

## FINAL REPORT

<b>I</b>	<b>The Name of the Evaluated Institution</b>	<i>NATIONAL INSTITUTE FOR RESEARCH AND DEVELOPMENT FOR INDUSTRIAL ECOLOGY</i>
<b>II</b>	<b>Evaluation Period</b>	26 -:- 27 June, 2012
<b>III</b>	<b>Members of the Team</b>	
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## 1. CONCLUSIONS AND RECOMMENDATIONS

This document reports on the evaluation of the NATIONAL INSTITUTE FOR RESEARCH AND DEVELOPMENT FOR INDUSTRIAL ECOLOGY (ECOIND).

Our team has studied the documentation provided before visiting the Bucharest headquarters of ECOIND. During our visit we received additional information from presentations and discussions with many of the permanent staff and PhD students.

Our evaluation team has met in Bucharest also representatives of one of the two subsidiaries of ECOIND, namely Timisoara branch.

In addition we received the comments of ECOIND representative to our preliminary report.

Overall, both the quality and quantity of infrastructure including instrumentation and laboratory installations are outstanding, reflecting a very active and successful infrastructure-building program of the management. Further, ECOIND benefits from very good levels of expertise in most of the scientific fields that are covered in its activity.

There is a good gender (with a notable excess of females) and age variety, with a need to employ additional highly skilled scientists. The motivation and involvement of young staff and PhD students are impressive.

The institute has been very successful in attracting external funds, especially from national sources. Private funds have constantly covered in the evaluation

period around 50% of the ECOIND budget, which is an outstanding performance in the Romanian context.

The scientific output is generally low at an international level, both with regard to quality and quantity. The scientific council and advisory board need to be more involved in both defining and implementing an international level research strategy. The representative of ECOIND recognized the importance of these issues in her response to our preliminary report and stated that the overall aim of ECOIND strategy is a more consolidated orientation toward top scientific domains and associated scientific productivity. As for scientific productivity, we appreciate the proposal of 100 % increase in number of ISI articles (with AIS) made by the representative of ECOIND. However, due to the ECOIND potential, we also recommend as an indicator of scientific productivity a significant increase in patents (especially in European patents). The advisory board could be enriched to include internationally-recognized, outstanding foreign specialists.

There is a strong need to improve fundamental research within the institute on topics that are of interest for the international research community and not only for the local community. The institute should be leveraging the state-of-the-art infrastructure into well-thought front-of-the-line projects that should be accompanied by publications of results in renowned journals with high impact factors to improve international visibility of ECOIND.

There should be a stronger focus in attracting international funds and collaborators and the response of the representative of ECOIND to our recommendation from the preliminary report is well defined in this regard.

A series of invited lectures given by outstanding scientists on a monthly basis should be established. This series should be planned strategically, to include foreign visitors, present partners, and – very importantly – potential collaborators. In addition, a regular journal club meeting should be established, especially for the young fellows in the institute, to introduce and discuss latest relevant developments in the research field. To stimulate output of an international level, internal evaluation procedure should highlight high impact factor ISI and AIS publications. An active procedure should be established to stimulate (through a bonus) main authors of articles in ISI journals (for example with IF over 1.0 or AIS over 0.8). In choosing scientific journals to which the ECOIND articles are submitted one have to firstly take into account the visibility of the journal in the scientific community of the specific domain to which the study belongs.

The impressive infrastructure should be used as strength to attract highly skilled scientist, to attract funding, to perform national and international cooperation and to compete with similar European institutions. We recommend to actively pursue Marie Curie and European Research Council grants for attracting such

highly skilled personnel, and to widely publicize job searches in Romania and abroad.

The percentage of CSI staff should be increased. The institute needs to attract highly-skilled, creative people with vision to lead their research teams with a large degree of independence in selecting a significant part of their research portfolios.

There is a strong need for more PhD students and more technicians to run sophisticated instruments like LC/MS-MS, GC/MS, ICP/MS and complex air sampling devices, in order to guarantee continual quality of work.

More inter-team collaborative research is desirable, although there is a good tendency to “in house” cooperation.

We recommend in-depth studies and focus on the Danube River and collaborations with similar national and international institutions in Danubian countries.

To the air pollution research we recommend to focus on continuously monitoring ultra fine and fine particles in urban air. But, detailed comments to the research program are made later on to each of the teams.

