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***Virtual Automation Networks***

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Task 1.3

Trend Screening and Self evaluation

Ex-post Social Impact Assessment

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# 1. INTRODUCTION

The **Social Impact Evaluation** (SIE) aims at applying a methodology intended to shape VAN research in order to improve its Social Impact –reinforcing positive impacts and avoiding the negative ones. The evaluation of the social effects of the outputs of a Research and Technology Development (RTD) project complements the evaluation of the scientific quality of these outputs.

Basically, the **purpose** of the social impact assessment of RTD projects is threefold:

- To spread the relevance of social impact assessment as a good RTD management practice.
- To increase the awareness of RTD managers about the consequences of the products/processes generated in their projects and the importance of their socio-economic impact assessment.
- To give additional information to the project partners in order to improve the social impact related to the products/services generated in their projects.

This deliverable constitutes the **third output of T1.3 Socio-economic impact activity**, a study that was carried out during the project as a complement to RTD activities. The *Evaluation Team* is an interdisciplinary group formed up by a group of economists, sociologists and engineers linked to CARTIF technology centre.

The **scope** of the social impact assessment includes all the potential impacts that the new product/process generated by the VAN project could have in both its manufacturing, in the case of devices, and in its use, in the case of new devices, services or processes. The purpose is not to analyse the social impact of the project itself, but its outcomes.

The inclusion of social considerations in RTD projects brings diverse **benefits** to the Framework Programme Stakeholders:

- ◆ Benefits for policy-makers: policy-makers would gain efficiency on accountability, transparency and would increase trust in relation to pressure groups and society at large. SIE can help policy-makers to demonstrate to the European taxpayer that the value-for-money has been obtained.
- ◆ Benefits for programme managers: understanding the linkages between actions and effects improves the selection of future projects, while broader evidence of impacts sustains the case for public resources to continue to be invested in their particular domain.
- ◆ Benefits for participants: accountability and re-enforcing of project outputs success through assuring participation of relevant stakeholders.

The **structure of this document** is as follows: Chapter 1 introduces the rationale underlying the applied SIE methodology; Chapter 2 deals with the SIE methodology focusing on the structure and purposes of the *ex-post* phase; Chapter 3 presents an analysis of the answers given by VAN partners to every questionnaires of the all SIE process; Chapter 4 provides some recommendations in the field of the social impact derived from the accomplished assessment; And, finally, Chapter 5 gathers the main conclusions extracted from the SIE process carried out during the VAN project.

## 2. METHODOLOGY

This section gives an overview of the concept of the Social Impact and the general structure of the evaluation methodology and it also explains with detail the specific methodology used in the *ex-post assessment*.

### 2.1. The Social Impact concept

The Social Impact concept can be understood as any effect or consequence on society that can be derived from the design and development of a RTD project or its outputs (goods/services), taking into account their whole lifecycle. As a variety of social impacts may arise, the *Evaluation Team* used a classification of different kind of impact to ease their analysis. Five domains have been considered<sup>1</sup>:

- ◆ **Environmental issues.** These aspects refer to what extent the technology contributes to process and product ecodesign (energy efficiency, energy and materials saving, etc).
- ◆ **Societal issues:** Impact on end-users' quality of life & safety, social development, universal design (including handicapped integration concerns), societal relationships, etc.
- ◆ **Innovation system:** Impact on innovation system's structure (human capital, innovative actors empowerment, alternative use of the technology, etc.) and on innovation system's culture (corporate innovation culture, technology shock, etc.).
- ◆ **Employment:** Impacts on employment creation and transformation (displacement and substitution effects, human health and safety, etc.)
- ◆ **Strategic economic issues:** Impact on endogenous development, geographically balanced development and SMEs empowerment from a regional point of view.

It is necessary to bear in mind the different time-profiles over which the impacts are manifested.

### 2.2. The SIE structure

A SIE should be carried out in different moments of the project's life and, in this case three main stages have been defined: *ex-ante*, *in-itinere* and *ex-post*. Although they

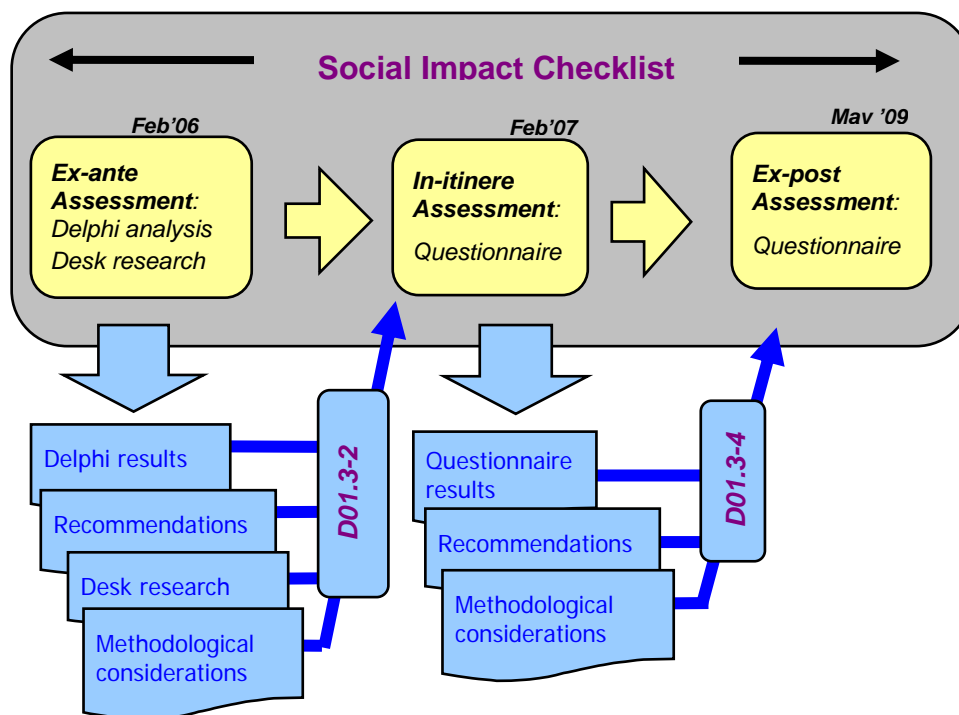
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<sup>1</sup>Some other Social Impact definitions:

- Social Impact is the study of the potential future effects of resource development on other resources and on social, economic and / or environmental conditions.  
Source: <http://www.for.gov.bc.ca/hfd/library/documents/glossary/l.htm>
- Impact Assessment (IA) in the European Commission refers to the integrated analysis of the potential economic, social and environmental impacts that could result from a decision to take or not to take action to tackle an identified policy problem.  
Source: [http://ec.europa.eu/governance/impact/index\\_en.htm](http://ec.europa.eu/governance/impact/index_en.htm)
- Social Impact is the study of analysing, monitoring and managing the intended and unintended social consequences, both positive and negative, of any planned intervention (policies, programs, plans, projects) in order to evaluate any social change invoked by those interventions.  
Source: [http://www.iaia.org/Members/Publications/Guidelines\\_Principles/ SP2.pdf](http://www.iaia.org/Members/Publications/Guidelines_Principles/ SP2.pdf)

have different approaches, there is a common backbone (Figure 1). This backbone is a Social Impact checklist divided in the five domains above mentioned that allows detecting the Social impacts of the VAN project at an early stage and, in turn, enabling to shape the project to improve its society oriented profile.

Figure 1. SIE Process



The **ex-ante SIE**, carried out in February 2006, consisted in a two step survey, which followed an approach similar to the Delphi method, and it was based on information previously gathered through a desk research. The *ex-ante* evaluation led to a report that contained the social impacts identified by partners and some recommendations that could improve the socio-economic performance of the project (see document D01.3-2, Socio-economic *ex-ante* assessment report, CARTIF)

The **in-itinere SIE**, completed in February 2007, consisted of an analysis of the answers extracted from a questionnaire that was sent to the partners; this analysis was completed with available information related to the social impact of technology. This evaluation led to a second report that undertook, among other issues:

- A review of the social impacts of the project.
- An update of the social recommendations.
- And some considerations on the inclusion/diffusion of social topics in the VAN project, and, in particular, the usefulness of the SIE. (see document D01.3-4, Socio-economic *in-itinere* assessment report, CARTIF)

The **ex-post SIE**, which motivates this deliverable, it is further explained in the following section.

## 2.3. The ex-post evaluation

The **aims of the ex-post evaluation** are the following:

- To review the set of social impacts already identified by the partners using the SI checklist.
- To identify recommendations related to the social impact previously detected.
- To identify good practices regarding the recommendations and the social impacts considered in the VAN project up to now.
- To identify good practises in the implementation of the SIE during the VAN project and recommendations for future implementations.

The **ex-post evaluation process has consisted** in a questionnaire sent to a representative of each of the organisations participating in the VAN project, as well as further work relative to the available information on the social impact of technology and technology assessment. Questionnaire outcomes and the desk research led to the *ex-post* report. Table 1 shows the main *ex-post* impact evaluation milestones.

Table 1. *Ex-post* impact evaluation milestones

Nov, 28 <sup>th</sup> 2007	A leaflet, focused on the SIE phases carried out until the moment, was prepared and sent to a representative of each of the organisations participating in VAN project. It was also published in the web site of the project.
Nov, 28 <sup>th</sup> 2007	An internal tracking template was prepared and sent to a representative of each of the organisations participating in VAN project to ease the following of the social aspect of the VAN project.
Oct, 22 <sup>nd</sup> 2008	In the meeting celebrated in Brno, the SIE process and the future steps in SIE were presented.
Dec, 22 <sup>nd</sup> 2008	<i>Ex-post</i> questionnaire was sent to VAN partners.
Feb, 28 <sup>th</sup> 2009	Deadline for the compilation of fulfilled questionnaires.
May, 27 <sup>th</sup> 2009	Deliverable completed containing conclusions about the compilation of the answers given by partners to the <i>ex-post</i> questionnaire and about the information extracted from the desk research.

The *ex-post* questionnaire was structured in four tables (templates to be fulfilled) and one question about the methodology (See annex I):

- ◆ Table 1 of the questionnaire consisted on a template of defined examples of beneficial or harmful social impacts detected from VAN partners during the course of the project. For each possible impact some information was required:
  - Impact effects as the impacts can be positive or negative.
  - Time status as impacts are expected to have already happened or would occur in the future.
  - Type of response, in order to learn about the kind of response given to the identification of a SI. This response could be of different kind: the impact was only identified; the impact was used to inform other partners; the impact was used to formulate a recommendation; and the impact was used to implement a measure.
  - Information about reference and context, in order to gather some information about the activities that have served to identify the social

impact and, if possible, to compile any references or document to track social impact in the project.

- ◆ Table 2 gathers information about recommendations, in the case that this might have been formulated. This table is linked to the first one as recommendations are associated with the identified social impacts.
- ◆ Table 3 gathers information about measures in case of having been implemented. This table is linked with the previous one as measures are considered as the way to put into practice the recommendations.
- ◆ Table 4 gathers information about the activities connected with the Social Impact of the VAN project and the usage and diffusion of the SIE methodology.
- ◆ Question 1 tries to get recommendations for improving the SIE, based on the experience of the partners in the Social Impact Evaluation of the VAN project.

Table below represents the different parts of the *ex-post* questionnaire and the pursued objectives of the *ex-post* evaluation.

Table 2. Ex-post questions and pursued objectives

Objective	Questions
To review the set of social impacts	Table 1
To identify recommendations related to the social impact	Table 2
To identify good practices regarding the recommendations and the social impacts	Table 3
To identify good practises in the implementation of the SIE during the VAN project and recommendations for future implementations	Table 4 and question 1

All VAN partners were expected to contribute to this impact assessment activity in order to obtain a wider view of the possible socio-economic dimension of this project.

## 3. ANALYSIS

The analysis of the information gathered throughout the questionnaire is organised in two sections. A first section is about the social impact identification and the activities related to the social impact evaluation carried out by VAN partners and a second section is about gathered recommendations and measures. In both cases, the *ex-post* evaluation is a final step in a procedure that was started with the *ex-ante* evaluation.

