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REPORT

« Eco-Responsible Development and ICT (DE TIC) »

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	5
LIST OF THE RECOMMENDATIONS.....	7
1. Introduction.....	11
GENERAL THEMES.....	13
2. Research and Innovation	13
3. Benchmarks: measurement and standardization	15
4. The usages.....	17
4.1. Professional Usages	17
4.2. Consumer use and consumer and user information.....	18
5. Training	21
6. Have an exemplary behaviour at level of the State and local governments.....	23
WORKING GROUPS SPECIFIC THEMES	25
7. Promote the development and use of new components	25
8. Encourage the installation of data centres in France with three goals of sustainable development, competitiveness of France and Land Planning.....	27
9. Thinking about data centres of the future (Data centre 2020).....	29
10. Promoting teleworking in a dual ecological and land planning purpose.....	31
11. In the area construction industry, optimize the design	33
12. In the construction sector, control the use of electricity.....	35
13. Optimize transportation and logistics	37
14. Assessing the company carbon footprint	39
15. Dematerialization.....	41
16. Conclusion.....	43
MEMBERS OF THE PLENARY GROUP	45

EXECUTIVE SUMMARY

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Created at the request of Mrs Christine Lagarde, Minister of Economy Industry and Employment, in agreement with Mr Jean-Louis Borloo, Minister of State, the Working Group on "Eco-responsible Development and ICT" (DETIC) has sought to extend previous work on this subject¹ and explore as widely as possible concerted actions envisaged by the government, stakeholders in the ICT sector and users.

It gathered a large number of participants, as part of a whole group, and three workshops, more specifically responsible of:

- Components (Working group 1)
- Computer centres (Working group 2)
- The appropriation of ICT by corporations, particularly SMEs, to reduce their ecological footprint (Working group 3).

Mise en forme : Puces et numéros

The group has sought consensus and, notably in working group 3, gave prominence to the information of the actors and the dialogue, involving major contractors, industry associations and consumers.

This document consists of reports of three workshops, preceded by a report of the Plenary Group that includes the main recommendations.

A number of general points apply to all workshops.

- Steadily technical progress in the area of the components have enabled the design of products ever more energy efficient and whose release is environmentally friendly. However, despite these gains, substantial and rapid growth of the "digital society" is such that a significant part of the French electrical consumption is now devoted to its operation. This justifies the fact that steps of progress and moderation in the ICT industry are maintained and even amplified, and an analytical approach of integrating ICT projects being conducted.
- Therefore it is necessary to encourage research and innovation in this area, particularly through European programs (Eureka), Community (PCRDT ERDF), or use of research tax credit (CIR).
- Emphasis was also placed on the need for a systemic approach and the importance of developing software that optimizes the need for hardware.
- This focus, combined with a strong demand for skills in this strategic area for the future requires an appropriate change in initial and continuing training of engineers and technicians and their awareness of the issue of eco-design.
- In parallel, an international standardization activity must be continued and even amplified, together with the support for eco-labels. It is necessary to know how to evaluate in order to develop these concepts.

Mise en forme : Puces et numéros

¹ Including the "France Numérique 2012" plan, the workshop results of MEDEF, the report CGTI/CGEDD/Arcep... The group did not attempt to define precisely the concept of ICT, but has implicitly adopted a broad ICT, close to the definition of SESSI (which may includes the components used in industry), while the Gartner's plate is smaller (IT and telecom, without broadcasting and the embedded components in vehicles, medical scanners...).

- The usage aspect must be taken into account and the group recommends to promote eco-friendly ICT equipments to environmental professionals (through the "TICPME 2010" program, through the dissemination of professional associations guides, and through public procurement) and provide the public with information enabling it to act (publication of good practice guides, display of energy performance of products as is already practiced for white goods).

More specifically, an approach to development and modernization of data centres is globally underway, and should promote the most modern techniques, encouraging through tax incentives, innovative data centres. Since this sector is strategic for the future, France which has a low-carbon energy should better leverage its competitive advantages in the area (prices, quality of networks, available skills) to promote the installation of data centres in France and contribute to its growth and the development of its territory.

It also appears that the diffusion of ICT usage is widely involved in the development of a more eco-friendly society. In this context, a number of recommendations aimed at greater use of ICT:

- Promote remote working with a dual ecological and land planning purpose; in particular, promote telecentres, in particular through a support at their start up and through the production of interoperability and ergonomics standards.
- In the field of construction, promote the use of standardised digital mock-up of buildings and neighbourhoods, both in the design and in the operation phases, to optimise their energy consumption. Using powerful and intelligent tools should also help at optimising the energy consumption, as well as the deployment of home networks and their interfacing with "smart meters". An international standardization work should be fostered to guarantee the future interoperability of these home networks.
- In the field of transport and logistics systems the use of optimised systems for the management of transported goods and travels (optimisation of shipments, of routes...) and standardization of electronic labels should have a substantial impact on the environment.
- The process of dematerialization of information exchanges and administrative procedures should be continued.
- Finally, the action of State and of local governments may be exemplary and proved to be a strong lever to promote all the actions recommended by the group.

The report identifies a number of promising avenues to be explored. It is therefore the beginning of a process and not its culmination.

