INSTITUTIONAL DEVELOPMENT PLAN

2012-2015
Introduction

The institutional development plan will ensure that the INCDMNR-IMNR remains relevant and responsive to the client’s needs and contributes to the institute stability and growth. It provides the basis for jointly integration of scheduling, implementation and control (measurements of the results performance, diagnosis of the results, corrective measures). The institutional development plan enables to the institute to look into the future (e.g. new research directions/themes, new markets, new clients requirements) in an orderly and systematic way. It enables the efficient allocation of the resources and the decision assuming for strategic investments. The institutional development plan (a strategic planning) is the process by which the management develop a vision for the IMNR future and determines the necessary priorities, procedures and strategies to achieve the vision. Measurable, realistic, attainable and challenging goals are included. A long term strategy for a period of 4 years (2012-2015) is emphasised in the institutional development plan.

Documents consulted for the elaboration of the institutional development plan:
2. Strategic Regional Frame of the Region Bucharest-Ilfov 2007-2013
5. European Technological Agenda on Sustainable Mineral Resources-Strategic Research Agenda
6. European Technological Platform Nanomedicine-Strategic Research Agenda
7. OSLO MANUAL (European Commission)

1. Scientific SWOT analysis

The SWOT analysis involves the evaluation of the large external medium (place of the institute in the macro system, the competitors, the external conditions, etc.), the evaluation of the internal medium (organization and personnel, the thematic and the infrastructure). We consider dimly important to analyse also the microenvironment of the organization in order to identify the best development strategy. The micro medium (or close external medium is represented by the medium that organization is directly influencing and is composed by all the groups interested by the organization functioning: clients, suppliers, partners and competitors. The competitive environment of a business is the part of a organisations’ external environment that consists of other firms trying to win customers in the same market. It is the segment of the industry that includes all immediate rivals. 

According to Porter model the profitability of the environment of an organization is affected by five forces:

1.1 Evaluation of the external close (competitive) environment

Intensity of the competition based on the domain structure

| The analysis of the competition intensity of the research market onto non-refundable sources | Competitors numbers | Low. There are only very few research entities, private or public, with expertise in the field of non-ferrous metals industry |
|-----------------------------------------------|---------------------|
| Market augmentation | Dynamic |
| Similarly products | Medium. IMNR is the only entity for certified nanobiomaterials analysis methods, offering technological consultancy in the field of non-ferrous metals industry and having the expertise to manufacture special biocompatible hybrid materials through high pressure solution methods, providing special solubilisation methods of complex minerals, and manufacturing lead free special alloys. For some products the clients can addressed other entities. |
| Fixed costs | Medium. The costs are variable depending on services demand meaning materials and equipments usage. |
| Exit barriers | Doesn’t exist |

Conclusion: Although on the market there is competition, IMNR has a niche enabling further development of the institute and this niche should be exploited.
Threats from the newcomers

The analysis of the newcomers in the non-ferrous metals industry research field

<table>
<thead>
<tr>
<th>Scale economies</th>
<th>Relative high barriers. The institute is unique and has 45 years of activity in the field. A large quantity of research products (materials, technologies, services, published papers, etc) to be offered.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolute costs barriers</td>
<td>Relative high barriers. Specific expensive infrastructure and personal expertise are required.</td>
</tr>
<tr>
<td>Governmental policy</td>
<td>Favourable. Available funds for state aid structural funds and so on.</td>
</tr>
<tr>
<td>Differentiation</td>
<td>Relative high barriers. The clients come on the basis of success in previous collaborations or /and recommendations.</td>
</tr>
<tr>
<td>Reorientation costs</td>
<td>Low, including the risk of non-satisfaction based on missing history.</td>
</tr>
</tbody>
</table>

Conclusions: It is not easy to penetrate the research market in the field of non-ferrous metals industry. The domain is very narrow. The achievements of the entity, the individual CV of the research personal and the infrastructure performance are very important. Newcomers meet tough barriers.

The negotiation power of the clients

Analysis of the position of IMNR clients in relation with the institute

<table>
<thead>
<tr>
<th>Buy large quantities</th>
<th>In the case of IMNR the contract value, type and timing are very important. The contracts are obtained on the competition basis launched by NASR.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buy easier similarly products from other trades people</td>
<td>No, the uniqueness of the research products in the field and time are important factors of the offered research services.</td>
</tr>
<tr>
<td>Have the financial force and acquisition systems which allows to obtain convenient prices and better quality products from the trades people</td>
<td>Low chances due to uniqueness.</td>
</tr>
<tr>
<td>What they buy has a low importance comparing to what they sell</td>
<td>No for NASR, for smaller clients yes.</td>
</tr>
<tr>
<td>If it is necessary, they can manufacture or offer themselves the respective products and services</td>
<td>Low chances due to uniqueness and patent protection.</td>
</tr>
</tbody>
</table>

Clients: The majority of the IMNR clients do not have a force position in relation with the institute. However, IMNR has a client with a force position – NASR.