### 3.1. Identified social impacts of VAN

Throughout all the SIE process, the identification of social impact has been a main activity as it becomes the starting point of reactions of partners. In the *ex-post* evaluation, a revision of the social impact list was carried out. In this case, the surveyed were asked to choose between the following non-exclusive alternatives related to the social impact: only identified, inform other partners, recommendation formulated or measure implemented.

Table summaries this identification for the *ex-post*, *ex-ante* (Feb 2006) and *in-itinere* (Feb 2007) evaluation. The number of respondents varies among the SIE phases, so the conclusions derived from the comparison among phases have to be done with caution, especially as heterogeneity among partners is quite important. Some ideas that can be extracted are the following:

- The detection of impacts varies between phases. This can be due to a change of mind of the person in charge of the SIE of the different VAN partners as knowledge about the VAN output is clearer and uncertainty reduced. Besides of a better understanding of the SIE process. It also can be justified, as already said, by the difference in the number of respondents to the different questionnaires. These number were 10 for the *ex-ante* evaluation, 12 for the *in-itinere* and 8 for the *ex-post*). Examples of the changes are: *safety and health at work* or *innovative actors' empowerment*, which increase their presence; or *Alternative or additional use of the technology* or *inclusion*, which decrease their presence.
- In the three phases, the more frequently factor pointed out by the partners has been *R&D resources within system of innovation* domain.
- Some factors received little attention during all the SIE process; this is the case, for example, of *technology shock* in *system of innovation* domain or *sectors not directly involved in VAN* within *economic issues* domain.

#### 3.1.1. Description of social impacts by SI domains

Along with the detection of social impacts, VAN partners give examples to illustrate these impacts. In this section, the description of the social impacts is gathered by the five domains used in the social impact checklist: environmental issues, system of innovation, societal issues, economic issues, employment (see annex 2).

The great majority of social impacts are positive; that means that they are beneficial and increase the value of the project for society. In some cases, the direction can be positive and negative, as in creation and destruction of jobs, but, as it is shown below, it seems that positive issues outweigh the negative ones.

Table 3. Social impact detected by SIE phase  
(percentage of surveyed VAN partners that mention an impact by SIE phase)<sup>1</sup>

		Ex-ante (%)	In-itinere (%)	Ex-post (%)
Environmental issues	01.1 Environmental regulation (manufacturer)	35,1	33,3	0,0
	01.2 Environmental regulation (end-user)	35,1	8,3	0,0
	02.1. Energy saving of manufacturers	35,1	33,3	50,0
	02.2. Energy saving of end-users	35,1	33,3	50,0
	03. Renewable energy	35,1	33,3	25,0
	04.1 Raw materials consumption (manufacturer)	52,6	16,7	25,0
	04.2 Raw materials consumption (end-user)	35,1	25,0	37,5
	05. VAN products end-of-life	52,6	25,0	0,0
System of innovation	06. Resources	87,7	91,7	75,0
	07. Innovative actors empowerment	0,0	91,7	87,5
	08. Technology shock	0,0	25,0	0,0
	09. Knowledge diffusion	52,6	91,7	75,0
	10. Interdisciplinary	17,5	50,0	12,5
	11. Alternative or additional use of the technology	52,6	0,0	0,0
	12. Public understanding of S&T	0,0	58,3	25,0
Societal issues	13. Public participation	17,5	83,3	25,0
	14. Conflicts related to social values	17,5	33,3	12,5
Economic issues	15. Co-operation	17,5	66,7	50,0
	16. SMEs innovation process	70,2	66,7	0,0
	17. Sectors not directly involved in VAN	17,5	16,7	0,0
	18. Regional cohesion	17,5	25,0	0,0
Employment	19. Jobs creation / destruction	70,2	41,7	37,5
	20. Jobs loss	17,5	16,7	25,0
	21. New skills and competence	70,2	58,3	37,5
	22. Employment substitution	17,5	41,7	0,0
	23. Employment displacement	17,5	16,7	50,0
	24. Enterprise Creation	70,2	16,7	12,5
	25. Inclusion	35,1	16,7	0,0
	26. Safety and health at work	0,0	66,7	37,5
	27. Employee's trust	17,5	50,0	12,5

<sup>1</sup> The number of total partner that answer varies between phases

### 3.1.1.1. Environmental domain

In this category, up to 5 fields can be identified (environmental regulation, energy saving, renewable energy, raw material consumption and product end-of-life). The description of social impacts is focused on energy saving issues and, in a smaller extent, to raw materials consumption. The following list gathers examples given by partners:

- The saving of fuel due to remote monitoring and maintenance of devices in use, as the end-user will be able to configure and maintain the physically distributed devices independently from its location. Besides, there will be also saving on other travelling expenses.
- The extent of failures/disasters can be reduced by a fast access to components.
- Throughout the definition of VAN device profiles and three conformance classes for each of them it is possible to optimise the energy consumption of the VAN solutions.
- In general, VAN fosters cost efficient production which also embraces energy savings at a remarkable degree. The optimisation of energy consumption can come, for example, from:
  - The co-ordination between suppliers and manufacturers.
  - A more flexible manufacturing system that can be synchronized over LANs and WANs that may lead to reduction of energy consumption due to reduction of downtimes.
  - The interoperability of VAN devices provides high possibilities in monitoring and configuration of complex manufacturing systems. This technology can be used to optimise the energy consumption.
  - As VAN devices itself is technology independent, end-users can choose optimised hardware from the energy point of view.
  - The use of IEEE 802.1e standard for fast roaming functionality within VAN Wi-Fi devices enable energy saving for end-users.
- The increase in the number of remote installations, like windmills, bio power station or other kind of distributed renewable energies production plants, which are controlled centrally and effectively. VAN will promote safe/secure remote control through WAN in these cases.
- The design of new products of renewable energy systems that can be easily integrated into the grid because of the usage of an open communication infrastructure as is the case of VAN communication.
- The improvement in the efficiency of production processes due to reduction of deficient products thanks to the VAN approach and, hence, some raw material is going to be saved and safe the effort of recycling waste material.
- The optimisation of consumption of material can come also through:
  - The co-ordination between suppliers and manufacturers thanks VAN devices, for example with the reduction of stocks.
  - The seamless integration of wireless technologies in VAN-based networks reduces the amount of wires tended in a plant. Besides the installation of machinery will be simpler.
  - The use of components of the shelf (COSTS) can be a source of reduction of raw material consumption.