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LIST OF THE RECOMMENDATIONS

Recommendation 1:

Establish a policy to support the ICT industry for more sustainable components and products by:

- Taking advantage of those programs such as PCRDT, ERDF, EUREKA, ITEA.
- ~~By including~~ including environmental criteria in the selection of innovative projects (OSEO...).
- With an emphasis on interoperability and hardware & software co-design.

Recommendation 2:

Be more present in international standards bodies (including through an extension of the tax credit on research activities to such tasks) and promote standards and labels (such as Energy Star, EPEAT), including those that incorporate an approach LCA. In parallel, monitor business practices to fight against counterfeiting, misleading labels and non-compliance to regulations.

Recommendation 3:

Promote the usage of ICT for environmental gains through:

- Promoting towards professionals (especially via the program TICPME 2010 and through public procurement) ecological materials both for their own consumption and for the environmental footprint of their uses.
- Launching, at State level, a study to establish benchmarks and to disseminate the results to the general public and professional federations (construction, energy, transport...).
- The implementation by industry associations and the diffusion in other areas of good practice guides highlighting the gains that can be achieved through ICT.

Recommendation 4:

Promote towards the general public ~~of~~ the best practices to save energy by:

- Disseminating professional associations guides to make optimum use of ICTs by the general public.
- A better information by extending to brown goods the obligation already in place for white goods to display energy performance, particularly for PCs, broadband access and electronic communication terminals (ongoing EC approach).
- The creation of an eco-comparator for cell phones. Computer manufacturers will provide useful data for the realization of an eco-comparator for PCs.
- An action to enforce labels (DGCCRF)
- An improved ergonomics of products.
- The promotion of management and control tools enabling customers to be protagonists of their own ecological footprint.

Recommendation 5:

- Intensify the initial training (engineers, technicians) in the field of ICT, and include the concepts of eco-design (energy efficiency, hardware + software co-design and responsible usage).
- Develop training materials for members of associations (construction, transport and ~~logistics...~~) and promote their inclusion in the priorities of joint training bodies (OPCA).

Commentaire [mp1]: transport et logistique ne sont pas dans le texte français

Recommendation 6:

Act at the state and local communities level through exemplary behaviour (impact of new regulations, public orders referring to "green" standards, waste management, development of telepresence usage in the administration...).

Recommendation 7:

- Widely deploy ICT components to build on their steady progress in energy efficiency.
- Recommend their wide use in intelligent systems projects throughout the economy.
- Addressing environmental issues on a systemic level.
- Assess the energy efficiency and carbon footprint of ICT products from 2012.

Recommendation 8:

Encourage the installation of data centres in France with three goals of sustainable development, competitiveness of France and land planning. Notably use for data centres the new simplified procedure for classified facilities. Further study the reflection to create an environment in favour to the establishment of data centres.

Recommendation 9: Thinking about the data centres of the future

- Establish an observatory on the "Cloud computing.
- Changing the rules to take into account the "Internet of Things" and the "Cloud computing".
- Supporting innovation around innovative data centres.

Recommendation 10:

Promoting teleworking in a dual ecological and planning purpose, and promoting the development of telecentres (support at start up).

Recommendation 11:

Promote the use of standardized digital mock for buildings and neighbourhoods, both in the design and the operation phases for optimizing their energy consumption. Encourage the actors to define the concept of "home network" and their interfaces with the various devices involved (including "smart meters").

Recommendation 12:

Promote the control of electric energy consumption through the widespread use of intelligent tools for measuring, displaying and driving energy consumption of apartments, buildings and neighbourhoods:

- Home networks.
- Sensors interconnected by standardized interfaces.
- Simple display the consumptions per usages.

Recommendation 13:

Promote "seamless" dematerialization to the entire logistics information chain, taking into account the electronic labels.

Recommendation 14:

Evaluate of the carbon footprint of the company.

Contribute (particularly at the EU level) to develop measurement tools for consistent comparisons between companies and integrate assessments of the carbon footprint of ICT equipments and services in a comprehensive impact study on the sustainable development of the Economy.

Recommendation 15:

Generalizing the dematerialization of all chains of information exchange, contracts, or administrative documents (working on authentication tools, interoperability and agree on standards for trade).

1. Introduction

A number of reflexions, in France and abroad, have already been conducted on the contribution of ICT to a society more concerned with sustainable development in an economy controlling its energy bill and its greenhouse gas emissions. In a context where the consumption of ICT is of an order of magnitude of 13% of French electrical consumption and increases about 10% per year², should be developed more energy-efficient and less waste producing ICT and better use it in industry, the services and everyday life in a perspective of sustainable development. In terms of "France Numérique 2012", the results of the workshop co-organized by MEDEF and Meeddat mid 2008, then the report CGTI / CGEDD / ARCEP early 2009 "ICTs and sustainable development", among many other works, have identified key aspects of the problem, make recommendations and launch a number of actions to achieve the objectives.

Created at the request of Mrs Christine Lagarde, Minister of Economy Industry and Employment, in agreement with Mr Jean-Louis Borloo, Minister of State, the Working Group on Development Eco-responsible and ICT (DETIC) has sought to extend previous work and explore as widely as possible concerted actions envisaged by the government, stakeholders in the ICT sector and users.