The negotiation power of the suppliers

Verification analysis: if suppliers of IMNR have a force position in relation with the institute

<table>
<thead>
<tr>
<th>There are numerous small clients which buy only from few large suppliers</th>
<th>The utilities suppliers are not preferential (ENEL, Distrigaz, ROMTELECOM). The other suppliers can be changed depending on necessities.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sell unique services and products</td>
<td>Medium. Only for main specific equipments, usually force us to buy maintenance services and consumables from them.</td>
</tr>
<tr>
<td>The cost to select other suppliers</td>
<td>Low, but also depending on suppliers type.</td>
</tr>
<tr>
<td>They do not depend on the evolution of a single activity domain</td>
<td>Our suppliers offer the same type of services/goods to any entity independent of its activity domain</td>
</tr>
<tr>
<td>Can they do by themselves what their clients do</td>
<td>No</td>
</tr>
</tbody>
</table>

Conclusion: The negotiation power of our suppliers is medium in the case of IMNR. The institute activity is dependent of utilities and raw materials and materials, equipment functionality.
Threat from the products or services replacers: Not applicable

1.2 Internal medium analysis  Porter's value chain

According to Porter theory the value chain helps the organizations to understand what offers them the competitive advantage having as starting point the idea that this advantage appears from the way the organization is structured and develops certain activities. These activities can be set by groups as it follows:

<table>
<thead>
<tr>
<th>Infrastructure</th>
<th>Human Resources Management</th>
<th>Technological development</th>
<th>Provision</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Researchers</td>
<td>- Infrastructure</td>
<td>- Materials</td>
<td>- Patents</td>
</tr>
<tr>
<td>- Documentation</td>
<td>- Client identification</td>
<td>- Developing the research offer</td>
<td>- Publications</td>
</tr>
<tr>
<td>- Negotiation</td>
<td>- Contracting</td>
<td>- Implementation of contract</td>
<td>- Technological transfer of the patents</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Promoting R&amp;D results to other clients</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Developing dissemination instruments</td>
</tr>
</tbody>
</table>

According to Porter’ value chain analysis the added value of services/products offered by IMNR is given by the possibility to offer the full chain for research starting from idea to the final product.
### 1.3 SWOT scientific analysis

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
</table>
| • Original procedures and materials developed in the institute unique on National and even EU level (high efficiency eco-technological solutions for non-ferrous and precious metals recovery, hybrid inorganic-organic composites)  
• Capacity to maintain traditional international partnerships based on previous results and collaborations and common participation in EU funded project  
• Capacity to attract new partnerships  
• Capacity to attract national partnerships in the activity field  
• Existing portfolio of patents and certified technologies ready to be transferred toward innovative enterprises  
• Analytical laboratory methods certified according to SREN 17025 regulations  
• Expertise of human resources with complementary skills in area of materials science, chemistry and physics (senior researchers)  
• Implementation of ISO 9001 | • Old infrastructure for structural characterization and mechanical assessment of advanced and nanostructured materials, coatings and films  
• Low impact of some publications  
• Lack of an efficient marketing strategy adequate for valorisation of research and development results  
• Small number of young researchers  
• Weak collaborations with certifying bodies  
• No competences as auditors in specific field of activity eco-technologies and nano-risk |

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
</table>
| SOCIAL  
• Existing human resources with education background in the S&T field at National and European level that can be attracted  
TECHNOLOGICAL  
• A large market for structural characterisation and mechanical assessment of different materials and nanomaterials  
ECONOMICAL  
• Market niches for new technologies and applications still in infancy stage (replacement of scarcely raw and critical metals, personalized regenerative nanomedicine; nanomaterials and methods for water purification and soil regeneration; materials for intelligent and efficient energy buildings and restoration)  
• Existence of non-refundable sources for RTD and Technology Transfer  
ENVIRONMENTAL  
• EU Regulation for environmental protection (two approaches: transformation of environmental problems in a common language - figures and EMAS-environmental management and auditing systems being a standard criteria for ISO 14001), Code of Conduct in Nanotechnologies and REACH  
POLITICAL  
• The activity of the research and development of products should take into account both the Governmental regulations and market requirements, such as: recycling and re-use of bagging and secondary materials, energetic efficiency, effective emissions regulations, and take-over the product at the end of its lifetime.  
• Necessity of innovation for sustainable development according to the EU research priorities from HORIZON 2020, ETPs Roadmaps and National strategies for competitiveness. | • Financial instability due to economical crisis  
• Reduced number of innovative SMEs, start-ups/spin-offs to uptake the research results  
• Drawbacks in the entrepreneurial education in both research and economical environment  
• Development of new market segments and the clients’ needs changes in the field of services |
2. Strategic scientific objectives and directions

Mission
IMNR has a strategic position in the field of non-ferrous metallurgy. IMNR will be a leader institute in the field of non-ferrous metals metallurgy research and applications, focused on responding with highest quality services to client needs. Innovation and know-how transfer is the core of research activity in IMNR. Integrity and engagement for excellence are the features of our activity and organizational culture.

General objective of ICDMNR IMNR
The general objective of IMNR encompasses the development of the institute to become a national leader in the field of science and technology of materials based on non-ferrous metals and fully integrated in European Research Area.