- The easier reuse of components since office compatible (cable, network, components).

### 3.1.1.2. Systems of innovation domain

In this category, up to 7 fields can be identified (R&D resources, empowerment, technology shocks, knowledge diffusion, interdisciplinary, additional use of technology and public understanding of S&T). The description of social impacts is focused on R&D resources, empowerment and knowledge diffusion issues and, in a smaller extent, on additional use of technology. The following list gathers examples given by partners:

- The development of VAN activities will increase amount of physical and human resources devoted to this field of research on the long term. A specific field will be the remote maintenance. This positive effect of the VAN project is in line with the traditional relevance of automation and industrial communication in the economic growth of industrialised countries, and with the existing trend of increasing support to automation science and practice, as is shown by research programmes (ARTEMIS in the European Union) and the evolution of industry.
- Co-operation underpins the VAN project due its nature. The project has enforced collaboration and discussion among all partners and for some of them the technology areas to do the research work were new. As a consequence it is perceived the possibility of permanent co-operation among VAN partners beyond the project. This co-operation can go further reaching non-VAN actors and, also, looking for the technology transfer to non-partner SMEs. As part of this process, communications and protocols have been tested and established among partners and this knowledge can be extended to possible partners.
- Due to the nature of the project, result diffusion is an already recognised objective of the VAN project and there is an active and common dissemination strategy of the VAN partners. This diffusion covers different kind of interested actors, which would be easier due to the diverse nature of partners (university and industry):
  - The results of new solutions can be integrated into current lectures.
  - Diffusion of the project results to the European automation industry, as major participants of this industry will gain new knowledge for potential upcoming products from VAN.
  - European Competence Group.
- Interdisciplinary has been tackled with the increase of the co-operation of automation, production, communication and information technology disciplines. It has been detected a possible new careers with interdisciplinary skills, but focused in integration of industrial communications.
- As project has linked the industrial and the office world, an easier exchange of technical knowledge is open.
- Alternative or additional use of the technology can appear in logistics, building control, house security or communication technologies, in general. No particular, specific real-time requirements of inter-LAN and WAN communication support development of novel QoS and redundancy solutions that may be utilized by non-industrial applications too.

### 3.1.1.3. Societal domain

In this category, up to 2 fields can be identified (public participation and conflicts related to social values). Only some conflicts have been addressed, referring to wireless technology and its health impact

#### 3.1.1.4. Economic domain

In this category, up to 4 fields can be identified (co-operation in the value chain, SMEs, sectors not directly involved in VAN and regional cohesion). The description of social impacts is focused on co-operation in the value chain and SMEs. The following list gathers examples given by partners:

- The creation of European companies alliances to promote open industrial communications.
- The philosophy behind VAN is to involve vendors, system integrators and end-user in this network to reduce effort and to react fast if an automation application does not work well. A close cooperation of all participants is necessary.
- Standardised products are highly beneficial for SMEs.
- SMEs – both manufactures and end users – will be addressed via the consortia PNO, IAONA and Interbus Club and the new VAN users group. These consortia provide the means to ensure technology transfer to SMEs.
- At least sectors as machine tool users, like moulds & dies, automobile and aerospace industry will find that VAN outputs fulfil some of their industrial needs.
- Improvement of the competitiveness and efficiency of the SMEs, as it can happen in the case of the bio power stations.
- As the time frame for implementation of such kind of networks/services will be shorter, and engineering, commissioning, maintenance will require less time expenditure, the adoption of innovative technologies will be easier to any kind of firms.

#### 3.1.1.5. Employment domain

The employment category is quite broad and up to 9 fields can be identified (job loss/creation, loss of unpleasant jobs, new skills and competence, employment substitution and displacement, enterprise creation, inclusion, safety and health and employee's trust). The description of social impacts is focused on job loss/creation, new skills and competences, loss of unpleasant job and safety and health and, in a smaller extent, to additional use of technology and employee's trust and employment displacement. The following list gathers examples given by partners:

- The quantitative effects on employment at the enterprise level go on opposite directions. On one hand, the destruction of jobs is possible as the introduction of VAN technology will make unnecessary some current job positions at the shop floor. In any case, these positions probably will in a possible harmful environment of the manufacturing level. In general, VAN technologies development might lead to a better utilisation of human resources reducing not automated activities.
- It has to be mentioned that part of this destruction comes from substitution of jobs as control jobs go out of the production site. In general, VAN outputs facilitate the globalisation and deallocation of Industry processes. This might happen mainly in the manufacturing sector and in a least extent in other sectors such as energy.
- On the other hand, sources of new jobs are identified:
  - In line with the increase of resource devoted to the field of R&D related to VAN is probable the job creation in research units.
  - As a consequence of improvement in the competitiveness of end-users there can be more need of sale forces.

- New solutions in handling of devices and communication networks including all phases of a life cycle will require qualified personnel. Therefore new positions should be created which are up to now not considered.
- The globalisation of maintenance employees (teleworking) can create new job profiles. In general, human resources devoted to remote maintenance will increase.
- Besides the personnel will need to upgrade their knowledge and competence as the implementation of telecommunication and advanced office networks into industrial floor forces them to get involved with peculiarities of this field. This is important as the European Union lacks qualified personnel in automation.
- In general, continuing education is necessary as the vertical integration of communication and the merging of office technologies into industrial communication require from the user a deeper understanding of communication.
- At the market level, opportunities to create enterprises emerge in service business activities, especially in the field of VAN solution provides, system integrators or public communication providers specialised in industrial communications.
- Examples of safety and health are:
  - The distributed control architecture of VAN can improve quality of control and thus might reduce stress and physical harm risks.
  - Through research in safety applications in heterogeneous networks the safety at work will probably improve.
  - VAN increases possibilities for telecontrol and monitoring harmful environments can be avoided
- Finally, also a negative impact has been described a reduction of the employee's trust associated to the increase of complexity and the loss of personal involvement in controlling the plan.