## **2. Justification of the marks**

### **2.1. The quality of R&D activities and their results *Mark: 3 (three)***

- There are 29 articles in journals with ISI impact factor with non-zero AIS that is 0.42 publications/researcher/5years. Total AIS is 20.36 and overall attract 38 citations (23 of them coming from a single article). The 68 researcher have published additional 53 ISI publications without AIS. Only few lead authors for AIS publications are from ECOIND.

- The decision to publish 44 articles in a recently founded journal with no impact factor is not reasonable (i.e., JEPE). In comparison to existing journals (e.g. Analytical Chemistry, Analytical Sciences, Analytical and Bioanalytical Chemistry, Intern. J. Environmental Analytical Chemistry, Field Analytical Chemistry, Environmental Science and Technology) the quality of this journal is not sufficient. The work published has not attracted citations, which suggests they are not influencing the field of research. The quality of the papers needs to be urgently improved. The literature referred is usually out of date.

We recommend that every two weeks to once a month one PhD student of each group must get an overview on recent publications of the research areas of interest and later on s/he should inform the other group members through a journal club seminar.

- 12 national patents for the evaluation period. Only one international patent submitted in the evaluation period. More European and if possible US patents are desirable.

- They have been successful in attracting national and international funds. Budget around 3 mill Euro per year. Private funds are around 50%, which is an outstanding performance in the Romanian context. Efforts to attract international funds could be improved.

- One start-up is in working phase. Good participation at international conferences. Many book chapters. Some public activity.

## **2.2. Human resources quality *Mark: 5 (five)***

- No visible gaps between teams and departments.

- Average age is 44.5 overall. Efforts to attract masters and PhD students are effective. The efforts to attract highly qualified scientists with working experience overseas are insufficient.

- Good number of international workshop attendance for staff.

- The ratio of scientific to administrative (including technical staff) is approximately 2.6:1, adequate in the context of specific field-work requiring a high number of technical staff.

## **2.3. Quality infrastructure and its rate of exploitation *Mark: 5 (five)***

- The infrastructure of the laboratories is outstanding.

- Variable rates of exploitation, but overall sufficient.

- The institute is very well positioned in terms of infrastructure. This should be used to attract highly skilled scientists and attract funding.

## **2.4. Management efficiency and quality of the research environment *Mark: 4 (four)***

- Good level of motivation of staff. A mechanism to stimulate authors of patents exists. The system could be improved by encouraging PhD students to publish their PhD results.

- The policy to publish an important part of publications in a single journal is questionable. The scientific council and advisory board need to be more involved in defining an international level research strategy.

- A bottom-up mechanism for decision making would be a desirable addition to the current procedures.

- Standard code of conduct in place. Field specific measures need to be integrated.

- A system should be established for publishing as many results as possible, which have been obtained from private funds.

## **2.5. Quality and credibility of the institutional development plan *Mark: 3 (three)***

- Along with market-oriented activity, a better defined and focused research strategy is needed in the development plan.
- There is a need to foster individual and new ideas. Regular brain storming within each team and between teams is recommendable. A mechanism of financial stimulants for successful large proposals and outstanding publications should be established.
- Collaboration and partnerships should be very much improved regarding international research groups and research centers.
- Communication policy should focus on the best international conferences, for example the IWA, SETAC and EGU conferences. Participation and leadership in European consortia is recommendable.
- There is a strong need for more PhD students and more technicians to run sophisticated instruments.

### **3. PRESENTATION OF TEAMS**

#### **3.1. Team E1: Pollution control of water, soil and wastes**

*Domain:* analytical research for development of methods, techniques, methodologies, standards for identification and control of pollutants in water, air, soil, waste, sludge, sediments, and also services to the economic environment.

#### **The quality of R&D activities**

During the 2007-2011 period the 16 scientists have published 12 non-zero AIS articles (an average 0.75 ISI-articles/researcher/evaluation period), 16 articles without AIS and other non ISI publications. The research activity was performed in different types of projects financed from national or international, public or private sources (9 international public projects; 4 national public projects; 15 projects/ contracts financed by companies from private sector; 3 private international projects; productivity of 2.375 projects&contracts/member team and 3.166 projects&contracts/researcher). Eight projects have been coordinated by the team. Most of the research activity was performed in cooperation with other teams from ECOIND but also with other Research Institutes (e.g National Research Institute in Informatics, Institute of Micro Technologies, National Institute of Statistics) and Universities (e.g. University of Bucharest, University of Agronomy from Bucharest, Technical University of Civil Engineering Bucharest).