Besides the administration and several services such as ADEME, many players in the ICT sector (electronic communications operators, manufacturers, associations, research institutes) and ICT-using sectors (enterprises and federations of the building, Public work, transport and logistics, energy, etc..) have been approached as well as organizations representing consumers and NGOs. The number and quality of proposals for participation led the group to establish a two-tier structure, with a whole group of twenty people and 3 workshops:

- The plenary group met 6 times from February to July and auditioned several speakers, including a representative of the European Commission (DGENTREPRISE), and provided guidance to the 3 workshops activities.
- The working group 1 examined the eco-design of components; both in terms of microelectronics (chip manufacturing), and in more comprehensive terms of the eco-design of integrated products taking into account the different aspects of the lifecycle (production, use, end of life). It also addressed the eco-design of software.
- The working group 2 focused on the problem of computing centres (data centres), for which both density and capacity are growing rapidly, with significant power consumption.
- The mission of the working group 3 was to promote ownership by enterprises (including SMEs) of ICT solutions to reduce their environmental footprint. It gave prominence to the information of actors and the dialogue, involving the major stakeholders, professional federations producing or using ICT as well as consumer representatives.

The workshops met once or twice a month from February to June, the participants ranging from a core group of ten people up to discussions involving more than 40 people. Although environmental associations have not actively participated in the working group that is

² Estimates from CGTI/CGEDD/Arcep 2008 and Remodece 2008 studies.

therefore not the same as the recent "Grenelle", the various sensitivities, including the ones of ecology expert, have been expressed and are included in the report.

The group sought to address all aspects of ICT, both the savings that can be made about on the footprint of ICTs themselves and gains that ICT can contribute to, directly or indirectly, on the fight against global warming. Different aspects of the life cycle were taken into account, from the footprint in the production to the recovery of waste through the use, even if the electric consumption side was analysed further. The numerous participants to the working group 3 reflected the importance attached to the gain of greenhouse gas emissions effect linked to the appropriation of ICTs by different users. The emissions strictly related to ICT³ represent only 2% of the total emissions, according to a Gartner study.

Regarding the "ecological footprint" of ICT and the potential gains that can bring their usages, the group made recommendations of incentives measures, without attempting to provide quantitative assessment of potential gain. Despite some numerical evaluations attempts, it became apparent that the measurement methods were not sufficiently standardized to address this issue constructively. In particular, given the possible contribution of Climate Energy, this point deserves further analysis still further, to the extent that ICT is a kaleidoscopic area for which the "ecological gain" can vary according to circumstances. Some products or applications can potentially lead to a significant ecological gain (component optimizing the engine combustion, traffic information to optimize a route...) while others generate a more limited gain.

In both the workshops and the plenary group, the proposals have been widely discussed and members were committed to seeking consensus. Despite quite different subjects of the three workshops, several themes (innovation, standardization, training) emerged repeatedly, leading to joint recommendations beyond the specific recommendations from each workshop.

Each working group produced a report that was submitted to its members, and then to the plenary group. The present document therefore consists of the reports of three workshops and the plenary group's report that sets out the most striking conclusions of the workshops, highlighting transversal themes and specific recommendations whose importance is stressed.

Transversal recommendations of the DETIC group concern the following themes: Research and Innovation, Benchmarks, Professional and Consumer Uses, Land Planning and Promotion, Training. More targeted recommendations including components, data centres and buildings aspects, transportation, energy, supplement them. The involvement in working group 3 of industry associations, including those in other sectors than ICT should facilitate the enforcement of the recommendations by those directly involved.

³ Including the "France Numérique 2012" plan, the workshop results of MEDEF, the report CGTI/CGEDD/Arcep... The group did not attempt to define precisely the concept of ICT, but has implicitly adopted a broad ICT, close to the definition of SESSI (which may includes the components used in industry), while the Gartner's plate is smaller (IT and telecom, without broadcasting and the embedded components in vehicles, medical scanners...).

GENERAL THEMES

2. Research and Innovation

Electronic components are at the heart of reducing the environmental impact of products, services and solutions in the ICT domain, including in all sectors using ICT to optimize their processes resulting in a better management of their energy consumption and their environmental impact. The components industry for 30 years has significantly reduced its environmental impact while increasing regularly the overall performance of its products. We should therefore accelerate the **adoption of the most innovative and efficient components in environmental terms**.

The group recommends to:

- Implement a policy to assist the industry to accelerate the development of more efficient components in terms of sustainable development, making better use of community programs available for ICT, PCRDT and ERDF, but also the Eureka clusters Catrene, ITEA-2 and Celtic where SMEs are as well represented as large groups along with universities and research centres. In the clusters, the theme or factor eco-energy is taken into account but could become more crucial.
- Develop a research and development policy built around innovations in production, including the integration of components and electronic systems in all products and services.
- Accelerate the adoption of the most innovative components in developed products and solutions, including through public procurement.

The interoperability of digital systems determines the optimization of the gain on the environment during the implementation of ICT, as the management of end-to-end systems and processes is made complex by the heterogeneity of norms and standards.

The Group therefore recommends that the government support the interoperability efforts through the support of research projects and standardization.

Hardware and software co-design, particularly embedded, is a promising way forward to improve the performance of materials. It is worth noticing that these improvements do not only spread in the specific field of ICT, but starting from ICT they disseminate in all industries: medical, aerospace, automotive and even agriculture... The working group 1 highlighted the potential for global optimization "hardware + software", which is often done under constraints (embedded hardware) while they could be justified by themselves through its potential.

This could be obtained by:

- The government support to research programs in co-design.
- An appropriate training of engineers and technicians enhancing their awareness of the various challenges.

