NATIONAL RESEARCH-DEVELOPMENT INSTITUTE FOR NON-FERROUS AND RARE METALS – I M N R

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INSTITUTIONAL DEVELOPMENT PLAN

2012-2015

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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:

1. National Strategy for R&D 2007-2013
2. Strategic Regional Frame of the Region Bucharest-Ilfov 2007-2013
3. The European Charter for Researchers. The Code of Conduct for the Recruitment of Researchers
4. Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing Horizon 2020 - The Framework Programme for Research and Innovation (2014-2020) from
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	
Scale economies	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.
Absolute costs barriers	Relative high barriers. Specific expensive infrastructure and personal expertise are required.
Governmental policy	Favourable. Available funds for state aid structural funds and so on.
Differentiation	Relative high barriers. The clients come on the basis of success in previous collaborations or /and recommendations.
Reorientation costs	Low, including the risk of non-satisfaction based on missing history.

Conclusions: 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	
Buy large quantities	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.
Buy easier similarly products from other trades people	No, the uniqueness of the research products in the field and time are important factors of the offered research services.
Have the financial force and acquisition systems which allows to obtain convenient prices and better quality products from the trades people	Low chances due to uniqueness.
What they buy has a low importance comparing to what they sell	No for NASR, for smaller clients yes.
If it is necessary, they can manufacture or offer themselves the respective products and services	Low chances due to uniqueness and patent protection.

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

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:

Specific equipments for characterisation and analysis, high performance and unique equipments for manufacture of non-ferrous materials, specialised software to model both the synthesis and characteristics of non-ferrous (nano)materials, modern laboratories,	Infrastructure
Experienced senior researchers (chemistry, metallurgy, materials science, and physics), PhD candidates and PhD experienced researchers, early stage researchers. Individual and team objectives linked to economical objectives, performance evaluation, individual and team's consideration, personal training in complementary fields, and orientation to the future.	Human Resources Management
Patents portfolio, existing homologated technologies, market niche, implementation of ISO-9001, certified analysis methods, site continuously updated, communication with clients, research infrastructure structural funds	Technological development
Communication capacity with the suppliers, negotiation abilities, selection of the suppliers based on certified procedures according to the legislation, use of computers systems in communication processes. The suppliers' data base was consolidated.	Provision

Input logistics	Operations	Output logistics	Marketing and selling	Service post selling
-Researchers -Infrastructure -Materials	-Documentation -Client identification -Developing the research offer -Negotiation -Contracting -Implementation of contract	-Research products for the clients (technologies products, services) -Patents -Publications	- Technological transfer of the patents -Promoting R&D results to other clients - Developing dissemination instruments	Feed-back for the client satisfaction Technological audit Human resources training courses in the field

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

Strengths	Weaknesses
• 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
Opportunities	**Threats**
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 mew 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**, *envisages 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´ 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.

Developed skills	Responsible	Period	Scientific direction	Expected results
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	Year 1- 4	SD 2	-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 Nano-structured Materials Laboratory -Head of Advanced Materials and Tech-nologies Laboratory	Year 1- 4	SD 2 SD 3	-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	Year 1- 4	SD 1 SD 2 SD 3	-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 constrains 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/compartments, 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

Mobility Action	Responsible	Period	Scientific direction	Expected results
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	Laboratory Heads	Whenever required	SD 1 SD 2 SD 3	-Increasing clients satisfaction and successful implementation of complex projects
Short- term mission of 1 PhD experienced researcher in the frame of ongoing COST Action TD 0802	Nanostructured Materials Laboratory Head Senior Researcher member in Management Committee	Year 1	SD 2	-Achievements of complementary skills in bio-chemistry field and characterisation of nanostructured organic-inorganic hybrids
Short - term mission of 1 PhD candidate early stage researcher in the frame of ongoing COST Action TU 0802	Nanostructured Materials Laboratory Head	Year 1	SD 2	Achievements of complementary skills in nanomaterials for clean energy applications
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)	Laboratory Heads	Year 1- Year 4	SD 1 SD 2 SD 3	Achievements of complementary skills in: -advanced materials characterisation nanomaterials processing, biological assessment of medical wastes
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	Nanostructured Materials Laboratory Head Project Director of POS DRU project from ICMPP-Iassy	Year 1	SD 2	Achievements of complementary skills in methods to determine the energy bonding in hybrid nanomaterials and biocompatibility assessment of hybrid nanomaterials
Hands-on training on the new e-beam equipment endowed with 5 guns at its manufacturing site –USA 2 senior researchers, 1engineer with expertise in electronics, 1 IT engineer	General Director, the POS 2.2.1 project director Management team of the POS 2.2.1 project	Year 1- Year 2	SD 1 SD 2 SD 3	Achievements of skills enabling to work on the new equipment and to develop new applications and technologies.
Knowledge transfer toward specialists from national industry in the frame of on-going POS DRU-PROFMEC project	Local project coordinator from IMNR	Year 1 Year 2	SD 2 SD 3	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.

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 tot 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.