Scientific directions strategic objectives
Considering the experience of three groups: Ecotechnology and Environmental Protection, Nanostructured Materials and New Advanced Materials and Technologies with the support of Physical-Chemical Analysis and Microscopic Characterization, a joint research line was formulated in IMNR aiming to the development of the non-ferrous metals based materials for high tech applications, the enhancement of the metal resources use and recovery rate of secondary non-ferrous metals based resources. The following scientific directions and strategic objectives are targeted:

Scientific direction 1: Environmental protection and sustainable supply of non-energy metal resources
The specific strategic objective of this scientific direction is to implement new concepts, new technologies for sustainable processes in non-ferrous metals industry and environmental protection (standards and best practices in non-ferrous metals industry)
This scientific objective aims to focus on the following broad lines of activities:
✓ Research to develop new innovative technologies and solutions for sustainable growth of resources and for the substitution of critical metals and materials
✓ Research to identify innovative recycling and re-use technologies for non-ferrous metals based raw materials which are the key for smart and sustainable growth of non-ferrous metals industry. Multidisciplinary approaches involving science, technology, and the economic aspects are envisaged.
✓ Research to develop new technologies and materials for waste water purification in order to improve metal recovery and reduce hazardous emissions
✓ Research to identify innovative solutions for waste prevention and minimization in non-ferrous metals industry and rehabilitation of sites polluted from metallurgical activities
✓ Participation in standards technical committee

The performance indicators for a period of 4 years are:
2 patent; 8 ISI papers in journals with relative influence score ≥0.3
4 technologies; 4 products; 2 European projects proposals; 5 National projects; 2 finalized doctoral theses

Scientific direction 2: Nanomaterials
The specific strategic objective of this direction is the Development of high-added value non-ferrous metals based nanomaterials for medical, energy and extreme conditions field applications.
This scientific objective aims to focus on the following broad lines of activities:
✓ Efficient synthesis and manufacturing of nanomaterials by new environmentally friendly operations, smart integration of new and existing processes to ensure the efficient transfer of knowledge into industrial innovation. This will enable the transition towards a green economy that takes into account the sustainable use of resources.
✓ Fundamentally new products enabling sustainable solutions in medical, energy and extreme conditions field applications
Advancing scientific knowledge of the potential impact of nanomaterials on health or on the environment, and identifying tools for risk assessment along the life cycle

Develop the capacity to measure/characterize the properties of non-ferrous metals based nanomaterials and predictive modelling of their manufacturing processes enabling their rapid introduction on the market

The performance indicators for a period of 4 years are:
3 patents; 12 ISI papers in journals with relative influence score ≥0.3
4 technologies; 4 products; 6 European projects proposals; 4 National projects; 2 finalized doctoral thesis; 2 new methods for assessment of nanostructured materials

Scientific direction 3: Advanced Materials

The specific objective of this direction is to develop materials with new functionalities and improved in-service performance, that minimize the impact on the environment and the consumption of resources.

This scientific objective aims to focus on the following broad lines of activities:

- Research on functional materials, multifunctional materials and structural materials, for innovation in energy and extreme conditions industrial sectors
- Research and development for innovative techniques of manufacturing advanced non-ferrous metals based materials and to identify solutions for the substitution of raw materials by economically attractive alternatives with a lower environmental impact
- Characterization, non-destructive evaluation and predictive modelling of performance for progress in non-ferrous metals based materials science and engineering

The performance indicators for a period of 4 years are:
1 patents; 8 ISI papers in journals with relative influence score ≥0.3
2 technologies; 4 products; 2 European projects proposals; 4 National projects; 1 finalized doctoral thesis.

3. The human resource strategy

Human resources activities make the connection between economic strategy and individual and team performance.

3.1. Recruitment policy

INCDMNR-IMNR, based on SWOT scientific analysis corroborated with financial SWOT analysis and according to its mission and strategic scientific objectives, envisions recruiting both early stage researchers and experienced researchers (PhDs; PhD candidates).

According to “The European Charter for Researchers-The Code of Conduct for the Recruitment of Researchers”, INCDMNR-IMNR will establish recruitment procedures which will be open, efficient, transparent, as well as tailored to the type of positions advertised (early stage researchers, PhD and PhD candidates experienced researchers), describing the knowledge and competencies required, including career development prospects. The procedure to hire on jobs vacancies will be announced on ANCS web site, EURAXES site, IMNR web site, AJOFM (Ilfov County Agency for Work Force Occupancy) and in local newspapers. Advertisement will be also made through the channels of the universities.

Different approaches are envisaged:
- The newly recruited researcher will be hired for a trial period (3 - 6 months according to the national legislation) full time. After the trial period the recruited researchers will have to pass a theoretical and practice exam. As a function of the exam results the recruited researchers will be then hired for long term period.
- The newly recruited researchers can be hired on the contracts full time/part time (occasional hiring) for specific tasks and positions.

Senior researchers from the institute will give particular attention to their role as leaders or project coordinators and will perform these tasks to the highest professional standards. Efficient transfer of knowledge enabling further successful development of the researchers’ careers will be assured. A special attention will be given on the induction process where the new researcher will compare his expectations with the workplace offer after the trial period.
A Career Development Plan for each newly recruited researcher will be prepared. The following courses are envisaged:

1) **Courses on research issues** (objective: To improve the scientific competences and to enlarge the expertise of newly recruited researcher; addressing scientific excellence, multidisciplinarity, hands-on training on special equipment enabling exposure to a range of research methods and techniques, including contact with different approaches to problem solving).

2) **Presentation of the newly researchers' work** (objective: To improve the communication skills of the newly researchers’ work; to disseminate the scientific results; to share the best practices between the researchers; addressing dissemination, transfer of knowledge).

3) **Connection with the industrial world** (objective: To fill the gap between the industrial and the academic world; to improve the newly recruited researcher’s appreciation of industrial possibilities; fostering an intersectorial approach and transfer of knowledge).

4) **Complementary skills** (objective: to provide to the newly recruited researchers knowledge and tools that enable them to also work in an industrial context; addressing personal career development and skills).

Below the needs for human resources development for a period of 4 years are presented.