Strengthening Research and Innovation in eco-ICT ("Green ITs") can be obtained by:

- The integration of this approach as a priority for the National Strategy for Research and Innovation (SNRI).
- Identifying opportunities for scientific and technical progress by 2020 in the field of ICT to bring out new technologies minimizing the environmental footprint
- Taking into account the expected benefits for the environment in evaluation and selection criteria of projects by the structures and agencies funding research and innovation.

Recommendation 1:

Establish a policy to support the ICT industry for more sustainable components and products by:

- ***Taking advantage of those programs such as PCRDT, ERDF, EUREKA, ITEA.***
- ***By including environmental criteria in the selection of innovative projects (OSEO...).***
- ***With an emphasis on interoperability and hardware & software co-design.***

3. Benchmarks: measurement and standardization

Normalization and standardization are key to the development of environmentally friendly information technology. Indeed, properly managing and optimizing assume that we know how to precisely define the object and its environment to measure its environmental impact.

However, the ecological indicators (including the "Bilan Carbone™") are very difficult to calculate in general because of the multiplicity of actors and contributions. It is even more true for ICT themselves as the area is subject to rapidly changing technologies and usages. Nevertheless, these indicators are needed to quantify the gains that ICT can make in the industrial or domestic sectors, to orient towards environmental performance computers and data centres architectures and provide user awareness. ICT is also a key tool for traceability and communication to consolidate the obtained figures and calculate the ecological footprint of all the products and their usages.

Given the highly globalized sector, the challenges can only be conducted in an international context and at least at European level.

-The Group therefore recommends:

- In the benchmarks and recommendations to use only international and recognized norms and standards without yielding to the illusory temptation of the development of "Franco-French" standards. But it is important to encourage the proactive role that can play the national standard bodies relevant in the new areas of normalisation activities.
- To be more present in international standardization bodies (eg EU, ISO, CE / ECE) to develop standardized measurement methods, and to do so, to increase the public support for the presence of industrial French standardization groups but mostly international working on these issues. It is particularly desirable to extend to 100% the mechanism of tax credit on research activities for the industrials participating to the activities "official" of standards bodies (IEC, ISO, CEFACT, ETSI, CEN, CENELEC, French representative offices)
- To define standards and update them according to technological change: In its communication dated March 12, 2009, the European Commission announced before the end of the year, after reviewing the results of a public consultation, a recommendation on this matter. ICT equipment, construction and transport are particularly targeted. Note that the new European Parliament should give its opinion on this issue.
- To promote a limited number of labels, including some such like EPEAT or Energy Star developed in the United States and subject to a binding EU text, proved their effectiveness in influencing the public procurement or user awareness and predict from the beginning the certification mode and the proactive actions to be launched against offenders.

It is also important:

- To carry our further work on "the weight of ICT in the analysis of life cycle", to propose actions to standardize methods for evaluating their environmental impact, taking into account both the overall chain of production and distribution of ICT that the gain brought by their usages in other sectors. Within this framework, the ICT industry that participated in the work are ready to implement the

Mise en forme : Puces et numéros

traceability and to publish in 2012 a value of the CO2 footprint of the production by product range, with, for some, the first partial estimates from 2010.

- To strengthen the market surveillance and especially the fight against counterfeit products or non compliant with norms and regulations.

Recommendation 2:

Be more present in international standards bodies (including through an extension of the tax credit on research activities to such tasks) and promote standards and labels (such as Energy Star, EPEAT), including those that incorporate an approach LCA. In parallel, monitor business practices to fight against counterfeiting, misleading labels and non-compliance to regulations.

4. The usages

4.1. Professional Usages

Under the circular of the Prime Minister of December 3, 2008, the implementation of an effective policy of **exemplary state** and national, regional and local public services in terms of managing their information resources must be translated into:

- Finding savings of energy consumption (Energy Star criteria / TCO / EPEAT in tenders, use of shared printers, duplex printing...).
- The commitment of public purchasers to consider, within the limits of applicable law, criteria related to environment and sustainable development in the ordering and procurement. Action of CIGREF for purchases of computer hardware in large companies is to be studied to expand the target.
- Consolidating data centres and the use of more efficient and more sustainable materials when renewing.
- Implementing at the State level of an environment in favour to telecommuting as mentioned in section 10.

In order for ICTs to play their role as a tool for the sustainable development of enterprises, it is essential that they undergo a **wide dissemination in the industrial tissue and especially SMEs**, an area where France is still lagging behind.

The Group recommends **intensifying the “TICPME 2010” program**. Launched in late 2005 by the Ministry of Industry in partnership with all actors (MEDEF, trade associations, chambers of commerce and industry...), this program aims to encourage enterprises in same industrial sector to pool their efforts, and develop, according to international standards, the specific tools they need to improve their trade and competitiveness. Under the impulse of the federations or large stakeholders, these tools have been designed to be implemented in a collective and coordinated way by the sector companies at regional level. Beyond the initial objective of competitiveness, the various projects implemented undoubtedly help to improve the environmental impact of the concerned industrial sectors (optimization of transport and logistics, tracking, using the use digital model in the construction sector...). The first phase of the operation between 2005 and 2007, resulted in two calls for projects with a budget of € 10 million, which resulted in the selection of multiple applications with a strong component of sustainable development (eco-design in construction, collaborative design in aeronautics, eco-design of packaging systems, dematerialization...).