### 3.2. Some recommendations and measures

One of the outputs of the SIE is the development of recommendations and the implementation of measures related to the identified social impacts. The work done has been focused basically on recommendations and smaller activity has been conducted in the implementation of specific measures linked to social impacts.

Recommendations can have a different role in the diverse phases of the evaluation, in line with the evaluation itself. In the *ex-post* phase, bearing in mind that the project is in its final year and the R&D activities are basically accomplished, the aims of the recommendations are:

- ◆ A revision of the recommendations developed during the project life to help to shape the social impacts of the project.
- ◆ Recommendations with a future approach that can be addressed to diverse kind of stakeholders (policy-makers, end-users, VAN researchers, other researchers).

Taking into account the work previously done (DO-1.3.2 and DO-1.3.4), and the *ex-post* evaluation carried out, the analysis of the recommendations has classified them into two blocks:

- ◆ **Practical recommendations**, gathering those related to the VAN project. In general, practical recommendations could be divided using two criteria: the kind

of actor addressed (VAN partners vs. other actors) and the time frame to apply the recommendation (within the VAN project vs. after VAN), the result being four types of recommendations, as Table 5 shows.

Table 4. Classification of recommendations depending of actors and time frame

	VAN partners	Other actors
Within VAN	Recommendations that try to modify the R&D activities of the VAN project in order to shape the VAN outputs	Recommendations that involve third parties on the shaping of the outputs of the VAN project
After VAN	Recommendations that try to guide partners in their future R&D activities on VAN field.	Recommendations that try to improve the social impact in the usage of VAN outputs. Recommendations that lead the way for future R&D activities on VAN field.

- ◆ **Overall recommendations** that are related to elements that can be useful to increase the social impact of future projects. These recommendations can be transferred to other Social Impact Evaluations, regardless the characteristics of a particular technology.

In relation with specific **measures**, the established dissemination of a plan defined in the DOW of the project can be seen as a measure implemented to ensure the knowledge diffusion. In a similar way, it has been planned to transfer specific parts of VAN results into user groups such as PNO or Interbus Club. Such consortia provide starting point of technology transfers to SMEs. Besides, the work carried out in the VAN project has justified the increase of R&D efforts of at least one partner and has allowed to increase the amount of publications and the presence in R&D events.

### 3.2.1. Practical recommendations

Practical recommendations are the set of ideas proposed by VAN partners in order to change the social impact of the projects. They are connected with the identification of social impact, as they try to foster positive impacts or reduce negative ones.

During the whole SIE process, recommendations have been included at all moment. At the beginning of the project, during the *ex-ante* evaluation (February 2006), the partners had the opportunity to propose recommendations associated with the identification of social impacts of the VAN project. In the *in-itinere* evaluation (February 2007), they were given the possibility of adding new recommendations. Finally, in the *ex-post* evaluation (February 2009), a revision of the work related to the SIE has been done and partners had the opportunity of adding or modifying recommendations in view of the development of the VAN project and, also, of their better knowledge of the social impact issues.

The nature of the recommendations is diverse, belonging to one of the five domains identified (environment, system of innovation, society, economy and employment), although the most numerous are those related to environmental and system of innovation issues.

As different partners have identified different social impacts, the recommendations are not always applicable to the totality of the project, being just of interest for a specific part of it. This is justified by the division of tasks within the project.

As the social impacts have two directions: positive (beneficial) and negative (harmful), the recommendations also can have two directions: to foster positive effects or to reduce negative ones.

During the *ex-post* phase the partners have given the following recommendations:

- To use proper conformance class for VAN devices based on application needs [Environmental issues, 02 energy saving].
- To use IEEE 802.11e standard for all VAN Wi-Fi devices [Environmental issues, 02 energy saving].
- To replace wired communication systems (cables, TAPs, gateways) by wireless communication means [Environmental issues, 04 raw materials consumption].
- To extend scope of R&D activities on wireless activities [System of innovation, 06 resources].
- To extend scope of R&D activities on system software interfaces to exchange configuration data [System of innovation, 06 resources].
- To identify possible ways for a permanent cooperation among partners (I\*PROMS network of excellence) [System of innovation, 07 innovative actors empowerment].
- To reinforce the links among VAN partners to foster a permanent co-operation and empowerment [System of innovation, 07 innovative actors empowerment].
- To reinforce the links with other partners to foster a permanent co-operation and empowerment [System of innovation, 07 innovative actors empowerment].
- To put a stronger focus on the dissemination phase and foster knowledge diffusion, considering users and end-users; academia and RTD organisations. [System of innovation, 09 knowledge diffusion].
- To point out the possibilities of cooperation among the tools to handle a complete VAN. For this a deeper understanding of communication technologies is necessary especially in finding ways to transfer information from one to another tool. [Employment, 21 new skill and competence].

Some of these ideas were already presented in previous phases. In the *ex-ante* phase, the following recommendations were gathered:

- The integration of low-power devices —i.e. wireless ZigBee modules. In addition to the reduction of consumption, low-power devices support the use of renewable energies —i.e. solar cells. [Environmental issues, 02 energy saving and 03 renewable energies].
- The use of Standard Components off the shelf (COTS) as Network Interface Cards can reduce slightly effort and material consumption compared to development and production of several proprietary solutions [Environmental issues, 04 raw material consumption].
- The focus of VAN on wireless solutions that will lead to a reduction of raw materials consumption [Environmental issues, 04 raw material consumption].
- To explore the applications of VAN technologies in electrical distribution systems for it helps a more efficient use of energy in society (see below "Innovation System") [Environmental issues, 02 energy saving].
- To apply when possible the principles of the environmental compatible product in design [Evaluation Team] [Environmental issues in general].