**Scientific direction 1:** Environmental protection and sustainable supply of non-energy metal resources
- No of early stage researchers to be recruited: 3 (expertise in materials science and chemistry)
- No of experienced researchers to be recruited: 2 (expertise in materials science and chemistry)

**Scientific direction 2:** Nanomaterials
- No of early stage researchers to be recruited: 3 (expertise in biochemistry, physics, chemistry)
- No of experienced researchers to be recruited: 2 (expertise in biochemistry, physics, chemistry)

**Scientific direction 3:** Advanced Materials
- No of early stage researchers to be recruited: 3 (expertise in non-ferrous based materials science, physics)
- No of experienced researchers to be recruited: 2 (expertise in non-ferrous based materials science, physics, electronics)

**3.2. Personnel training**

The institute proceeds preventive actions ensuring to the personnel a general education enabling to surmount different potential situations. In the table below the skills development plan of the personnel is summarised.

<table>
<thead>
<tr>
<th>Developed skills</th>
<th>Responsible</th>
<th>Period</th>
<th>Scientific direction</th>
<th>Expected results</th>
</tr>
</thead>
</table>
| Environmental auditors            | -Institute/ Head of Human Resources Compartment -Head of Eco-technologies and Environmental Protection Laboratory | Year 1  | SD 1                 | -Training of 1 experienced researcher and 1 Technological Development Engineer  
-Starting the implementation of ISO 14001:2005  
-Increasing the capacity to diversify the services portfolio of the institute |
| Project management                | Institute/ Head of Human Resources Compartment  
Heads of Research Laboratories | Year 1-4 | SD 1 SD 2 SD 3       | -Training of 5 experienced researchers and 5 senior researches  
-Increasing the capacity to attract national and international funds |
| Risk management                   | -Institute/ Head of Human Resources Compartment  
-Heads of Research Laboratories  
- Economic Director               | Year 1  | SD 1 SD 2 SD 3       | -Training of 3 experienced researchers, 3 senior researchers and 1 Technological Development Engineer  
-Increasing the capacity to identify solutions to solve risk situations and to elaborate plans for unpredictable situations |
| Entrepreneurial competencies      | -Institute/ Head of Human Resources Compartment  
-Heads of Research Laboratories | Year 1-4 | SD 1 SD 2 SD 3       | -Training of 1 experienced researcher, and 2 senior researchers  
-Increasing the capacity for technological transfer and developing 1 spin-off |
### Nanorisk Assessment

- **Institute/ Head of Human Resources Compartment**
- **Head of Nanostructured Materials Laboratory**

<table>
<thead>
<tr>
<th>Year</th>
<th>SD 2</th>
</tr>
</thead>
</table>

- **Training of 1 experienced researcher and 1 Senior researcher**
- **Implementation of Code of Conduct for Nanotechnologies of the European Commission**

### Processing Data

- **Institute/ Head of Human Resources Compartment**
- **Head of Nanostructured Materials Laboratory**
- **Head of Advanced Materials and Technologies Laboratory**

<table>
<thead>
<tr>
<th>Year</th>
<th>SD 2</th>
<th>SD 3</th>
</tr>
</thead>
</table>

- **Training of 2 experienced researcher in IT data processing**
- **Increasing the capacity to model manufacturing processes of nanomaterials and advanced materials**

### Innovation Management

- **Head of Technological Transfer Centre**

<table>
<thead>
<tr>
<th>Year</th>
<th>SD 1</th>
<th>SD 2</th>
<th>SD 3</th>
</tr>
</thead>
</table>

- **Increasing the capacity of technological transfer**

### 3.3. Mobility

Researchers’ mobility refers to shorter/longer research visits to other research institutions, collaborators or facilities elsewhere inside the country and outside the country. The researcher mobility aim is to increase individuals’ and team knowledge. Four effects of researcher mobility should be taken into account with respect to innovation achievements: Efficiency; Productive capacity; Human resources development; Social capital. The researchers, during their stages, remain in contact with the institute and when they come back must endeavour to promote the diffusion of the knowledge and experience gained. Researchers can move from one team to another team from the institute according to the expertise required to implement a project in a certain period of time.

The development of a high-tech and innovative Research Centre in the frame of POS 2.2.1.Research Infrastructure Project is an opportunity to attract skilled human resources both from inside and outside the country. The policy of the institute aims to offer new research opportunities and their links with industrial environment. It is expected that this policy will have a powerful effect for making the centre attractive for highly skilled human resources.

### 3.4. Mechanism for evaluation and stimulation of the personnel

In this case constraints are important. In particular labour market and budgets can limit the space of rope of the institute in this field. However, the institute has a strategy to stimulate the personnel, aiming to maintain and to attract skilled human resources. The following criteria are taking into account:

- **Performance** which is evaluated by own Methodology for Evaluation of Human Resources, approved by the Board of IMNR. The performance criteria are considered at individual level.
- **Move-up** based on exams according to effective national legislation
- **Contracts values and importance**

### 3.5. Gender Policy

Recruitment of the new personnel necessary for RTD laboratories will be done according to the effective legislation. Recruitment and promotion of the employees on the positions, professional degrees or superior grades is done based on the professional competencies without any discrimination of political and syndicate affiliation, nationality, sex, religion. Recruitment and promotion is performed on the basis of the exam or competition. Evolved regulation is advised by the Scientific Council and is approved by the Managing Board with employees’ representatives advising. Other rights and obligations of the contracting parts arise from the effective regulations (among them those of Law 202/19 April 2002 concerning the chance equality between women and men, brig up - to – date on 08 September 2006).