The funding of this program deserves to be extended to accelerate the local deployment and the awareness of SMEs' on the entire territory, to ensure a migration to other sectors. Success criteria for projects should better integrate environmental benefits.

The Group also recommends that, by industry sector, specific measures to accompany the dissemination and use of ICT are developed: without being necessarily exhaustive, some of them are proposed under specific themes, with an emphasis on developing efficient equipments in terms of electrical energy, on the diffusion of measurement and management tools enabling a responsible usage and promoting data centres optimized for energy consumption.

Recommendation 3:

Promote the usage of ICT for environmental gains through:

- **Promoting towards professionals (especially via the program TICPME 2010 and through public procurement) ecological materials both for their own consumption and for the environmental footprint of their uses.**
- **Launching, at State level, a study to establish benchmarks and to disseminate the results to the general public and professional federations (construction, energy, transport...).**
- **The implementation by industry associations and the diffusion in other areas of good practice guides highlighting the gains that can be achieved through ICT.**

4.2. Consumer use and consumer and user information

The citizen action in the everyday use of digital products and services is essential and it is important to educate users on the topic by providing reliable and objective information that enables them to become responsible actors and to appropriate ICT and its applications in the best conditions of use.

-The Group recommends:

Mise en forme : Puces et numéros

- Launching a number of objective studies on these subjects in order to have benchmarks and to disseminate them widely to the general public or professionals perhaps in the context of methodological appendices of the "Bilan Carbone™" of companies.
- Initiating a communication campaign towards the public through the presentation of best practices of everyday life, in a simple and educational way conducted with the support of all partners (public services, consumers, industrials)⁴.
- The information and awareness of users and consumers to enable them to be aware of the environmental impact of their actions (and measure and control it, often thanks to ICT). This information must be clear to make possible purchase and usage responsible choices. It corresponds to strong changes in the trend toward the "better consume".
- Developing a benchmark of energy efficiency in the EU context, based on the sampling, then display, product by product, accompanied by an indication of consumption according to various modes of operation including in financial terms often more meaningful.
- An effort by manufacturers and distributors to enhance both the ergonomic of the equipments, particularly for those customers that are less technophile, and writing clear and educational leaflets to promote a proper usage.
- In construction, energy and transport fields, a communication action on the environmental and financial gain that can be expected from some initiatives based on ICT. Sometimes these fields will be directly affected (sensors, smart metering, route optimizing); sometimes they will only be through websites with comparators informing the user about the value of these operations.

⁴ For reference, as an example, the guide of Alliance Tics: <http://www.alliance-tics.org/dossiers/environnement/Guide%20eco-utilisateur/Guide%20de%20l'eco-utilisateur.htm>

- At an EC level, a constructive monitoring of the ongoing debate on legislation aimed at extending to brown products of the existing obligation of consumption display in place for white goods. This display of performance should be both understandable by the general public and representative of the actual usage of the equipments.
- A greater involvement of the DGCCRF to control affixing labels and markings, including avoid misunderstandings resulting markings having a different meaning. More generally, better market surveillance to ensure compliance with existing regulations is to implement, including for prohibited substances (RoHS).

Recommendation 4:

Promote towards the general public of the best practices to save energy by:

- **Disseminating professional associations guides to make optimum use of ICTs by the general public.**
- **A better information by extending to brown goods the obligation already in place for white goods to display energy performance, particularly for PCs, broadband access and electronic communication terminals (ongoing EC approach).**
- **The creation of an eco-comparator for cell phones. Computer manufacturers will provide useful data for the realization of an eco-comparator for PCs.**
- **An action to enforce labels (DGCCRF)**
- **An improved ergonomics of products.**
- **The promotion of management and control tools enabling customers to be protagonists of their own ecological footprint.**

5. Training

Relatively advanced information is required from the players because the ICT sector, multifaceted and globalized, offers complex scenarios and in addition to goodwill, a basic minimum is essential for assessing the ecological gain brought by the equipment and actions of each party. Beyond products and services it is important, in particular, to enhance the best practices and the knowledge of tools in professional sectors. Appropriate **training** on the entire chain is crucial to maximize the positive impact of ICT for the environment.

This should be achieved by:

- The development of a policy to make careers in the ICT sector more attractive in view of their environmental impacts. The risk is indeed predictable from a shortage of engineers and technicians on these competences that are key for the future. This is particularly true in the electronics areas. The strong impact of an optimized and global design of both materials (see power consumption of boxes, PCs, TVs...) and software (an optimized software better accept a less powerful hardware that will pollute less) was stressed. It is therefore important to include in the curricula of training schools for technicians and engineers (for instance by the introduction of eco-ICT modules into the curriculum of the Telecom Institute), as in the continuous training, sensitization / training of designers to the consideration of ecological constraints on the footprint of the products they design as well as the one induced by their usage. In parallel, a reflection on the creation of new training courses should be initiated (training courses on energy efficiency, the problem of wastes, eco-responsible usages...) with the objective of crossing the various skills that are now commonly taught in "silo" without connection between them. The industry should participate in the preparation and the conduct of such training (via speakers for example).
- The implementation of a coaching methodology, in conjunction with professional associations, for the development of training tools necessary to their members, especially online tools.
- A systematic training for CSR managers to improve their knowledge of the tools (methodology, information system) to assess the environmental impact of companies' actions (individual impact of each project, record year-end...).