- A stronger focus on the dissemination phase. Issues to be taken into account to maximize the benefits of knowledge diffusion: Focus on events with VAN technology users and end-user; Consider also academia and RTD organisations as it foster further research that will lead to more resources mobilised in VAN field; Proper draft of the dissemination papers [System of innovation, 09 knowledge diffusion]
- To find creative ways to reach SMEs —not necessary addressing them directly, but via the existing users groups: PNO, IAONA, Interbus club— in order to empower SMEs [system of innovation, 16 SMEs innovation process].
- To reinforce the links among VAN partners to foster a permanent co-operation and empowerment [system of innovation, 15 co-operation].
- To invest time and resources to look for alternative or additional uses of technology, since this paves the way to create new applications of interest for a broader audience —i.e. building control or house security; logistics; communication technology in general [Evaluation Team]. Some partners noticed, however, that this could divert resources from VAN main objectives. [system of innovation, 11 additional use of the technology].
- To monitor the eventual appearance of conflicts related to social values — security vs. privacy, human-health impacts related to electromagnetic fields— that may arise in the course of the project and to inform properly relevant stakeholders [Evaluation Team]. Some partners pointed out the special relevance of the impact of the electromagnetic fields on health [societal issues, 14 conflict related to social values].
- To take into account in the course of the project the specific needs of SMEs — as they have particular difficulties for innovate— so they can benefit from VAN products [Economic issues, 16 SMEs innovation process].
- To provide tailored training for the current shop floor employees in order to guarantee that they can operate VAN products and avoid a job loss. This training will also provide new skills and competences and prevent a negative technology shock —i.e. employees rejection of VAN products [Employment issues, 21 new skills and competences].
- To create an awareness campaign among the end-user's employees, in order to describe the nature of the process innovation derived from VAN products implementation. This will support the employee's trust in the process and prevent negative attitude towards VAN products [Evaluation Team] [Employment issues, 27 employee's trust].

In the *in-itinere* phase, some specific recommendations and general ideas were exposed by partners:

- Inclusion of radio frequency transmitter power level parameter to attributes of a VAN wireless device to reduce its energy consumption, which can lead to using of renewable energy sources. [Environmental issues, 02 energy saving and 03 renewable energies].
- To use the VAN knowledge in the field of bio power stations [system of innovation, 11 additional use of the technology]. This could improve the competitiveness and efficiency of SMEs, which are common in this sector.
- To transfer specific parts of VAN results into users groups such as PNO or Interbus Club [System of innovation, 09 knowledge diffusion]. Such consortia provide a starting point of technology transfer to SMEs [Economic issues, 16

SMEs innovation process]. Contacts have been made and PNO's representatives seem to be open for input/extensions of standards.

- In the expected future adoption of VAN products/results, all kind of end-users requirements have to be considered, not only technical ones. [Economic issues, 16 SMEs innovation process & Economic issues, 16 sectors not directly involved in the VAN].

### 3.2.2. Overall recommendations

The work carried out during the VAN project allows to identify general recommendations in order to increase the social impact of an R&D project. These recommendations are applicable to any project dealing with different technologies and they mainly come from the desk research done by the Evaluation Team.

Besides, recommendations to improve the SIE methodology, as a tool oriented to introduce the social impact issues on R&D projects, can be considered. These latter recommendations come basically from the experience held during the VAN SIE by the VAN partners and the Evaluation Team.

Some general ideas to bear in mind in order to improve the social impact of a technological project are:

- To use foresight techniques to foresee and take into account unexpected consequences in order to minimise the negative ones and to take advantage of the positive ones.
- To follow the precaution principle avoiding alternatives carrying risks of generating non-desirable consequences, even when the probability of happening is low.
- To avoid leaving out social impacts which are not significant on a small scale, as they could become significant on a large scale. (i.e. the power consumption of a single device is not relevant while the consumption of several thousands is relevant).
- To avoid leaving out social impacts that can appear only in the long term. In general, it is advisable to bear in mind the different time span of the different impacts.
- As some social impacts are not always easy to foresee, it is advisable to allow the participation of other actors or stakeholders. This is not always possible as the information of projects can be confidential.
- In case of not being possible to eliminate a potential negative impacts, it is advisable to provide information and to assure the adequate management of the risk in order to facilitate competent private and public organisations to take over the preventive and palliative actions.

The recommendations oriented to improve the SIE methodology are the following:

- To increase the awareness about the social impact of the research activities among researchers. This can be achieved by different ways:
  - To improve the SIE diffusion among all the researchers involved in the project, not only the person in charge of the SIE but to all researchers, which could participate by means of the responsible person of their organisations.
  - To ensure an adequate communication between partners once potential social impacts have been visualised.

- To use regular meetings or meeting “on demand” if necessary to enable diffusion of social impact and SIE.
- To start working with the SIE almost immediately in the life of the projects, in order to enable: the early identification of social impacts; the development of useful recommendations to shape de social impact of the project by partners, and the co-ordination of a common to work in the field of the social impacts of the project.
- To keep in mind the Social Impact checklist during all stages of the analysis and design phases as an additional reference for decision making.
- If the project is carried out by several partners, it is necessary to co-ordinate and organise a common agenda of: identified social impacts, formulated recommendations and measures to be implemented, although in some cases some social impacts can affect only a part of the project and, hence, only some of the partners.

## 4. SUMMARY OF CONCLUSIONS

Through the introduction of the SIE in the VAN project, the objective intended was to increase the social profile of a R&D project, that can be beneficial both for participants and the whole society.

In order to achieve this aim, several steps were implemented in different moments of the project. This deliverable includes the results of the *ex-post* evaluation and a general revision of the work done so far in the field of the social impacts of the VAN project.

The *ex-post* evaluation, being carried out in the final year of the VAN project (Dec 2008 – May 2009), is the third phase of the SIE process. Previously, an *ex-ante* evaluation was performed in the first year of the project allowing to: a) identify social impacts and try to get some consensus through a two steps survey and; b) formulate some recommendations addressed to the identified impacts. It generated the deliverable D01.3-2 (Socio-economic *ex-ante* evaluation report).

Also subsequently, an *in-itinere* evaluation was performed during the second year of the project, during which: a) the diffusion and usage and usefulness of the SI issues and the SIE methodology among partners were addressed; b) the social impact identification was revised; and c) recommendations were analysed about their viability. A deliverable was produced D01.3-4 (Socio-economic *in-itinere* evaluation report).