In IMNR, 38 women work from a total of 81 personnel. 28 women are involved in research and development activities. 6 women from a total of 38 women are in leading positions: heads of laboratories/compartment, scientific director is a woman.

The strategy of IMNR on gender issues is to keep or even to improve this ratio. No negative discrimination in promoting women in both scientific and leading position characterise the activity of the institute.
<table>
<thead>
<tr>
<th>Mobility Action</th>
<th>Responsible</th>
<th>Period</th>
<th>Scientific direction</th>
<th>Expected results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobility of researchers from Physical-Chemical Analysis Laboratory (expertise in chemistry and physics field) and Microscopic Characterisation Laboratory (expertise in geology field) to technological research teams</td>
<td>Laboratory Heads</td>
<td>Whenever required</td>
<td>SD 1, SD 2, SD 3</td>
<td>-Increasing clients satisfaction and successful implementation of complex projects</td>
</tr>
<tr>
<td>Short- term mission of 1 PhD experienced researcher in the frame of ongoing COST Action TD 0802</td>
<td>Nanostructured Materials Laboratory Head</td>
<td>Year 1</td>
<td>SD 2</td>
<td>-Achievements of complementary skills in bio-chemistry field and characterisation of nanostructured organic-inorganic hybrids</td>
</tr>
<tr>
<td>Short - term mission of 1 PhD candidate early stage researcher in the frame of ongoing COST Action TU 0802</td>
<td>Nanostructured Materials Laboratory Head</td>
<td>Year 1</td>
<td>SD 2</td>
<td>Achievements of complementary skills in nanomaterials for clean energy applications</td>
</tr>
<tr>
<td>Short visits to research laboratories and industrial partners involved in on-going FP 7 projects (2 senior researchers, 3 PhD experienced researchers, 2 PhD candidates early stage researchers)</td>
<td>Laboratory Heads</td>
<td>Year 1-Year 4</td>
<td>SD 1, SD 2, SD 3</td>
<td>Achievements of complementary skills in: -advanced materials characterisation nanomaterials processing, biological assessment of medical wastes</td>
</tr>
<tr>
<td>Long term visits (two month) of 1 PhD experienced researcher in the frame of ongoing project POS DRU-Postdoctoral Program “Cristofor Simionescu” to a university and one institute from abroad</td>
<td>Nanostructured Materials Laboratory Head</td>
<td>Year 1</td>
<td>SD 2</td>
<td>Achievements of complementary skills in methods to determine the energy bonding in hybrid nanomaterials and biocompatibility assessment of hybrid nanomaterials</td>
</tr>
<tr>
<td>Hands-on training on the new e-beam equipment endowed with 5 guns at its manufacturing site – USA 2 senior researchers, 1 engineer with expertise in electronics, 1 IT engineer</td>
<td>General Director, the POS 2.2.1 project director Management team of the POS 2.2.1 project</td>
<td>Year 1-Year 2</td>
<td>SD 1, SD 2, SD 3</td>
<td>Achievements of skills enabling to work on the new equipment and to develop new applications and technologies.</td>
</tr>
<tr>
<td>Knowledge transfer toward specialists from national industry in the frame of on-going POS DRU-PROFMEC project</td>
<td>Local project coordinator from IMNR</td>
<td>Year 1-Year 2</td>
<td>SD 2, SD 3</td>
<td>IMNR will train industrial specialists (target group of 48 persons) in application of advanced materials for mechanics and mechatronics, and hands on training on thermal mechanical characterisation of coatings enabling the increasing of capacities to implement new technologies and products with high added value.</td>
</tr>
</tbody>
</table>
4. Mechanisms for stimulating the appearance of new research directions

IMNR exploits the following mechanisms for stimulating the appearance of new research directions:

4.1. Collaborations with universities
The specific feature is to integrate research and innovation in the field of non-ferrous metals industry with education enabling interdisciplinary and complex research activities development. In a joint program with the universities, IMNR offers to PhD students and post doctoral students the possibility to use the infrastructure facilities for experimental part of their thesis. IMNR benefits of the opportunity to develop new directions / themes for basic research. On the other hand, PhD early stage and experienced researchers from the institute participate in post doctoral programs in the frame of Structural Funds-POS DRU also enabling the development of new basic research directions.

4.2. The role of European projects, participation in Research Networks, participation in European Technological Platforms
Participation in European projects open the possibility to access new innovation directions according to industrial partners needs. On the other hand, offers the possibility to jointly develop new research directions and patent originally new ideas.

Participation in European Technological Platforms (ETP Nanomedicine, ETP-Sustainable Mineral Resources, Nanofuture Initiative) enables to gain knowledge on the innovation policy at European level and strategic directions in specific fields.

Participation in Research Networks, such as COST actions funded by ESF (European Science Foundation) and bilateral cooperation offer the possibility to exchange ideas and researchers with academic and industrial partners enabling the development of new basic research directions/themes and applications.

4.3. The role of users in creating new research directions
New SMEs having a market niche but no research resources are interested to buy know-how or to jointly develop new research directions.

4.4. Scientific Advisory Board
Scientific Advisory Board participates to the elaboration of strategy development for RTD activities and RTD plan. Scientific Advisory Board is formed from senior researchers with experience in major scientific directions of the institute and has the competence to propose and advise on generation of new directions, advise the scientific international and national training stages and international cooperation, coordinate scientific events organised by the institute. In the Scientific Advisory Board are co-opted three invited members namely: Dr. Siemon Smid having experience in technological transfer from BreakingResearch, Luxemburg, Prof.dr. Nicolae Anastasiu, correspondent member of Romanian Academy having expertise in mineral resources, Prof.dr. Dragos Taloi having expertise in non-ferrous based material science.

