

DESIGNING A WEEE VIRTUAL ECO-INNOVATION HUB: THE VISION OF THE ACADEMIC AND RESEARCH ENVIRONMENT

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ABSTRACT

The drastic reduction in investments caused by the financial crisis determined the search for new alternatives in order to streamline the waste electrical and electronic equipment (WEEE, e-waste) collection and recycling, as well as the recovery of valuable materials. In this context, the development of an innovation hub has the potential to increase the competitiveness by facilitating dialogue and innovation and to promote public-private partnerships, while responding to the different needs of academic and research environment, business and public authorities. However, given the novelty of such a collaboration system, it is essential to analyze the users' requirements in order to better understand their interests and unfulfilled needs. Among them, the academic and research environment is very important due to its great contribution to both the economic and social development of society. In the current economic climate based very strongly on technology and innovation, this category of users provides certified knowledge and participate in the production of technology by writing patents, prototyping and developing models. In this context, the paper aims to identify the academic and research environment requirements in relation to the eco-innovation hub.

KEYWORDS: *knowledge transfer mechanisms, innovation technologies, WEEE recycling, environmental protection*

JEL CLASSIFICATION: *Q53, Q55, Q56, Q57*

1. INTRODUCTION

Eco-innovation is a new concept of great importance to business and policy makers getting increasingly more attention in the European Union and at the global level. Eco-innovation could be achieved either technologically or non-technologically, for economic reasons or environmental protection pressures in order to enable the sustainable use and conservation of natural resources, reduce pollution and waste management costs or to promote organic products on the market.

Eco-innovation presents clear opportunities for many kinds of activities and covers a wide range of areas, which include management, recycling and recovery of waste, but also eco-design and circular economy. In all these areas, eco-innovation offers attractive development perspectives due to a broad range of opportunities based on the integration of new technologies in traditional sectors or niches approach.

As regards European Union, many initiatives addressing the concept of eco-innovation have been taken in recent years:

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- the EU's Eco-innovation Action Plan aiming to increase European competitiveness by offering direct funding to various projects
- the Framework Programme for Research and Innovation for 2014-2020 supporting the implementation of the Action Plan
- the Europe 2020 strategy for a smart, sustainable and inclusive growth focusing on innovation as an essential factor in overcoming the economic crisis and generating economic growth.
- the Resource-Efficient Europe initiative highlighting the role of eco-innovation in increasing competitiveness
- the associated Roadmap towards a Resource-Efficient Europe focusing on improving resource efficiency.

Over the past few years, a greater attention to eco-innovation in the waste sector has been paid, both at European and worldwide level. Furthermore, the implementation of eco-innovative policy practices, tools and technologies in the e-waste recycling sector has been required.

E-waste has become an emerging problem because of its rapidly increasing amount and the content of the toxic substances. These dangerous chemicals are harmful to human health and could pose further problems for the environment if the waste is not disposed of properly. Moreover, e-waste leads slowly towards resource depletion, if not recycled or reused. However, e-waste could also represent an enormous business opportunity for the companies due to the valuable and precious materials found in complex electronics.

According to the International Environmental Technology Center of the United Nations Environment Program (UNEP), an increase of 40% in the generation of e-waste is recorded each year worldwide. In these circumstances, e-waste reduction could be difficult or even impossible. Therefore, it is imperatively necessary to identify new ways of recycling by using solutions of treatment and recovery of valuable materials that enable new ways of saving money for the companies.

The transition from traditional technologies characterized by known risks to the innovative technologies subject to uncertainty is a complex process that could raise a range of economic, financial and informational barriers such as high investment costs, limited access to finance and low levels of consumer awareness. In this context, each of the key players in the field (collection and recycling companies, business consulting firms, universities, research institutes, etc.) should not only be aware of the scale of the benefits that could arise from eco-innovation in the e-waste sector, but also establish partnerships aimed at the effective transfer of knowledge, technology and investments. Effective collaboration and knowledge transfer could be achieved through cooperative mechanisms such as science parks, business incubators, the poles of competitiveness and economic clusters (Ciocoiu, 2013).

2. THE DEVELOPMENT OF INNOVATIVE SYSTEMS AND KNOWLEDGE TRANSFER MECHANISMS IN THE E-WASTE SECTOR

In the literature, the effectiveness of collaborative systems and knowledge transfer mechanisms, as points of accessibility to technology, research cooperation and human resources, has been addressed in several studies. Porter (1998) explains the concept of cluster and its role in the development of different areas, mentioning that Silicon Valley and Hollywood are the most famous.

