEY RESULTS

The survey produced a lot of information about R&D organizations activity, which will be analyzed in work package 4 for the providing national innovation system in NN of the RF assessment. In this report we will make just brief characteristics of survey outputs.

Over 80 organizations of all types, located in all federal okrugs participated in the survey.

Break down by type of organizations. Fig.9. summarizes the distribution of organizations by key areas. The total share of academic organizations and universities in both samples (707 and 8$ institutions) equals 68%. However, academic sector was more active in answering questionnaires, and communicating. The academic sector includes more than 30 organizations. It is represented by the organizations of the Russian Academy of Sciences and the Russian Academy of Medical Sciences as well as by organizations of Central, Siberian, Far Eastern and Ural Branches of the RAS.

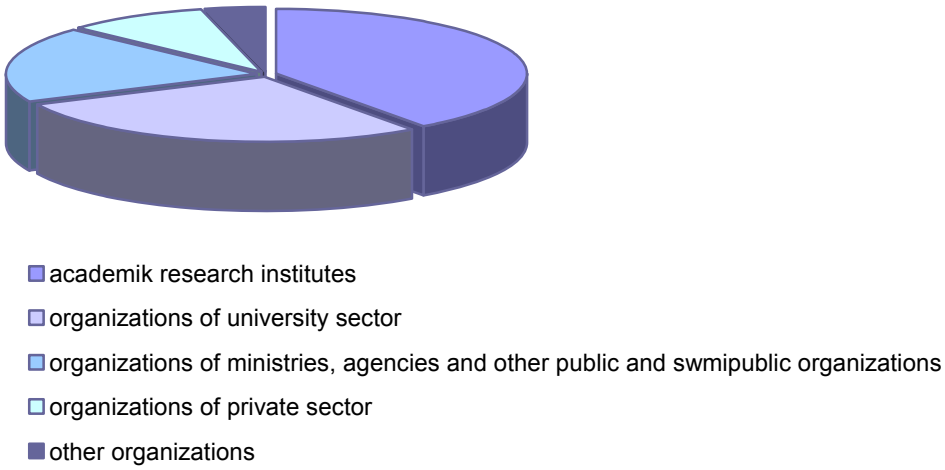


Fig. 9. Distribution of the Survey Respondents by Organization Type

The university sector includes well-known universities and regional ones, which are becoming active actors in nanoscience. It contains information on over 20 organizations. In the regional context organizations of this sector are located in all regions of the RF.

The third sector contains information about 15 organizations. The private sector numbers about 10 organizations. It includes private non-profit and for-profit organizations, which provide R&D on nanoscale. The most active organizations with strong R&D capacity are placed here.

Distribution of organizations across the regions of the RF. The database contains organizations from all regions of the RF. Fig.10 indicates the distribution of organizations across the regions of the RF.

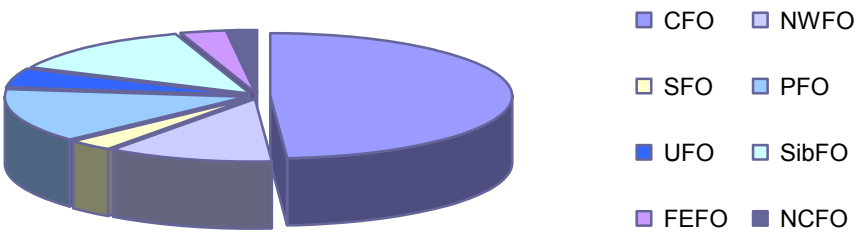


Fig. 10. Distribution of the Survey Respondents by Regions (Federal okrugs)

One may observer that in the survey participated organizations from all federal okrugs, although the dominance of Central Federal okrug was obvious.

Break down of organizations by number of employees. Fig.11. summarizes the distribution of organizations by number of employees. The number of small (less than 100

employees) and medium-size (between 100 and 250 employees) research organizations in the Survey Database is almost equal to the number of large institutions.

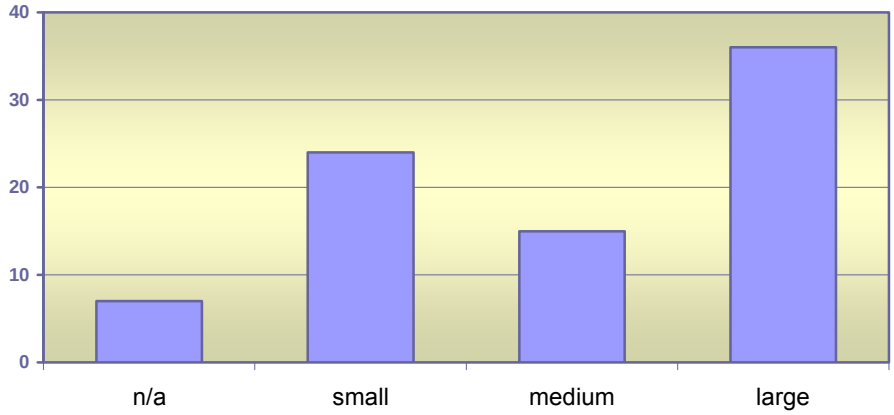


Fig. 11. Distribution of Responding Organizations by Size

Size of large companies varies from 260 employees at the Far Eastern Institute of Automation and Control Processes to 5000 at the State Scientific Center of the Research Institute of Atomic Reactors.