4.4. Foresight/exploratory workshops
Foresight/exploratory workshops organisation is very useful as a practical tool for diagnosing where and how certain approaches to foresight and strategy work may need improvement or refinement, addressing the strategic question „how can we survive in an increasingly competitive environment”. The keys of these foresight/exploratory workshops are on one side reflection and analysis (enable to see the emerging issues, trends, dynamics and the drivers of the specific fields: mineral resources and materials development respectively), on the other side is creativity (strategic thinking enables to formulate an integrated perspective or vision of where the institute should be heading). The outputs of these workshops are:

− To define the actual range of options of the activities developed in the institute in specific research directions
− To define future views/approaches in the institute specific research directions.

Bases on these outputs, the institute will gain more information and experience and can adjust the course of the strategic planning.
The institute has financial autonomy assured also from other sources, structural funds attraction respectively. In this situation there is the possibility to stimulate the RTD personnel depending on contracts volume in which they are involved. The only restriction is imposed by effected national legislation (HG 475/2007) and the maximum working time duration according to National Labour Code. In the crisis period 2009-2011 the institute assured the activity continuation in optimal conditions by applying a prudent and
efficient restructuring program not affecting the research activity, such as: 1. Incomes increasing from connected activities to research activities; 2. Reduction of the volume of general administration costs by: activity program reduction; maintenance costs reduction, preservation of some fixed assets; 3. Salaries costs reduction for the entire personnel for a period of 4 months.

6. Infrastructure: investment plan and strategy

<table>
<thead>
<tr>
<th>No.</th>
<th>Scientific direction</th>
<th>Equipment/Instrument</th>
<th>Estimated value [euro]</th>
<th>Acquisition term</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SD 1</td>
<td>Solubilisation autoclave endowed with agitation</td>
<td>78700</td>
<td>June 2012</td>
</tr>
<tr>
<td>2</td>
<td>SD 1</td>
<td>Microwave autoclave</td>
<td>40000</td>
<td>June 2012</td>
</tr>
<tr>
<td>3</td>
<td>SD 2</td>
<td>High pressure autoclave (p=7000 bars)</td>
<td>60000</td>
<td>June 2012</td>
</tr>
<tr>
<td>4</td>
<td>SD 2</td>
<td>Medium pressure autoclave (p=200 bars)</td>
<td>23000</td>
<td>June 2012</td>
</tr>
<tr>
<td>5</td>
<td>SD 2</td>
<td>Spray-dryer</td>
<td>35000</td>
<td>June 2012</td>
</tr>
<tr>
<td>6</td>
<td>SD 1 SD 2 SD 3</td>
<td>Multiple electron beam deposition installation, in vacuum, inert or reactive gas endowed also with RF sputtering ion beam facilities</td>
<td>1300000</td>
<td>June 2012</td>
</tr>
<tr>
<td>7</td>
<td>SD 1 SD 2 SD 3</td>
<td>ICP-OES (Optical emission spectrometer with inductive coupled plasma)</td>
<td>145000</td>
<td>June 2012</td>
</tr>
</tbody>
</table>

From structural funds project POS 2.2.1-Research Infrastructure

From structural funds project POS DRU and PNII-Ideas project

From new projects calls and own budget

<table>
<thead>
<tr>
<th>No.</th>
<th>Scientific direction</th>
<th>Equipment/Instrument</th>
<th>Estimated value [euro]</th>
<th>Acquisition term</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>SD 2 SD 3</td>
<td>Micro scratch tester for characterisation of adhesion and microhardness</td>
<td>50000</td>
<td>March 2012</td>
</tr>
<tr>
<td>9</td>
<td>SD 2 SD 3</td>
<td>Nano-mechanical test platform-upgrading of the micro scratch tester</td>
<td>75000</td>
<td>Year 2-Year 3</td>
</tr>
<tr>
<td>10</td>
<td>SD 1 SD 2 SD 3</td>
<td>Scanning electron microscope</td>
<td>200000</td>
<td>Year 2-Year 4</td>
</tr>
<tr>
<td>11</td>
<td>SD 1 SD 2 SD 3</td>
<td>Surface area porosimetry measurement system</td>
<td>100000</td>
<td>Year 2-Year 3</td>
</tr>
<tr>
<td>12</td>
<td>SD 2 SD 3</td>
<td>Electrochemical system for ultra thin films and biomolecule measurements</td>
<td>200000</td>
<td>Year 3-Year 4</td>
</tr>
</tbody>
</table>

Infrastructure strategy is based on the three research directions developed by the institute, namely: Scientific direction 1: Environmental protection and sustainable supply of non-energy metal resources; Scientific direction 2: Nanomaterials; Scientific direction 3: Advanced Materials.

The equipments envisaged at positions 1-7 are current acquisition and are the basis for the development of a Research Centre for study and intensification of metallurgical processes at high pressures and temperatures in the frame of a Structural Funds POS 2.2.1 project. The equipment envisaged at position 8 completes the centre infrastructure and will be used both for the institute own tests and training of the personnel with university education from industry. SWOT scientific analysis revealed the lack of characterisation equipments at micro and nano scale. Consequently in the investment plan, equipments for characterisation are envisaged (position 9 and 10). For developing the existing research directions by a complex, multidisciplinary approach and to increase the capacity to square up to new research directions complementary equipments are envisaged (position 11 and 12).