Furthermore, Henry and Pinch (2006) describes the competitive advantages conferred by clusters to companies due to faster access to resources and knowledge.

An evaluation of the companies' level of innovation by comparing firms located in powerful industrial clusters to those located outside is performed by Baptista and Swann (1998) as well as

Beaudry and Breschi (2003). According to these authors the presence of a cluster is important, but not decisive in getting high-performance levels by companies. However, a cluster populated by many innovative companies could bring multiple benefits to a firm, especially if such innovative companies do not exist in its own industrial sector.

The role of incubators in helping new technology-based firms to gain increasing economic relevance is analyzed by Colombo and Delmastro (2002). In this regard, the authors make a comparison between on- and off-incubator firms concluding that firms located in incubators perform better than those located outside. Three years later, Grimaldi and Grandi (2005) make a classification of business incubators specifying that each category is determined by the requirements and needs of the private sector.

Links and Scott (2007) highlights the growing role of university research parks in knowledge transfer between universities and the industry sector and emphasize the importance of collaboration between them. Massard et al (2014) performs a review of best practices and success factors regarding eco-innovation parks in 27 countries. Moreover, Conicella and Salvador (2012) have conducted a survey on the companies' motivation for choosing physical locations like science parks or virtual locations like clusters or innovation pole.

Evers (1997; 2008) points out the necessity of creating both knowledge cluster and knowledge hubs and makes a comparison between the two innovative systems. The concept of innovation hub is also explained by INTELI (2007) which identifies 21 of such urban policy mechanisms located in different parts of the world. In addition, Lange, Handler and Vila (2010) consider that the key element of economic development is the so-called "sophisticated collaboration" between actors from different fields. According to the authors mentioned above such collaboration could be achieved through locally based clusters and new forms of innovation hubs.

An important analysis of systems for enhancing innovation and knowledge transfer is made by Ciocoiu (2013) who presents the innovation hub as a new form of innovative cluster. The author considers that in today's world of evolving telecommunications, the clusters are no longer valid and should be replaced with virtual innovation hubs which are more oriented towards using technologies for innovation and growth. Furthermore, Barsoumian, Severin and Spek (2011) examine the 27 EU member states cluster policies in relation to eco-innovation, highlighting that eco-innovation is the key to enhancing competitiveness and improving performance in all industry sectors.

According to UNEP and European Commission (n.d.), eco-innovation offers new opportunities for the private sector in addressing environmental issues while contributing to a sustainable economy. Hawkins et al (2009) also consider that eco-innovation has a key role in developing an energy efficiency and resource conservation based economy and in reducing the impact of human action on the environment at European level. Their opinion is supported by OECD (2009) which describes the key role of eco-innovation in combating climate change and ensuring green growth in the post Kyoto period. In addition, the market opportunities for eco-innovation are viewed as promising by the European Union Eco-innovation Action Plan which supports the fast adoption of eco-innovation on the market (COM, 2011).

At the opposite pole, Ciocoiu (2013) points out the most significant problems hindering investments in eco-innovation such as limited access to information and knowledge, insufficient grants and poor information on tax incentives. Moreover, Ockwell et al (2010) specifies that the incorrect understanding of eco-innovation measurements as well as the high costs and risks associated with investing in eco-innovation represent serious obstacles to the implementation of this concept on the market.

Several studies in the literature consider eco-innovation as a driver in the e-waste sector. UNEP (2009) highlights that innovation hubs and knowledge centres represent significant tools for eco-innovation in the e-waste recycling sector and have great potential for development in emerging markets. The market potential of innovative technologies for e-waste recycling industry in the emerging nations is assessed by Schlupe et al. (n.d.) who analyze the study elaborated by UNEP in 2009. The authors conclude that the implementation of innovative technologies depends significantly on the economic growth of each country. The use of eco-innovation in different fields, especially in the e-waste sector in developing countries is also studied by the German Federal Ministry for Economic Cooperation and Development (2014) which draws attention to the fact that eco-innovation barriers are more pronounced in emerging markets. In addition, the private sector in developing countries lacks the financial resources for the acquisition of new technology.