Recommendation 5:

- ***Intensify the initial training (engineers, technicians) in the field of ICT, and include the concepts of eco-design (energy efficiency, hardware + software co-design and responsible usage).***
- ***Develop training materials for members of associations (construction, transport and logistics...) and promote their inclusion in the priorities of joint training bodies (OPCA).***

6. Have an exemplary behaviour at level of the State and local governments

This point, addressed in the circular of the Prime Minister's of December 3 of 2008 and in the report "France Numérique 2012", is not detailed here because the proposed actions are already mentioned in other chapters, but the action of the State and local governments can undoubtedly have a ripple effect by:

- Public procurement referring to quality standards (EPEAT, Energy Star...) for hardware and software.
- The creation environmental impact studies records including and especially for projects involving ICT.
- An exemplary management by the State of its own waste.
- The initial and continuing training of engineers and technicians.
- The awareness of all civil servants or equivalent and when necessary an appropriate training.
- The development of telepresence usage in government: the State as a showcase for remote working.
- State, local authorities and government agencies tenders promoting the use of the digital model of building, home network, tools of measurement and intelligent control of energy consumption in buildings and neighbourhoods.
- The dematerialization of administrative procedures.

The professionals are wishing a further consultation with government on the modalities of implementation of the circular of December 3, 2008 in ICT.

Recommendation 6:

Act at the state and local communities level through exemplary behaviour (impact of new regulations, public orders referring to "green" standards, waste management, development of telepresence usage in the administration...).

WORKING GROUPS SPECIFIC THEMES

7. Promote the development and use of new components

The working group 1 (Components) wished to emphasize the steady progress made in the field of energy efficiency components. For thirty years, the cost of production and consumption of components has been steadily decreasing. These advances have enabled a reduction of 50% in 10 years of the electricity needed in the factories of components (with today 1kWh per cm² of silicon for the manufacturing of integrated circuits) and a reduction of 60% per year of consumption of components reduced to the transistor.

Despite new constraints linked to the sizes of silicon layer near the scale of atoms, which can cause leakage currents by tunnelling effect, the group believes that the ongoing progress of performance (following Moore's law) will continue for at least one half dozen years. It is therefore important to advertise these progresses, to recommend the use of these new components on one hand, and to prepare the future on a second hand.

The working group recommends addressing issues relating to the environmental impact of production and operation of ICT products and components on a systemic level, involving all the components involved in their life cycle. This is a major concern in the design of finished products (PCs, televisions, boxes...) so that their consumption is optimized according to their usage, e.g. standby selective functions. EC legislation bindings already implemented or being adopted cover the main points. The banning of certain hazardous materials (lead), with the RoHS directive and recovery of ICT wastes with the WEEE Directive, are also major points because, beyond the fight against pollution, recovery / recycling reduces the production carbon footprint of new components.

Some manufacturers are ready to implement a policy of measuring the carbon footprint in production in order to publish results in 2012.

Recommendation 7:

- ***Widely deploy ICT components to build on their steady progress in energy efficiency.***
- ***Recommend their wide use in intelligent systems projects throughout the economy.***
- ***Addressing environmental issues on a systemic level.***
- ***Assess the energy efficiency and carbon footprint of ICT products from 2012.***

8. Encourage the installation of data centres in France with three goals of sustainable development, competitiveness of France and Land Planning

Working group2 started working from the following preliminary considerations:

- Data centres are levers of an eco-responsible economy. This is particularly true for France, which has low carbon energy.
- There is bound to renew linked to the inevitable obsolescence of the current installed data centres.
- A proactive development of data centres is a strategic challenge of land planning and even of national sovereignty.

The working group believes that France should make better use of its assets to maintain, attract and host computer and digital services centres. It recommends the appointment of a government communication policy on the attractiveness of France for hosting computer and digital services centres. As in the field of electricity, it is important to achieve effective leadership in terms of control and risk of "digital energy" that make up computer centres.

In this spirit, the simplification of procedures is a key point and the working group noted with satisfaction the new ordinance 2009-663 of June 11, 2009, establishing a simplified procedure applicable to data centres.

It also recommends a similar approach on the aspect of personal data protection. A study group should be established on these issues.

It also recommends the creation, under the leadership of local communities, of Computer Centres type of market that would provide platforms pooled around the Regional Computer Centres (e.g. the opportunity study made by the region of Corsica).

Finally, it should be noted that under its "Codes of Conduct" approach, the EC published its first code on the efficiency of data centres (version 0.9 of August 12, 2008), covering the information technology side (efficiency in terms of consumption of the equipments in the data centre) and the "infrastructure" side (electrical and mechanical support systems). It is worse to adopt this approach and to bring at European level the introduction of stricter standards for CO2 emission data centres, which should facilitate their implementation in France thanks to the low CO2 content of our electricity.

The key success factors

Several conditions appear that these recommendations result in better control of energy expenditure data centres:

- The group recommends moving the computing infrastructure of the State from the current decentralized model to a model of Shared Services Centres. This model, generating economies of scale and rationalization is the main lever to pool the resources deployed and used in computer centres.
- Revise the legislative framework: in particular the tax treatment of the design and operation of computer centres.