7. Technology transfer and the attraction of non-public funds

To succeed in securing long-term competitiveness and sustainable growth in the field of non-ferrous metals, the IMNR should adopt a strategic and integrated approach to innovation following priorities for action proposed in the Europe 2020 strategy. The institute will focus on the strengthening the „knowledge triangle” to facilitate commercialisation and knowledge transfer toward innovative SMEs at regional, national and European range.
In this respect the Technology Transfer Centre (CTT) from IMNR (certified by NASR and re-accredited in 2011) will become the key player in valorisation of the portfolio of existing and future patents, technologies and products. The main actions are described in the table below.

<table>
<thead>
<tr>
<th>Action</th>
<th>Responsible</th>
<th>Period</th>
<th>Expected results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protecting valuable knowledge; get revenues for the institute</td>
<td>Researchers, Head CTT</td>
<td>Year 1-4</td>
<td>Elaborate min. 8 patent requests</td>
</tr>
<tr>
<td>Market access and dissemination the patents at National level to find potential users</td>
<td>Head CTT</td>
<td>Year 1-4</td>
<td>Collaboration with members of the National TT Network ReNITT (minimum 20 entities)</td>
</tr>
<tr>
<td>Market access and dissemination the patents at international level to find potential users</td>
<td>Head CTT, Laboratory Heads</td>
<td>Year 1-4</td>
<td>Collaboration with Enterprise 4Europe in patent brokerage events (1/year)</td>
</tr>
<tr>
<td>Train researchers on IPR and innovation strategies to enhance the skills in knowledge protection and valorisation (2 researchers)</td>
<td>Head CTT</td>
<td>Year 1-2</td>
<td>Cooperation with OSIM and specialized IPR agents</td>
</tr>
<tr>
<td>Enhance cooperation with potential end-users and attracting private co-financing of RTD activities of the institute</td>
<td>Head CTT, General Director</td>
<td>Year 1</td>
<td>Initiate the cluster for advanced materials (minimum 5 SMEs)</td>
</tr>
<tr>
<td>Valorisation of research results on the market</td>
<td>Head CTT, General Director</td>
<td>Year 1</td>
<td>Generate 1 spin-off in cooperation with a strategic partner</td>
</tr>
<tr>
<td>Give to the potential end-user the whole chain for application (technical-economical analysis for 3 technologies)</td>
<td>Head CTT, Financial Dep.</td>
<td>Year 1</td>
<td>Enhance economical analysis of homologated products and technologies</td>
</tr>
<tr>
<td>Consultancy and technological audit post-technology transfer (for 2 SMEs)</td>
<td>Head CTT, CTT experts</td>
<td>Year 1-4</td>
<td>Client satisfaction strategy and attraction of new contracts</td>
</tr>
</tbody>
</table>

8. Strategic partnerships and visibility: events, communications, collaborations.

IMNR strategy starts from the following main requirements to maximise the efficiency of the technology transfer preview in the document titled: Conclusions on Innovation Union for Europe, 3049th COMPETITIVENESS (Internal Market, Industry, Research and Space) Council meeting Brussels, 26 November 2010: prioritising investments in education, training, research (from fundamental to applied), development and innovation, and key technologies, including key enabling technologies (advanced materials); putting in place strong policies for human resources in science, technology and innovation; maximising value for money by tackling fragmentation and by increasing the efficiency of public spending on RDI at national and regional level; encouraging to mobilise available Structural Funds for RDI, facilitating the cooperation between European networks and clusters.

Marketing activities should be improved according to the new market requirements and to increase the visibility of the institute. Consequently, the abilities of the personnel involved in such activities should be improved. The accent will be put on strategic thought, communication abilities and sensitivity to clients’ needs. A data base concerning the clients will be elaborated on the basis of clients’ orderings, payments, sounding answers, meetings for services conferring.

The major actions are presented in figure below.
## Basic research

- Clustering-facilitating research cooperation and marketing: Develop the Innovative Cluster on Advanced Materials ([www.nanofutures.ro](http://www.nanofutures.ro)). *

### Market performance

- Partnership Institute – industry (National Projects, EU Projects)
- Leader role in organizing the Romanian Conference on Metallurgy and Materials Science ROMAT, every 2 years
- Continue annual workshop on Functional Nanomaterials – FUN NANOS, in cooperation with CNRS/PROMES France and EURICE GmbH Saarbrücken
- Organize in 2012 two foresight/exploratory workshops in the non-energy resources and advanced materials respectively to establish the future views/approaches and connections between these major research directions from the institute. *Exploring new fields.*

### Recruitment

- Starting the first spin-off
- Enhancing activity of Centre for Technology Transfer

### RESOURCES

- Pilot Demonstrators-POS O2.2.1-Structural Funds „High PTMet” *Sharing infrastructure and recruitment.*