According to UNEP and International Environmental Technology Centre (2007), innovative technologies are essential for e-waste recycling as well as for the recovery of precious and special metals, while helping to reduce the risks for the environment and human health. Furthermore, the European Investment Bank (2012) considers that the investments in innovative technologies for e-waste recycling could bring enormous economic benefits in many European countries. This idea is supported by Bisgaard et al (2012) who state that innovative technologies could help companies become more competitive in the market. The acquisition of new technologies may be beneficial in various fields, the e-waste sector being one of them, and may lead to the appearance of green products or services on the market.

Taking into account the enormous amount of e-waste generated at the global level and its negative impact on the environment, Ciocoiu (2013) also believes that eco-innovative solutions are the key to promoting the use of e-waste as a resource. Moreover, the 15th Forum on Eco-innovation and UNEP Roundtable on Eco-innovation (2013) points out that eco-innovation is a key approach to increasing market opportunities regarding e-waste reuse.

3. METHODOLOGY OF RESEARCH

In order to determine the users requirements for a virtual hub of eco-innovation has been used a research methodology based on the survey technique. The discussions with professionals from universities and research institutions from Romania helped the authors to design the questionnaire (Appendix 1).

The questionnaire starts with general questions and gradually focuses on specific issues, trying to identify the motivations of users. The questionnaire has 17 closed questions, some of them containing many possible answers. It also has a few questions for data identification in order to ensure the respondents representativeness.

The authors identified two categories of potential survey respondents:

- university teaching staff, with executive and operational positions
- scientists and researchers from R&D institutions, with executive and operational positions too.

The first step was to identify R&D institutes and universities which are engaged in environmental protection or have the activity focused on waste management issues. There have been identified:

- 8 R&D institutes that have developed or conducted research projects and studies concerning eco-innovation and waste management
- 43 universities with research centers or departments with interests in waste management or environmental protection

The survey was conducted from September to October 2014. To simplify the process of collection and processing of the results the respondents were pleased to complete the questionnaire on-line at <http://www.ecoinnewaste.ase.ro/?p=92>.

The survey tried to analyze the following issues:

- To evaluate the usefulness and opportunity of development a virtual eco-innovation hub for WEEE recycling;
- To establish the availability of academic and research media for the development and maintenance of the virtual hub.

4. RESULTS

After collecting the data, resulted a sample of 43 respondents. The analysis of the survey responses highlighted that WEEE eco-innovation is considered a topical and urgent issue requiring concomitant involvement of all market actors: universities, research institutes, business, public authorities.

Only 21.73% of respondents have had academic or research preoccupations in the field of WEEE and 34.78% in the field of eco-innovation, most of them being teachers. The low percentage of respondents with such preoccupations could be a signal about the need to include the WEEE issues in information campaigns. A virtual mechanism for promoting WEEE and eco-innovation could be useful not only for academic and research environments, but also for the business, because of the various opportunities on the market for recovery or reuse of this category of waste.

The small percentage of researchers in these fields represents a signal about the necessity of collaboration between teachers and researchers in subjects concerning WEEE and eco-innovation. The cooperation between the two sectors is essential and must be seen as a process of eco-innovation in which the transfer of knowledge is the core mission.

The academic and research sectors have understood the importance of including WEEE and eco-innovation among the research topics and teaching disciplines: there are courses at all levels of teaching, masters and doctoral students, research projects in this area. Generally, the academics and researchers are aware that innovation is a driver of progress. The lack of human resources, materials, access to relevant information represents only some of the barriers in the development of the field. The difficulty to develop departments of eco-innovation and technology transfer concerning WEEE makes necessary the establishment of a mechanism to facilitate the transfer of knowledge and technologies between various market players: universities, research institutes and private companies.

Almost half (47.82%) of the respondents recognize the utility of a virtual hub of eco-innovation in recycling WEEE. They are aware about the positive implications of such a hub on the development of waste management. This fact may be a positive sign for a future voluntary participation of universities and research institutes in the operation and perpetuation of such a virtual mechanism of cooperation.

When asked if they have knowledge about the existence of a virtual hub of eco-innovation in another field than WEEE, 95.65% of respondents have responded No. The high percentage of negative responses reflects the fact that although the hub concept is well known in IT, in other fields it is in an early stage of development. Perceiving it as a mechanisms that facilitate increased collaboration between universities, research centers and private companies, takes place gradually, once its benefits are recognized.