Finally, the objectives of the *ex-post* evaluation were to: review the set of social impacts; identify recommendations and good practices related to social impact issues during the project; and to formulate recommendations for future implementations of the SIE methodology. To ease the analysis of the partners an internal tracking of the social impacts and associated recommendations, measures and actions was prepared in November 2007.

As a result of the work carried out by VAN partners and CARTIF, as a responsible body, some possible social impacts of the project have been identified. Due to the differences among partners and their tasks in this big project, there is not a consensus in their answers. The majority of them were beneficial and were concentrated in the environmental and innovations system domain. Nevertheless, all of the fields of social impact have been assigned by at least one partner.

In turn, several recommendations have been formulated. As some of them had been explicitly gathered in previous deliverables, they can have been taken into consideration by VAN researchers, although there has not been a formal agreement or an agenda to implement these recommendations.

Besides, several partners had carried out activities related to social issues within their organisations, either in VAN or in other projects, and also pushing forward to other organisations.

### Guidelines for the *ex-post* Impact Assessment of the VAN project

<b>WHAT is the aim of the questionnaire?</b>	<p>This questionnaire is part of the final phase of the VAN Social Impact Evaluation (<i>ex-post</i> assessment, Task 1.3).</p> <p>During this phase, VAN partners will be asked to provide information on identified social impacts of the VAN project and related actions to them (recommendations formulated, measures implemented,,,) and also to provide information on the activities linked to the Social Impact Evaluation carried out during the project.</p> <p>Conclusions will be held in a report (D01.3-6, Socio-economic <i>ex-post</i> report, CARTIF), gathering: the social impacts of the VAN project; the activities oriented to shape the VAN research to foster the VAN societal performance; and some considerations on the social impact evaluation.</p>
<b>WHO should contribute?</b>	<p>All partners are expected to appoint a contact person for impact assessment activities. He/she should fill in this questionnaire by themselves or by someone else in their organisation. The person in charge must have a general knowledge of the background and the rationale of the project and the VAN activities, although it might not be an expert on the socio-economic dimension of the VAN project.</p>
<b>HOW do you have to fill in this questionnaire?</b>	<p>The responsible person has to fill in the yellow areas of the table 1, 2, 3 and 4, taking into consideration the list of potential social impacts and the activities of his organisation in the VAN project.</p> <p style="padding-left: 40px;">Table 1. Social impact identification. Table 2. Recommendations. Table 3. Measures. Table 4. Other activities.</p> <p>If the organisation has used the internal tracking "<u><a href="#">VAN template for preparing expost SIE.xls</a></u>" sent by email also on the 20th of July 2007. You may copy/paste in this questionnaire some of the columns of the tables that they have already been filled in and in addition please answer the Recommendation Question at the end of the questionnaire.</p>
<b>Deadline</b>	<p>The deadline for the compilation of fulfilled questionnaires will be <b>February 28th 2009</b>.</p> <p>Filled questionnaires must be sent back to <b>Ainhoa González</b>. Both e-mail (<b><a href="mailto:aingon@cartif.es">aingon@cartif.es</a></b>) and fax (+34 983 546 521) are welcomed.</p>

## Task 1.3. Ex-post Impact Assessment

**Table 1. Identification of social impacts (SI)**

Bearing in mind the different social impacts that can be derived from a R&D & innovation Project (See attached list in the annex), please fill in the table 1. Also the deliverables D1.3.2. and D1.3.4 can be useful.

[If you have filled in the internal tracking use the columns 2 to 5 and 7 to 9 from table 1 of the Internal Tracking]

	Type of impacts	Description	Impact effect	Time status	Type of response	Reference	Context and procedure
#	Choose from the Social Impact Checklist the type of the identified SI (See Annex 1)	Describe the Social Impact (SI) identified	Inform if the identified SI has a beneficial or a harmful effect	Inform if the identified SI has already happened or if it will probably occur in the future	Inform about the response given to the identification of the SI (multiple answer is possible)	If possible, provide a reference or document to track SI identification	Describe the activities that have served to identify the SI (responsible thinking, a meeting within the organization or with other partners, suggestion of a researcher, document reading)
1			<input type="checkbox"/> Positive (beneficial) <input type="checkbox"/> Negative (harmful)	<input type="checkbox"/> Has happened <input type="checkbox"/> Still to happen, low probability <input type="checkbox"/> Still to happen, medium probability <input type="checkbox"/> Still to happen, high probability	<input type="checkbox"/> Only identified <input type="checkbox"/> Inform other partners <input type="checkbox"/> Recommendation formulated (go table 2) <input type="checkbox"/> Measure implemented (go table 3)		
2			<input type="checkbox"/> Positive (beneficial) <input type="checkbox"/> Negative (harmful)	<input type="checkbox"/> Has happened <input type="checkbox"/> Still to happen, low probability <input type="checkbox"/> Still to happen, medium probability <input type="checkbox"/> Still to happen, high probability	<input type="checkbox"/> Only identified <input type="checkbox"/> Inform other partners <input type="checkbox"/> Recommendation formulated (go table 2) <input type="checkbox"/> Measure implemented (go table 3)		
3			<input type="checkbox"/> Positive (beneficial) <input type="checkbox"/> Negative (harmful)	<input type="checkbox"/> Has happened <input type="checkbox"/> Still to happen, low probability <input type="checkbox"/> Still to happen, medium probability <input type="checkbox"/> Still to happen, high probability	<input type="checkbox"/> Only identified <input type="checkbox"/> Inform other partners <input type="checkbox"/> Recommendation formulated (go table 2) <input type="checkbox"/> Measure implemented (go table 3)		

(Add new rows if necessary)

## Task 1.3. Ex-post Impact Assessment

**Table 2. Recommendations formulated**

If you have identified a social impact and have responded to it with a recommendations (see Table 1/Column 6) please fill in a row in this table.