### PEOPLE


### PROCESS

- Ease of work
- ENHANCEMENT OF THE ACTIVITY OF THE INSTITUTE FOR TECHNOLOGY TRANSFER

## 9. Risk Analysis

<table>
<thead>
<tr>
<th>Risk issue</th>
<th>Probability of occurrence</th>
<th>Impact on the institute</th>
<th>Level of attention required</th>
<th>Preventive/remedial action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early stage and experienced researchers recruitment fails</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>Publicise job vacancies positions through various channels. Intensify search for the researchers willing to return to.</td>
</tr>
<tr>
<td>Planned equipment from positions 9-12 not bought</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
<td>Can happen if the rate of success at projects calls is low. Plan own budget (from services, contracts with private entities) accordingly.</td>
</tr>
<tr>
<td>Members of a certain research team leave the institute.</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
<td>Redistribute the workload to the remaining team members. Ensure that the team members announce their departure in advance (notice period), so that the appropriate redistribution plan can be designed or hire new personnel.</td>
</tr>
<tr>
<td>Foresight/exploratory workshops attendance too low for the desired output</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
<td>Start preparation 4-6 months in advance with interesting program and topics. Experienced consultants will be involved to ensure the appropriate visibility level of the call (public domain, web, e-mail, etc) and attract available and experienced participants.</td>
</tr>
<tr>
<td>Cluster on Advanced Materials fails</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>Joint cooperation with RENITT to identify SMEs availability will be started from the very first beginning</td>
</tr>
<tr>
<td>Cash-flow assuring</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>Strategic planning of the resources (monthly, quarterly, biannual, annually)</td>
</tr>
<tr>
<td>Assuring absolute autonomy for water supply</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>Planning of the own resources to prevalently assuring water supply</td>
</tr>
</tbody>
</table>
10. Conclusions

The institutional development plan of the institute is elaborated on the basis of the external analysis environment, scientific SWOT analysis, financial SWOT analysis and mission of the institute.

The institutional development plan takes into account the following specific characteristics: target area (non-ferrous metals industry), staff size, composition and structure, program areas, relationship with the private sector and with the major national public entities.

Experience accumulated in the implementation of previous RTD projects, capacity to attract European and structural funds covering all the research domain of the institute, continuously improvement of the infrastructure, existence of a technological transfer centre, complementarily human resources experience, involvement of young researchers, the existence of a well-defined managerial strategy in the economical-financial field constitute the guaranty that the institutional development plan is feasible and the objectives are achievable.

The institutional development plan will be carefully monitored and evaluated to rapidly decide corrections and improvements if is the case.
GLOSSARY

AROTT: Romanian Association for Technology Transfer
ASRO: Standardization Association in Romania
ACS: Assistant Researcher
CALIST: Funding programme of National Plan for Research, Development and Innovation - National Programme of Quality and Standards
CAPACITIES: Funding programme of National Plan for Research, Development and Innovation that relates to developing research capacity, by RDI system by opening the international scientific environment and connection to the national socio-economic
CEEX: Research Excellence Program
COST: Intergovernmental framework for European Cooperation in Science and Technology, allowing the coordination of nationally-funded research on a European level
CS: Scientific researcher
CSI: Scientific researcher with first degree
CSII: Scientific researcher with second degree
CSIII: Scientific researcher with third degree
EC: European Commission
EN: European standard
EU: European Union
EU HORIZON 2020: Horizon 2020 is the financial instrument implementing the Innovation Union and Europe 2020
FEDR: European Fund for Regional Development
FP7: Seventh Framework Programme
HG: Government decision
ICECHIM: former Institute for Research in Industrial Chemistry
IDT: Technological Development Engineer
IMNR: National Research and Development Institute for Nonferrous and Rare Metals
INFRAS: Funding programme of National Plan for Research, Development and Innovation that relates to the consolidation of standardisation and quality infrastructures
INNOVATION: Funding programme of National Plan for Research, Development and Innovation that relates to increased capacity for innovation, technology development and uptake of research results into production, to improve the competitiveness of national economy and quality of life
IPROCHIM  
former Institute for Design in Chemical Industry  

ISO  
International Organization for Standardization  

INSME  
International Network for Small and Medium Sized Enterprises  

INTERREG IVC  
European funding programme that supports Innovation & Environment Regions of Europe Sharing Solutions  

MATNANTECH  
Funding programme of National Plan for Research, Development and Innovation that relates to New Materials, Micro and Nanotechnologies  

MECMA  
Ministry of Economy, Trade and Business Environment  

NASR  
National Agency for Scientific Research  

NUCLEU Programme  
National Authority for Scientific Research programme  

OSIM  
State Office for Inventions and Trademarks  

PARTNERSHIP  
Funding programme of National Plan for Research, Development and Innovation that aims to create conditions for better cooperation between different entities of RDI, business and / or government units to address the problems identified  

PhD  
Doctor of science  

PN  
National plan  

PNCDI  
National Plan for Research, Development and Innovation  

POS  
Operational Sectorial Programmes (Financed by Structural Funds)  

POSCCE  
Sectorial Operational Programme Increase of Economic Competitiveness  

POSDRU  
Human Resources Development Operational Programme  

POS O2.2.1  
Operational Sectorial Programme for Enhancing Economic Competitiveness – Operation Research Infrastructure Development  

R&D  
Research and Development  

RDI  
Research – Development and Innovation  

RELANSIN  
Funding programme of National Plan for Research, Development and Innovation that relates to Economic Recovery through Research and Innovation  

RENAR  
Accreditation Association Romania - National Accreditation Body  

ReNITT  
National Network for Innovation and Technological Transfer  

RO  
Romania  

RTD  
Research and Technological Development  

SC1  
RTD Laboratories Technical Support Team  

SC2  
Physical-Chemical Analysis Team  

SC3  
Optical Microscopy Laboratory Team  

SME  
Small and medium-sized enterprises  

SR  
Romanian standard  

T I  
Technician first level  

T II  
Technician second level  

TS  
Technician  

TT  
Technological transfer  

UEFISCDI  
Executive Unit for Financing Higher Education, Research, Development and Innovation