Regarding WEEE training areas that would be addressed, the perceived priority issues are:

- Specific legislation (86.95%)
- Techniques and modern technologies for recycling (73.91%)

- Impact on the environment (73.91%)
- Management of WEEE Policies (56.52%)
- The behavior of users of electrical and electronic equipment (56.52%)
- Training of specialists in the field (47.82%)
- The informal sector of the management of WEEE (21.75%)

The respondents' answers regarding *their expectations from using a virtual hub for eco-innovation in the recycling of WEEE*, reveals that increasing the levels of awareness of WEEE is one of the highest expectations generated by the use of the eco-innovation hub. Moreover, the amount of WEEE increases every year, making it more and more difficult for communities or states to reduce or eliminate this type of waste. Therefore, WEEE management becomes increasingly complex, both technically and commercially, requiring new technologies for collecting and recycling as well as partnerships between market players in order to recover raw materials. In this context, a mechanism for providing a constant flow of information to the actors involved in this field could be the starting point for future collaboration and better identification of needs as well as for increasing firms' capacity to absorb new technologies, especially those resulting from research-development-innovation.

The analysis of the responses about *the main requirements that would have to meet a virtual hub for eco-innovation in the recycling of WEEE* showed that most respondents are concerned about the hub's advantages for its users: accessibility, database for documentation, feedback and relevant solutions, function as a portal of news, events in the recycling of WEEE. The respondents have not been too focused on transforming the hub into a mechanism with educational and informational purposes which could generate appropriate and ethical behaviours among citizens in accordance with European and international rules regarding selective collection and recycling of WEEE. Furthermore, the annual ranking of those who promoted the hub has not been considered an important activity by many respondents.

The answers to the questions regarding *the organization of the training sessions in the field of eco-innovation and WEEE on the virtual hub of eco-innovation* highlighted the respondents' preference for interactive sessions. Such sessions encourage the exchange of ideas, knowledge and experiences and promote debates on different topics of interest. Moreover, they could strengthen cooperation among hub members, removing communication and knowledge barriers and encouraging the exchange of information.

Analyzing the responses to the question on *the importance/ usefulness of the facilities that might be offered by a virtual hub for eco-innovation in developing recycling systems of WEEE in Romania*, it appears that most respondents have given great importance to the cost-benefit analysis model for the recycling of WEEE and to the eco-innovation platform for training in the field of the WEEE management. The cost-benefit analysis is widely used in the development of environmental policies and projects in order to determine their efficiency. As regards the eco-innovation platform, it could host outreach events, debates between academic, research and business environment on current and future issues about WEEE management, as well as online training activities on eco-innovation, thus contributing to information and knowledge exchange between hub members.

As regards the extent to which *the existence of a WEEE eco-innovation hub may contribute to an increased efficiency/visibility of the activities in which the respondents are employed*, over two thirds of them have ticked *very much* and *somewhat* while the rest of them have been identified as undecided. WEEE hubs are key factors for innovation and increased efficiency through the development of institutional cooperation and multi-sectorial approaches as well as stimulation of interactions between market players. In addition, they represent a starting point for association of private companies, universities, research environment and other market players. In conclusion,

academic and research environment are aware of the benefits generated by such mechanisms for the institutional actors.

The organization interest in registering as a user and in participating in operation of the virtual hub of eco-innovation has generated positive answers to nearly half of respondents. The initiatives like virtual hub of eco-innovation should be seen as an instrument for promoting and supporting competitiveness, innovation and development in every area. The requirements for quality of life, the existence of a corresponding environment, the need to have a strong, competitive and innovative waste management industry justify the development of these hubs. According to the answers to this question, both academic and research environment have understood that such initiatives could generate real growth in a field and promote cooperation between universities, research institutes, business environment and other actors in a given geographical area.

As regards *the way in which respondents can contribute to the operation of the hub*, most of the them, university teachers and researchers, consider that publishing articles, reviews and comments on various topics of interest as well as participating in the discussion forum are the most important ways for providing information in order to ensure inter-connection and cooperation between hub members and clear benefits for all its users. Moreover, the essential characteristic of universities is interdisciplinary, based on an exchange system in which each side gives the best knowledge to its collaborators.

The option on the dissemination of research findings has been ticked by a small number of respondents. A possible explanation for this situation could be that they do not always conduct research on this topic. Moreover, academic and research environment are continuously expanding and developing and they are permanently looking for new topics and research opportunities.