- Simplify / revise the current laws that require governments to possess information on their own territory (including at the finest grain of local agglomerations) in order to facilitate the sharing of computer resources and their geographical clustering in pool type Computer Centres⁵.
- Make sure that the strengths of France are known to major investors in computing centres such as the CIOs of information consuming global enterprises and Computer Centres hosting corporations.

This initiative for the installation in France of data centres is consistent with the "White Paper" published by the CRIP⁶ in June 2009.

The working group 2 has listed **a series of indicators** that would be useful to follow in order to better steer the actions to promote data centres: the number of m2, number of new centres, evolution of the average PUE (Power Usage Efficiency: the quotient of the total energy consumed by the energy used by servers).

Finally, in terms of indicators, the working group 2 is in favour of a complement of the PUE by other more relevant energy performance indicators harmonized with international work in two different axes:

- "Passive" energy efficiency, taking into account the operation part of the data centre to be improved through self-assessment and measurement.
- "Active" energy efficiency, leading to proposals on the building design, air / water recycling, use of energy sources with low carbon emissions such as heat pumps, wind turbines, photovoltaic cells...

Recommendation 8:

Encourage the installation of data centres in France with three goals of sustainable development, competitiveness of France and land planning. Notably used for data centres the new simplified procedure for classified facilities. Further study the reflection to create an environment in favour to the establishment of data centres.

⁵ While keeping if possible the national location of sensitive or personal data.

⁶ The CRIP is an independent non-profit user association (1901 Act) regrouping the actors responsible for the design and operation of data centres within companies.

9. Thinking about data centres of the future (Data centre 2020)

The group considers that the PUE and conventional cooling technologies are pushed to the limits of their capabilities.

The current model of growth in Information Systems with PUE greater than 2 has proven over the years 2006 to be unsustainable in that it does not take all the profits of the computing power performances that have evolved 3 times faster than the famous Moore's Law.

Moreover, the emergence of the "Internet of Things" and "Cloud Computing" will profoundly change the landscape of ICT usage.

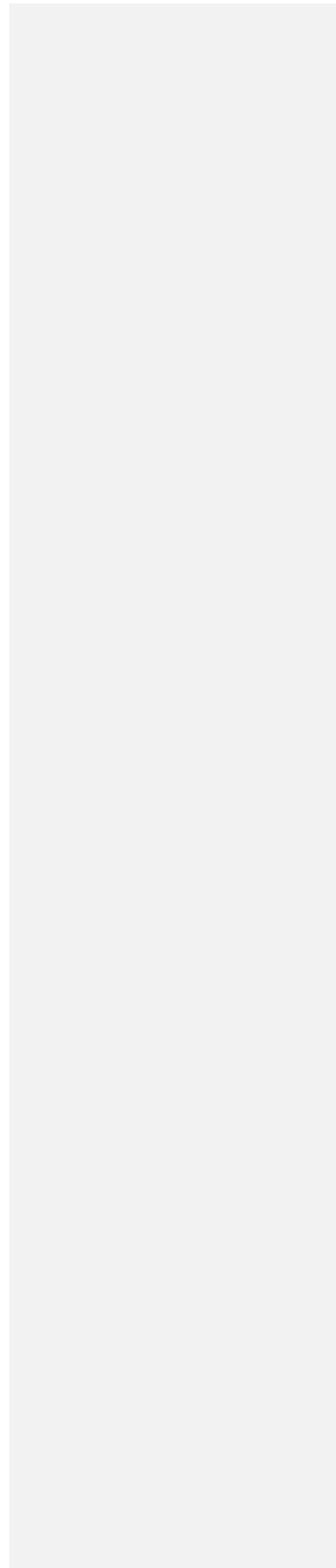
In front of these challenges, the group recommends to:

- Establish a strategic research observatory on the impacts of "Cloud Computing" and initiate research on innovations around "Cloud Computing" to promote their development in France. The competitiveness clusters, unifying the work of industry, academic research centres and INRIA, could support these activities. Some projects of this nature have already been launched, and this action should be strengthened and integrated into a global strategy.
- Support French industry in the development of software massively multi-core and adapted to the dynamic of power of new technologies.
- Strengthen the teaching of software engineering technologies to adapt them to the new infrastructure technologies with resources constraints and energy intelligence. The competence of teachers and researchers will be enhanced through projects funded by the ANR.
- Develop technical curriculum of Data Centres Urbanization. They are at the intersection of certain basic disciplines and will, where appropriate, also be considered for reclassification training courses in a national policy of employment support.
- Support innovation around data centres, particularly in the areas of integrated automation solutions, or heat recovery through tax incentives for innovative data centres following criteria evaluated by a public body (such as ADEME).
- Change French law to take into account the emergence of the "Internet of Things" and "Cloud Computing". More than a challenge, it is here to capitalize on the characteristics that make our regulation one of the richest and of those giving the best guarantees of transparency and ethics to the operators.

Finally, we also recommend that the action plans, in their implementation, are subject to formal monitoring every 6 months among all stakeholders.

Recommendation 9: Thinking about the data centres of the future

- **Establish an observatory on the "Cloud computing."**
- **Changing the rules to take into account the "Internet of Things" and the "Cloud computing".**
- **Supporting innovation around innovative data centres.**



10. Promoting teleworking in a dual ecological and land planning purpose

To reduce the travels that are energy consuming, and improve the quality of the professional life, it is wise to:

- Facilitate remote working for both people in teleworking situation and mobile professionals in particular through the deployment of "telecentres".
- Prepare a guide setting out the interoperability and consistency conditions between the enterprise and networks of the centres allowing "seamless" remote working and true nomadism, integrated into the nominal operations of companies and administrations.
- Facilitate, through a government support, the boot strapping of telecentres.