#### **Human resources**

The total number of employers is 20 occupied workplaces (75% female staff; 11 high studies, from which 7 attested and 4 technicians). Two PhD students and

two Master students are involved in their scientific activity. The average age is 44.5 years. The ratio of the administrative staff is not too high (4 technical staff, including the laboratory and technical staff). Four young scientists have research experience in foreign laboratories (University of Valencia, EPAL Laboratory Lisboa, WISUTEC Chemnitz, Munster Analytical Solutions GmbH). This figure must be enlarged.

### **Infrastructure**

They are very well equipped which allow them to solve many problems in their research field. They are also involved in several inter-laboratory studies. The level of exploitation of the infrastructure is high (about or over 80%).

### **Management efficiency and the quality of the research environment**

Within the research team satisfaction is good. The team has good collaborations with other teams, at national level and also at international level. To increase the scientific quality of the team work, the unit/team leader should motivate more the best team members.

### **The quality of the institutional development plan**

Taking into account the experience accumulated and also the modern infrastructure, the team intends to develop new research activities in the next 4 years (2012 –2015), such as: analytical research for development of sensitive methods for dioxins and furan, pharmaceutical residues, steroid estrogens from water and soil; specific methods for testing the effect of different types of materials used for drinking water distribution on water quality; screening methods for different types of wastes. They are aware of the necessity to improve the quality of their publications. They have large potential for high quality research. One of their priorities is recruitment of experienced scientists and young researchers at the beginning of their career.

The equipment is “state of the art”, but an ASE apparatus for advanced solid extraction of solid waste, sludge etc. is missing, especially for the analysis of PCDD/F’s in these matrices.

Another reasonable supplement is a High-Resolution ICP/MS for solving speciation problems.

In water analysis for example one has to differentiate between As(III) and As(V) or between Cr(III) and Cr(VI) to get information on the toxicity of the sample resp. the risk for human beings.

In case of pesticide analysis in the literature there are published so-called collecting methods, that means a special sample preparation for all classes of pesticides and a subsequent LC/MS-MS

resp. GC/MS determination. We send this “multi residue method” which is established by the EU Reference Laboratory to the General Manager Ms.Nicolau.

The research plan for the next time needs some supplement. By “in house” projects experience should be acquired in analyzing

- new classes of pollutants like antibiotics and pharmaceuticals in groundwater of rural areas, where intensive animal breeding is practiced
- endocrine disruptors in surface and drinking water
- new classes of pesticides
- mycotoxins and algae toxins (cyanobacteria)
- brominated flame retardant residues in sediments and sewage sludge (origin: all kind of plastic material)

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The reviewers are aware of the fact that the group has to attract research projects and money by chance, but at a moment – starting with new instruments in new laboratories – the group should collect as much base knowledge and experience as possible.

### **3.2 Team E2: Bioassays and Biological Analysis Laboratory**

Domain: Pollution control and monitoring of the environment using biological and microbiological methods; aquatic ecosystems control and biodiversity monitoring in accordance with WFD; development of eco-toxicological methods for assessment of ecological risk; implementation of enzymatic techniques to evaluate risks upon environmental health.

#### **The quality of R&D activities**

During the evaluation period the team has published seven ISI articles (an average 0.7 ISI-articles/researcher/evaluation period), three non ISI publications and one book chapter.

The team has benefited from international funding (two projects from public and one from private international funds) and national sources (three public and



seven private). Good level of cooperation with other teams from ECOIND and also with other institutions, both national and international.

### **Human resources**

The total number of employers is 11, with ten occupied workplaces at present (90% female staff ; seven with high studies, from which five attested, and three technicians). Two PhD students and two Master students are involved in the activity of the team. The average age is 40 years.

### **Infrastructure**

All laboratories of the team (i.e. microbiological, ecotoxicological and hydrological laboratories) are very well equipped. The level of exploitation of the infrastructure is satisfactory (about or over 60%).

### **The quality of the development plan**

Overall, the group's activities and strategy are satisfactory.

In aquatic toxicology studies with a living community of *Daphnia Magna* as well as bioanalytical detection methods like EROD resp. CALUX for dioxin like compounds, Yeast Estrogen Assay for endocrine disruptors and immunoassays for pesticides as sensitive screening method should become implemented in the research program. The scientists should become familiar with these methods by training. So, in case of corresponding projects they are able to perform these investigations for risk assessment.

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### **3.3 Team E3: Air Pollution Control**

Domain: Development and validation of new methods for air pollution from emissions and ambient air (lack of national and international standard methods); studies regarding industrial and ambient air pollution level.