Analyzing the responses to the question on *the categories of organizations that are the best suited to host a virtual hub for eco-innovation in the WEEE recycling*, it appears that universities have achieved the highest response rate, closely followed by the professional associations of operators in the field of waste management. Moreover, universities are considered key players benefiting from human and technical potential in order to produce and adapt research findings to the external environment. In addition, they promote research and facilitate its dissemination by publishing studies and articles; they also provide training and methodical support. With regard to the professional associations, it is assumed that they pay more attention on practical knowledge on waste management, building positive relationships with similar organizations and participating in events organized by the business environment.

5. CONCLUSIONS

The analysis of the requirements of academic and research environment regarding WEEE issues for a virtual HUB Project proposal was investigated in this paper with the help of a survey questionnaire addressed to university teachers and researchers.

Based on the issues and ideas raised in this paper, one can affirm with certainty that a national or even a local dialogue on technology transfer and innovation in the field of WEEE is required. In addition, special attention should be paid to the dissemination and exploitation of results obtained in research projects realized with the participation of universities and institutes for research and development. Moreover, the relationships between universities, research institutes and socio-economic environment in order to facilitate direct transfer of knowledge and technology is very important.

In this context, the development of a virtual hub for eco-innovation in the field of WEEE becomes increasingly imperative. This virtual hub could ensure:

- a better use of research findings as well as knowledge and technology transfer from universities and research institutes towards interested companies;

- a better understanding of the funds' access modalities in order to support innovation and technology transfer programs
- a better access to knowledge and local, national and international events in the field of innovation and technology transfer.

Furthermore, the hub provides technical assistance, advice, and an institutional framework for developing the WEEE sector in order to enhance the absorptive capacity of new technologies by companies, especially those resulting from research, development and innovation as well as the transfer of informational assets obtained from research by academic and research institutions.

It should be also noted that the members of a virtual hub for eco-innovation in the field of WEEE should be aware of knowledge and communication barriers and other impediments that may arise if the involvement is only formal. In this regard, all the members should set clear priorities and business environment should accept collaboration with institutes for research and development while academic environment should improve its image. Furthermore, the other actors should be aware of the need to continue to modernize the sector and increase efficiency.

The present research was not conducted on a large scale and the responses represented the opinion of 43 university professors and researchers. That is why the findings cannot be generalized as relevant for all the members of the hub. In addition, it is very important to involve other categories of respondents like business environment in order to triangulate the information provided by the university teachers and researchers. In this regard, further researches on a larger scale should be conducted to see if they validate or not the findings of the present paper.

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Appendix 1

Questionnaire concerning the analysis of the requirements of academic and research environment regarding WEEE issues for a virtual HUB Project proposal

1. The Organization in which you are employed is:
 - University
 - Research Institute

2. The academic or research degree:
 - Professor
 - Associate Professor
 - University lecturer
 - Assistant Professor
 - Scientific researcher
 - Scientific researcher I
 - Scientific researcher II
 - Scientific researcher III

3. Position in the organization:
 - Executive
 - Operational

4. The field of activity of the organization you are working for is:
 - Social and Political Sciences
 - Economic sciences
 - Engineering Sciences
 - Natural sciences
 - Agricultural and forestry Sciences
 - Exact Sciences
 - Other.....

5. The city in which is located the institution you are working is:

6. The Department/The Faculty you are working is:

7. Did you have preoccupations in the field of recycling the waste of electric and electronic equipments (WEEE)?
 If yes:
 - In the research field
 - In the academic field

8. Did you have preoccupations in the field of eco-innovation ?

If yes:

- In the academic field
- In the research field

9. Does exists in your institution concerns regarding the study/research of the WEEE issues ?

If yes:

- There is a program/course on management of waste (in general)
- There is a program/course on WEEE management
- Waste Management (generally) is included in the curricula of disciplines from Bachelor degree and/or Master degree courses
- WEEE Management is included in the curricula of disciplines from Bachelor degree and/or Master degree courses.
- There are doctoral and postdoctoral students researching in the field of waste management
- There are doctoral and postdoctoral students researching in the field of WEEE management
- There are research projects addressing issues in the field of waste management
- There are research projects addressing issues in the field of WEEE management

10. Does exists in your institution concerns regarding the study/research of eco-innovation issues?

If yes:

- There is a program/course on eco-innovation
- Eco-innovation is included in the curricula of disciplines from Bachelor degree courses
- Eco-innovation is included in the curricula of disciplines from Master degree courses
- WEEE Management is included in the curricula of disciplines from Bachelor degree and/or Master degree courses
- There are research projects addressing issues in the field of eco-innovation
- There are colleagues reasearching issues in the field of eco-innovation