The State should adopt an exemplary behaviour and present itself as a showcase of remote working and to do so:

- Use the changing patterns of work organization and function following restructuring (distribution activities in several places and binding) to encourage the use of videoconferencing: a first approach, a room for significant administrative entity, particularly those that are decentralized.
- Implement without delay the Prime Minister circular "Exemplary State" of December 3, 2008 (including the actions of "France Numérique 2012").
- In parallel develop solutions using home teleworking through the deployment of home networks.

***Recommendation 10:
Promoting teleworking in a dual ecological and planning purpose, and promoting the development of telecentres (support at start up).***

11. In the area construction industry, optimize the design

Promote the use of standardized digital mock of buildings and neighbourhoods, both in the design than in the operation phases, is a way to optimize their energy consumption through:

- The use of the IFC / ISO standard on the structuring format of data.
- The training of the various professions.
- The recommendation to use the standard digital model in public procurement (government, local authorities, managers of public housing, social landlords), and in buildings made for the actors represented in the group (ICT users federations, industrial and ICT operators).

Should be also encouraged the actors to define the concept of "home network " and their interfaces with the various devices involved (including "smart meters") by:

- Establishing standards for a large-scale industrialization, applicable to neighbourhoods' local area networks, housing buildings and their interfaces. The purpose is, in particular to allow managers and users have the information on the status and the consumption of various energy sources and to optimize the use of materials.
- Accompanying open forums involving all concerned sectors.
- Participation EC works.
- The full-scale experiments of using the standard.

Recommendation 11:

Promote the use of standardized digital mock for buildings and neighbourhoods, both in the design and the operation phases for optimizing their energy consumption. Encourage the actors to define the concept of "home network" and their interfaces with the various devices involved (including "smart meters").

12. In the construction sector, control the use of electricity

To control the electricity consumption in usage phase, it necessary to:

- Promote the generalisation of intelligent tools for measuring, displaying and steering energy consumption of residential premises, commercial buildings and neighbourhoods through:
 - Networks for residential housing with the necessary circulation of information.
 - Sensors and equipment interconnected by standardized interfaces.
 - The simple display of consumption by use.
- Expand awareness of the construction centre and management to the available tools for existing energy efficiency assets.
- Raise the awareness, quantify the benefits and encourage consumers to use these tools to measure, display, and steering.
- Promote exemplary actions of the State, local governments, and public and private managers in this eco-responsible management.

Recommendation 12:

Promote the control of electric energy consumption through the widespread use of intelligent tools for measuring, displaying and driving energy consumption of apartments, buildings and neighbourhoods:

- ***Home networks.***
- ***Sensors interconnected by standardized interfaces.***
- ***Simple display the consumptions per usages.***

13. Optimize transportation and logistics

To optimize the transport of goods, and thereby reduce energy consumption, it is worth to:

- Promote the "seamless" dematerialization to the entire information chain of logistics.
- Strengthen the participation to standards groups.
- Apply international standards from the beginning.
- Integrate the whole set of the administrative documents (particularly the custom ones).
- Make compatible electronic IDs tags with this information chain to obtain the full traceability of goods.
- To support and train all transport and logistics companies to these models and their use in the context of sustainable development.
- Promote the sharing of the expression of needs and the use of computer resources.

Recommendation 13:

Promote "seamless" dematerialization to the entire logistics information chain, taking into account the electronic labels.

14. Assessing the company carbon footprint

The comparison between companies and consistency between the various links in the chain of production, distribution and use of ICTs requires the development of measurement tools that France can contribute to in the context of EC and international activities. These tools should aim to:

- Define standardized methodologies and forecast their update at the rate of the technological evolutions.
- Promote the interoperability of relevant information systems.
- Take into account the environmental dimension in the corporate ERPs.

Then, estimates of the carbon footprint of ICT equipments and services should be integrated as soon as possible in a comprehensive impact study on the sustainable development of the economy and the society: trade federations representing ICT will publish by the end of 2009 the results of a study they have undertaken in this area.

Recommendation 14:

Evaluate of the carbon footprint of the company.

Contribute (particularly at the EU level) to develop measurement tools for consistent comparisons between companies and integrate assessments of the carbon footprint of ICT equipments and services in a comprehensive impact study on the sustainable development of the Economy.

15. Dematerialization

To generalize the dematerialization of all chains of information exchange, contracts, or administrative documents, it is necessary to:

- Continue the dematerialization of administrative documents when the environmental and social impact is positive.
- Generalize logic indexing, authentication, interoperability, and intelligent retrieval of electronic documents tools.
- Agree on standards for exchanging information to prevent any break in each of the chains.
- Stepping up training and support of structures and end users.

Recommendation 15:

Generalizing the dematerialization of all chains of information exchange, contracts, or administrative documents (working on authentication tools, interoperability and agree on standards for trade).

16. Conclusion

The recommendations in this report are expressed in general terms, not binding. Clearly they must be taken one by one to be implemented through actions and proposals. The consensus within the Working Group deals with their realistic and promising character, although the time limit has prevented to explore in detail the terms of the agreements necessary to implement them and assess the reliably the possible gains for the environment.

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