### **The quality of R&D activities**

During the 2007 to 2011 period the 8 scientists have published three ISI articles (0,37 ISI articles/researcher/ evaluation period). The research team was involved, as coordinators and partners, in six projects (with a productivity of

0,75 project/researcher/evaluation period). The financial support has been only from national funding.

### **Human Resources**

The total number of employers are 11 occupied work places, from which two Masters students and three PhD students and three technicians. The average age is 39 years.

### **Infrastructure**

The group has the necessary infrastructure to solve problems in their research field and to develop new research themes. The level of exploitation of the infrastructure is good.

### **Management Efficiency and the Quality of Research Environment**

Within the research team satisfaction is good. The team has good collaboration at national level, but need more to be more active on international level. This team is very well interacting with the other ones in ECOIND.

### **The Quality of the institutional Development Plan**

The strategy and the research plan are satisfying. They are aware of the necessity to improve the quality of their publications as they have large potential for high quality research. The research and development strategy of the team looks good, but they have to be aware of submitting patents in order to make visible their applicative dimension, too.

We recommend the following supplement:

Impact assessment of ultra fine (<PM 2.5) and fine (2.5 PM) particulate matter in urban dust is very important for a risk assessment, because epidemiological studies have shown their importance for health effects on the respiratory system and for passing the blood barrier.

So, this kind of investigations, especially the continuously monitoring of urban emissions is necessary.

The analysis of Hydroxy-PAH's as photo degradation products of PAH's resp. the monitoring of Nitro-PAH's on the surface of particulate matter from traffic should become included in the research program.

The sampling equipment must be improved. Additional staff, especially technicians are necessary for sampling campaigns resp. field work.

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### **3.4 Team E4: Environmental Pollution Assessment & Monitoring**

Domain: Assessment of industrial pollution and environmental risk; development of industrial waste water management and hazard assessment; hazardous substances in aquatic ecosystems; technological processes specific to environmental protection; recovery of useful substances.

#### **The Quality of R&D Activities**

During the 2007 to 2011 period the ten scientists have published three non-zero AIS articles (0,3 non-zero AIS articles/researcher/evaluation period) and eleven other publications. The research team was involved, as coordinators and partners, in thirteen projects (with a productivity of 1,3 project/researcher/evaluation period. The team has also elaborate six new project proposals in NPRD II competition. The financial support has been from both public and private funds. The activity of the team has also an important applicative dimension related to studies, documentations and services for transferring the results to companies (projects awarded by tender systems).

#### **Human Resources**

The total number of employers is 14 occupied work places from which are five PhD students, two Masters students and four technicians. The average age is 46,3 years.

#### **Infrastructure**

The team has a very good infrastructure to solve many problems in their research area. The level of exploitation of the infrastructure is high.

#### **Management Efficiency and the Quality of the Research Environment**

Within the research team satisfaction is good. The team has good collaborations at national and international level. The team is also interacting with the other ones in ECOIND. To increase the scientific quality, the unit/team leader should motivate more the best team members.

#### **The Quality of the institutional Development Plan**

They are aware of the necessity to improve the quality of their publications. They have large potential for high quality research. The research and development strategy of the team looks good, but they have to be aware of submitting patents in order to make visible their important applicative dimension.

The group should try to find national and international projects in a ratio 1:1.

The methods of in situ and at the spot analysis should become improved.

### **3.5 Team E5: Environmental Technologies and Technological Transfer**

*Domain:* Research and technological development for elaboration of physical – chemical and/or biological treatment technologies for water, industrial and

municipal wastewater, sludge processing, waste treatment, by-products recovery, soil recovery; technological transfer of technological results: implementation of new technologies, optimization of existing technologies, technical assistance for technologies' implementation.

### **The quality of R&D activities**

During the 2007-2011 period the 16 scientists have published 7 non-zero AIS articles (an average 0.44 ISI-articles/researcher/evaluation period), 17 articles in other relevant publications. The E5 research team was involved, as coordinators and partners, in *carrying out 36 projects* (representing about 29% of the ECOIND total number of projects and having a productivity of 1.64 projects/member team and 2.25 projects/researcher)). These have been financed from external or internal, public or private funds, and six are still ongoing projects. They also have a funding support from SMEs.

**Reasonable patent output** - 3 patents of national and one international patent demand PCT/RO2011/ 000026/ 11.11.2011. International patents should be instead encouraged.

### **Human resources**

The total number of employers is 22 occupied workplaces (16 high studies from which 10 attested and 6 technicians). Three PhD students and two Master students are involved in their scientific activity. The average age is 43 years. The ratio of the administrative staff is not too high (6 technical staff, including the laboratory and technical staff).