11. Does exists in your institution interest in including in academic teaching and research issues concerning waste management and innovation in general ?:

- Yes, on short time
- Yes, on medium and long time
- No

12. Does exists in your institution interest in including in academic teaching and research issues concerning WEEE Management and eco-innovation:

- Yes, on short time
- Yes, on medium and long time
- No

13. What is your opinion on the priority of the WEEE fields of instruction that should be addressed:

- Specific legislation
- Techniques and modern technologies for recycling
- Management of WEEE Policies
- Impact on the environment
- Training of specialists in the field
- The behavior of users of electrical and electronic equipment
- The informal sector of the management of WEEE

14. Do you know what means and what is the purpose of a virtual hub for eco-innovation in the field of recycling of waste electrical and electronic equipment?

- Yes
- No
- I do not know/no answer

15. Do you know of the existence of a virtual hub for eco-innovation in a different domain than the WEEE ?
- Yes.
 - No
 - I do not know/no answer

16. What expectations do you have from using a virtual hub for eco-innovation in the recycling of WEEE?
- increasing information about WEEE;
 - improving the level of recycling of WEEE;
 - encouraging the interaction between different stakeholders of WEEE recycling;
 - development of partnerships and the exchange of best practices between universities/research institutes/business/public authorities active in the field of WEEE recycling;
 - increasing the visibility of the Romanian research;
 - fostering environmental education, civic spirit, responsibility and business ethics in the field of WEEE recycling;
 - development of ideas/inventions/innovations and specific projects to stimulate the (eco) innovation, especially in the field of recycling of waste;
 - other expectations.
 - I don't know/I am not answering

17. What are the main requirements that would have to meet a virtual hub for eco-innovation in the recycling of WEEE?

	Very much	Somewhat	Undecided	Not too much	Not at all
To be easily accessible to users, in terms of connection facilities and the cost of acquisition of desired information					
To include databases for documentation, as well as options for communication between participants (discussion forums, launch of debate themes, etc).					
To allow the processing of data and information					
To provide feedback and solutions for economic agents interested in WEEE recycling and eco-innovation from the university and research environment.					
To function as a portal of news, events in the recycling of WEEE					
To become an instrument of civic education for improving the population's attitude regarding the separate collection and recycling of WEEE					
To popularize "recipes for success" of economic agents from Romania who performed in the recycling of WEEE, contributing to the development of a proactive behavior among other companies					
To present annually on the virtual hub the top companies, universities, stakeholders who promoted computer applications, products, services or innovative technologies for WEEE recycling					

18. How do you think that would have to be organized the training sessions in the field of eco-innovation and WEEE on the virtual hub of eco-innovation:

- Interactive training sessions
- Teaching sessions and exercises
- Examples and case studies
- Methodologies and practical applications
- Simulations and role-playing games

19. How important/useful do you think that there the features that might be offer by a virtual hub for eco-innovation in developing recycling systems of WEEE in Romania:

	Very much	Somewhat	Undecided	Not too much	Not at all
Recycling model based on ideality					
Cost-benefit analysis model for the recycling of WEEE					
Multi-criteria model for the analysis of the features of the relevant products for recycling					
Virtual library of eco-innovation					
Eco-innovation platform for training in the field of the WEEE management					
Discussion Forum					

20. The existence of a WEEE eco-innovation hub may contribute to an increased efficiency/visibility of the activities in which you are employed ?

	Very much	Somewhat	Undecided	Not too much	Not at all
The extent to which contribute					

21. Do you think that your organization would be interested to register as a user and to participate in operation of the virtual hub of eco-innovation?

- Yes
- No
- I do not know/no answer

22. How do you think you can contribute to the operation of the hub:

- by publishing articles, reviews, and comments on various topics of interest
- by dissemination of the research results in the field of WEEE recycling,
- by participating in the discussion forum,
- by posting some guides, procedures, methodologies, case studies, etc. in the virtual library of the hub

23. Which of the following categories of organizations are the best suited to host a virtual hub for eco-innovation in the WEEE recycling:

- Universities
- Research institutes
- Professional associations of operators in the field of waste management
- Collective management Organizations of WEEE
- Authorized Recyclers of WEEE
- Public authorities responsible for the management of WEEE
- Others
- I do not know/no answer