Distribution of organizations by technological field and spheres of application The database includes organizations, which provide R&D in all outlined technological fields and spheres of application (see Fig.12). Many of them play in two or even more fields at the same time.

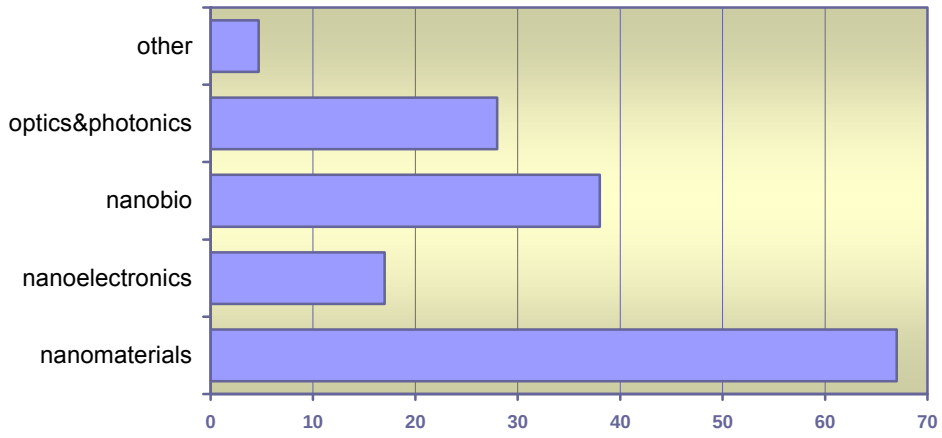


Fig. 12. Distribution of the Survey Respondents by Technological Fields

Similar to the larger sample of institutions, most of them deal with nanomaterials. Those institutes have focus on fundamental and applied aspects of synthesis and study of nanocrystals, thin films, nanotubes, nanoparticles and composites. Nanobiotechnology represents the second

most popular field of research. Drugs delivery and tissue issues have a certain kind of priority in this area.

The respondents were suggested to provide list of keywords relevant to their research activities. The most repeated words turn out to be: alloys, bioengineering, biocompatible materials, biomedical technology, biotechnology, carbon nanotubes and nanomaterials, coatings, colloid systems, composites, electronic microscopy, magnetic, nanocomposites, nanoelectronics, nanofilms, nanomaterials, nanometrology, nanoparticles, nanophotonics, polymer, sensors, surface (modification etc.), nanotoxicology.

Among the application areas for research "healthcare and medical devices" take the lead. The runners up are environment protection and energy production.

Conclusions

The developed database of R&D organizations in NN contains more than 700 organizations and provides information for an accurate assessment of NN R&D capacity in Russia which will be carried out in work package 4. This large number of organizations active in NN indicates that Russia is an important player in this emerging S&T field. Russia has strong R&D capacities in most subfields of nanotechnology. Nanomaterials seems to be the area where most organizations are active. The expertise in NN is concentrated in the academic sector, some universities, and some organizations of branch science. With the growing significance of NN in stakeholders' priorities, institutional changes have been started in all sectors of science and all regions of the Russian Federation. Currently one may observe some specialization of Russia in nanomaterials, nanoelectronics and nanooptics although nanobiotechnology seems to become a catching-up field.

The developed Target database of R&D organizations includes more than 80 organizations, which provide R&D in all nanofields, these organizations are oriented on collaborative projects with EU partners. The database covers both, well-known and strong Russian research organizations of all sectors of science and fast developing new players, active in NN. The database provides additional information about potential partners for collaborative projects, their fields of specialization, human capacity, facilities and publications. The database forms a background for further successful implementation of the project.

The survey of R&D organizations provides very detailed information about performance of R&D organizations, their human capacity, partners in publications, patenting activity, and the like. It forms the information background for the assessment of the national innovation system in NN, and will be analyzed in work package 4. A first brief overview of survey seems to indicate that Russian scholars are more oriented on collaboration with EU scholars than on other regions of the world. Many organizations have already partners and experience in implementation of collaborative projects.