[If you have filled in the internal tracking use the columns 2 to 6 from table 2 of the Internal Tracking]

#	Description	Related Social Impacts	Time status	Reference	Context and procedure
	Describe the recommendations related to the identified social impacts	Refer to the related social impact/s using the Social Impact Checklist (up to two topic can be chosen from the Annex 1)	Inform if the recommendation is to be put in practice during the VAN project time frame or after its conclusion	If possible, provide a reference or document to track the recommendation	Describe the activities that have served to generate the recommendation (responsible thinking, a meeting within the organization or with other partners, suggestion of a researcher, document reading)
1		1) 2)	<input type="checkbox"/> Within VAN <input type="checkbox"/> Alter VAN		
2		1) 2)	<input type="checkbox"/> Within VAN <input type="checkbox"/> Alter VAN		
3		1) 2)	<input type="checkbox"/> Within VAN <input type="checkbox"/> After VAN		
4		1) 2)	<input type="checkbox"/> Within VAN <input type="checkbox"/> Alter VAN		

(Add new rows if necessary)

## Task 1.3. Ex-post Impact Assessment

**Table 3. Measures implemented**

If you have identified a social impact and you have responded to it with the implementation of a measure (see Table 1/Column 6) please fill in a row in this table.

[If you have filled in the internal tracking use the columns 2 to 5 from table 3 of the Internal Tracking].

#	Description	Related Social Impacts	Reference	Context and procedure
	Describe the measure implemented (for example, the inclusion of a specific criteria)	If possible, refer to the related social impact/s using the Social Impact Checklist (up to two topic can be chosen from the Annex 1)	If possible, provide a reference or document to track the action	Describe the activities that have served to generate the implemented measure (responsible thinking, a meeting within the organization or with other partners, suggestion of a researcher, document reading)
1		1) 2)		
2		1) 2)		
3		1) 2)		
4		1) 2)		

(Add new rows if necessary)

### Task 1.3. Ex-post Impact Assessment

**Table 4. Other activities/actions related to the Social Impact of VAN project or the Social Impact Evaluation (SIE) methodology**

If you have carried out other activities related to the use and diffuse of the Social Impact of the VAN project or the SIE methodology please fill in a row in this table.

[If you have filled in the internal tracking use the columns 2 to 3 from table 4 of the Internal Tracking].

#	Description	Reference
	Describe other activities that have served to use or diffuse of the Social Impact of the VAN project or the SIE methodology (the activities related to social impact identification, formulation of recommendations and to measures implementation should not be duplicated)	If possible, provide a reference to track the activity
1		
2		
3		
4		

(Add new rows if necessary)



### Task 1.3. *Ex-post* Impact Assessment

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Recommendation Question	Taking into account the experience of your organisation in the Social Impact Evaluation of the VAN project and the relevance of the social criteria of the EU R&D Agenda. Could you give us any recommendation for improving the SIE in future projects?
1	

(Add new rows if necessary)

Many thanks for your cooperation

### Annex 2. Potential social impacts of VAN project

Field	Name	Impact on...
Environmental issues	1.Environmental regulation	the fulfilment of manufacturers' corporate environmental policies
		the fulfilment of environmental policies for project-products end-users
	2.Energy saving	the manufacturers' energy consumption
		the energy consumption of project-products end-users
	3.Renewable energy	the design of project-products due to the integration of renewable energies
4.Raw materials consumption	the manufacturers' raw materials consumption	
	the raw materials consumption of project-products end-users	
5.VAN products end-of-life	the end-of-life phase of the project-products	
System of innovation	6.Resources	the amount of physical and human resources devoted to this field of research on the long term
	7. Innovative actors empowerment	the cohesion and established mechanisms of the innovation system (e.g. fostering a permanent co-operation among the involved partners, enhancing technology transfer to non-partners SMEs, supporting the development of policies and regulations of the sector)
	8. Technology shock	the end-user's industrial process (i.e. hard-to-handle shocks within the organisational innovation culture)
	9. Knowledge diffusion	the European Automation Industry as a whole once the project is completed due to the planned dissemination activities
	10. Interdisciplinary	the consolidation or creation of a truly interdisciplinary research line
	11. Alternative or additional use of the technology	usefulness of the generated knowledge of the project or of the project-products in other scope (i.e. other use apart from the objective of the project).
12. Public understanding of S&T	the public understanding of industrial communications due to dissemination outcomes	
Societal issues	13. Public participation	the number of groups of stakeholders that take part in the decision-making process
	14. Conflicts related to social values	any current ICT-Society social controversies (i.e. conflict related to: security vs. privacy, human-health and electromagnetic fields, human-computer and/or human-human technology-mediated interaction)
	15. Co-operation	the co-operation among organisations along the value chain (i.e. enhancing the communications among the end-users and their suppliers/customers)
Economic issues	16. SMEs innovation process	the possibility of SME to introduce project-products into their manufacturing processes, bearing in mind the SMEs' specific difficulties for innovating
	17. Sectors not directly involved in VAN	the fulfilment of needs of industrial sectors not represented in project consortium by project-products (regardless their technological level)
	18. Regional cohesion	the European Union less developed regions due to planned efforts on project diffusion in terms of products and knowledge
Employment	19. Jobs creation / destruction	the creation or destruction of jobs within the end-users organisations
	20. Jobs loss	the job destruction of unhealthy, dangerous and / or physical demanding jobs
	21. New skills and competence	skills and competence required to end-users' employees
	22. Employment substitution	the substitution of employees within the end-users' organisations (i.e. job substitution of high-qualified unemployed person finds a job related to project technologies at the expense of a low-qualified employed person)
	23. Employment displacement	the generation of geographical job displacement effect (i.e. new jobs are created at the expense of jobs lost elsewhere)
	24. Enterprise creation	the creation of new enterprises to exploit project outcomes
	25. Inclusion	the inclusion/exclusion of employees (i.e. project-products help end-users to shape job sites — decreasing the physical requirements— in order to recruit people traditionally left out of those jobs.
	26. Safety and health at work	safety and health at work (i.e. through the working sites ergonomics improvement or the reduction of stress or physical harm risks)
	27. Employee's trust	how employees trust the manufacturing process to operate properly, as a result of VAN products adoption