### **Infrastructure**

They have a very good infrastructure. They have necessary infrastructure to solve many problems in their research field. The level of exploitation of the infrastructure is high (about or over 80%).

### **Management efficiency and the quality of the research environment**

Within the research team satisfaction is good. The team has good collaborations at national level and also at international level. To increase the scientific quality of the team work, the unit/team leader should motivate more the best team members.

### **The quality of the institutional development plan**

They are aware of the necessity to improve the quality of their publications. They have large potential for high quality research. One of their priorities is recruitment of experienced scientists and young researchers at the beginning of their career.

The photo degradation studies must be extended to other classes of compounds.

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### **3.6 Team E6: Management Systems**

The management projects and services should become continued.

### **3.7 Team E7: Timisoara Subsidiary: Control, Assessment and Environmental Technologies**

Domain: Institute's replica for western part of the country with a focus on collaboration with Hungary and Serbia. Fundamental and applied research in water and waste water treatment, soils and polluted soils remediation, recovery of wastes and ecological remediation; assessment of environmental risk of economical activities and studies regarding the evolution of environmental quality and industrial emissions.

#### **The quality of R&D activities**

During the evaluation period the eight scientists have published 5 non-zero AIS articles (an average of 0.63 AIS articles/researcher/evaluation period), with an additional 9 ISI articles non-AIS and 56 other publications. The research activity has been carried out within different type of projects, including one Cross-Border Cooperation Hungary-Romania and six national projects financed CDIPNCD I II program. Much of the research activity was performed in cooperation with foreign, regional partners, especially from Hungary, but also with national partners.

#### **Human Resources**

The total number of employers is nine, with eight occupied workplaces (62,5% female staff; six high studies, from which five attested and two technicians). Two PhD students are involved at present in the scientific activity of the Subsidiary. The age range of staff spans 45 to 56 years.

One team member attended an internship in Italy (Ca Foscary University/Venice).

#### **Infrastructure**

Our team has not visited the Timisoara Subsidiary, according to the documentation received and the discussions in Bucharest the subsidiary is equipped with most of the relevant equipment needed. Additional equipment

needed includes a Jar Test System, a turbidimeter, a centrifuge and appropriate electrocoagulation equipment.

### **The quality of the development plan**

The team already understands the need for greater attention to the quality of publications produced. Appropriate priorities include also extending international collaborators and recruitment of young researchers.

There are a lot of remediation and phyto remediation studies published in the literature, mostly without big success. A related interesting question is what happens with the contaminated plants after the remediation. We recommend an intensive literature search and follow up studies in this regard.

The literature also must be studied regarding the efficiency of electrochemical treatment processes.

Finally the level of efficiency of pilot plants or of technical level is open to question.

## **3.8 Team E8: Ramnicu Valcea Subsidiary:Environmental Control and Pollution**

### **Assessment**

Domain: Pollution control and assessment services in Oltenia area: industrial pollution monitoring and control; technical assistance to implement and verify radiation technologies developed by ECOIND in the Oltenia area.

### **The quality of R&D activities**

During the evaluation period the six scientists have published two articles in ISI journals (an average 0,33 ISI-articles /researcher/evaluation period), 18 non-ISI publications. The research activity was performed in different types of projects financed from national, public or private sources (140 projects, with the main beneficiary being SC OLTCHIM SA).

### **Human Resources**

The total number of employees working in the Ramnicu Valcea Subsidiary is six, with all work places occupied at present ( 83% female staff; three high studies, from which three attested and three technicians). Two PhD students are at present involved in the research activity. The average age is 44 years.

### **Infrastructure**

The subsidiary has very old equipment, most of the research activities are performed at Bucharest ECOIND laboratories. While such strategy is appropriate, we encourage the expressed wish for modernizing some of the on-

site equipment, such as purchasing a new gas chromatograph and a UV/VIS spectrometer.

**The quality of the development plan**

The Subsidiary became a recognized environmental assessor in the Oltenia area, with adequate competences in environmental monitoring. So, the monitoring of pollutants in the oltenia area should be continued. Efforts should be made to increase publication output ISI journals.

**Final grade (the mean of the integer marks on each criterion): 4,0 (four)**

**Proposed classification level: A**

- The institute is very well positioned in terms of infrastructure. This should be used to attract highly skilled scientists and attract funding.

**Proposed certification level: A (overall mark 4.0)**

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Date: 05.08.2012

12/12.