5. Financial SWOT analysis

Strengths	Weaknesses
- the existence of an efficient management in critical situations (economical-financial crisis); -the existence of a well-defined managerial strategy in the economical-financial field; -the existence of a well-organized and efficient control system which is based on: internal control, internal audit, C.F.P.P.; - the realisation of the economical-financial indicators performance which allow the institute participation in national and international research competitions (revenues, expenses, profits, solvency, liquidity); - the existence of an accounting software which allows the costs identification according to the profit centres (research themes, laboratories, cost structures etc.); - the existence of some performance IT equipments which allow the identification, surveillance and classification of costs in the approved budgets (the project budget, the institute budget); - at the institute level there is a well-defined budget, monthly check of the approved economical-financial indicators; -the implementation in the institute of the managerial control system according to the provisions of OMFP 946/2005; - the implementation of the quality management system according to SR EN ISO -9001/2008 -taxes and contributions for the state budget are paid on time; -daily checking of the liquidity level, the existence of an optimum liquidity; - increasing the profit due to the development of the RTD activity;	-high cost of borrowed capital (one of the basic potential resources to finance the current activities and to finance the investments needed for the development of the research and development sector); - substantial and continuous decrease of the activity of the economical agents in the field of non-ferrous metals; - the dependence on S.C. Neferal – S.A. concerning the running water supply and sewage and rain water takeover; - limited development of the marketing, promotion and distribution activities;

Opportunities	Threats
-the expansion of the economical operators demand for certain types of structural and physical-chemical analysis; -the existence of RTD contracts with private partners; -new market niches; -the creation of a fund to allow a balanced approach of the syncope in the Romanian economy; -the existence of some financial incentives which assure supplementary funds for development; -the possibility to attract revenues from the Fund for Structural Development, European research programs, bilateral cooperation programs.	-adoption of legislative rules (fiscal and economical) or restrictive regulations with adverse impact; -economical recession at national and international level involving the diminishing of the public funds for RDI activities; -unfavourable fluctuations of the national currency in respect with EURO or USD; -changes in the credit policies (interest rates and bank guarantees) of the financing bank - BCR; -problems to assure the Cash-Flow – the lack of the financing sources for the base activities until the financing of the new competitions; - there are new competitors for some market segments addressed by other entities

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

No.	Scientific direction	Equipment/Instrument	Estimated value [euro]	Acquisition term
From structural funds project POS 2.2.1-Research Infrastructure				
1	SD 1	Solubilisation autoclave endowed with agitation	78700	June 2012
2	SD 1	Microwave autoclave	40000	June 2012
3	SD 2	High pressure autoclave (p=7000 bars)	60000	June 2012
4	SD 2	Medium pressure autoclave (p=200 bars)	23000	June 2012
5	SD 2	Spray-dryer	35000	June 2012
6	SD 1 SD 2 SD 3	Multiple electron beam deposition installation, in vacuum, inert or reactive gas endowed also with RF sputtering ion beam facilities	1300000	June 2012
7	SD 1 SD 2 SD 3	ICP-OES (Optical emission spectrometer with inductive coupled plasma)	145000	June 2012
From structural funds project POS DRU and PNII-Ideas project				
8	SD 2 SD 3	Micro scratch tester for characterisation of adhesion and microhardness	50000	March 2012
From new projects calls and own budget				
9	SD 2 SD 3	Nano-mechanical test platform-upgrading of the micro scratch tester	75000	Year 2-Year 3
10	SD 1 SD 2 SD 3	Scanning electron microscope	200000	Year 2-Year 4
11	SD 1 SD 2 SD 3	Surface area porosimetry measurement system	100000	Year 2-Year 3
12	SD 2 SD 3	Electrochemical system for ultra thin films and biomolecule measurements	200000	Year 3-Year 4

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.

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

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 co-operation 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	***Applied Research***	***Prototype***	***Market Entry***
NETWORK - Connecting	Clustering-facilitating research cooperation and marketing: Develop the Innovative Cluster on Advanced Materials (www.nanofutures.ro). ***Market performance***.			
	Partnership Institute – industry (National Projects, EU Projects) ***Recruitment***			
	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 Saarbruken			
	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.***			
PROCESS ease of work		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 Skills, knowledge	Expending educational programs for future markets using structural funds-Human Resources Development projects. ***Sharing of infrastructure***.			

9. Risk Analysis

Risk issue	**Probability of occurrence**	**Impact on the institute**	**Level of attention required**	**Preventive/remedial action**
Early stage and experienced researchers recruitment fails	Low	High	High	Publicise job vacancies positions through various channels. Intensify search for the researchers willing to return to.
Planned equipment from positions 9-12 not bought	Medium	High	High	Can happen if the rate of success at projects calls is low. Plan own budget (from services, contracts with private entities) accordingly.
Members of a certain research team leave the institute.	Medium	High	High	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.
Foresight/exploratory workshops attendance too low for the desired output	Medium	High	High	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.
Cluster on Advance Materials fails	Medium	Medium	Medium	Joint cooperation with RENITT to identify SMEs availability will be started from the very first beginning
Cash-flow assuring	Low	High	High	Strategic planning of the resources (monthly, quarterly, biannual, annually)
Assuring absolute autonomy for water supply	Low	High	High	Planning of the own resources to prevalently assuring water supply

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*
CIP programmes	*Competitiveness and Innovation Framework Programme*
CNCSIS	*National Council of Scientific Research in Higher Education*
CNFPA	*National Council for Adult Vocational Training*
CNMP	*National Centre for Programme Management*
CORINT	*Funding programme of National Plan for Research, Development and Innovation that relates to international cooperation and partnership*
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*
EPO	*European Patent Office*
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*
IDEAS	*Funding programme of National Plan for Research, Development and Innovation that relates to obtaining scientific and technological results, consistent with those of Europe reflected by increasing visibility and international recognition of Romanian research*
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*