

II

(Preparatory Acts)

EUROPEAN ECONOMIC AND SOCIAL COMMITTEE

426th plenary session, held on 20 and 21 April 2006

Opinion of the European Economic and Social Committee on the Communication from the Commission to the Council, the European Parliament and the Economic and Social Committee — Nanosciences and nanotechnologies: An action plan for Europe 2005-2009

(2006/C 185/01)

On 7 June 2005 the European Commission decided to consult the European Economic and Social Committee, under Article 262 of the Treaty establishing the European Community, on the abovementioned proposal.

The Section for the Single Market, Production and Consumption, which was responsible for preparing the Committee's work on the subject, adopted its opinion on 28 March 2006. The rapporteur was Mr Pezzini.

At its 426th plenary session, held on 20 and 21 April 2006 (meeting of 20 April), the European Economic and Social Committee adopted the following opinion by 117 votes with four abstentions.

1. Background

1.1 In its previous opinion⁽¹⁾ on nanosciences and nanotechnologies, the EESC recognised that it would be helpful to include a brief definition of the main terms used, reflecting the fact that the opinion dealt with a partly new subject, whose vocabulary was little known or at any rate little used. Those definitions should therefore be restated at the beginning of the present opinion.

1.1.1 Many other European programmes which started in 2000 are still in force in 2006, alongside the sixth framework programme. Consequently, it is worth indicating in the notes which main programmes have implications for N&N, especially those programmes that are of particular importance to the new Member States, who did not have the opportunity to follow their inception and the debate on their objectives before 2004.

1.2 Definitions⁽²⁾

1.2.1 **Nano** — means one billionth of a whole. In this case, nano is used to mean a billionth of a metre.

1.2.2 **Micro** — means one millionth of a whole. In this case, it means one millionth of a metre.

1.2.3 **Nanosciences** — The nanosciences are a new approach to traditional science (chemistry, physics, electronic biology, etc.) and deal with the basic structure and behaviour of materials at the level of atoms and molecules. These sciences in fact study the potential of atoms in the various scientific disciplines⁽³⁾.

1.2.4 **Nanotechnologies** — These technologies enable atoms and molecules to be manipulated so as to create new surfaces and objects that, having a different make-up and arrangement of atoms, have properties that can be used in day-to-day life⁽⁴⁾. These are technologies that deal with billionths of a metre.

1.2.5 **In addition to the above definition, it is worthwhile mentioning another, more significant one from a scientific point of view. The term nanotechnology** describes a multidisciplinary approach to the creation of materials, mechanisms and systems, by means of the nanometric scale control of materials. In accordance with this multidisciplinary approach, a broad knowledge-base in electronics, physics and chemistry is required to establish a nanotechnology qualification.

⁽¹⁾ OJ C 157 of 28.6.2005.

⁽²⁾ *Ibid.*

⁽³⁾ Interview with Commissioner Busquin (summary in IP/04/820 of 29 June 2004).

⁽⁴⁾ See footnote 2.

1.2.6 **Nanomechanics** — The dimensions of an object begin to be important in determining its properties when the scale of its dimensions is of one or a few dozen nanometres (objects made of a few dozen or a few thousand atoms). Within this range of dimensions, an object composed of 100 iron atoms has physical and chemical properties that are radically different to one composed of 200 atoms, even if they are both made of the same atoms. Similarly, the mechanical and electromagnetic properties of a solid made up of nanoparticles are radically different to those of a traditional solid of the same chemical composition and are affected by the properties of the individual constituent units.

1.2.7 **Microelectronics** — This is a branch of electronics that deals with the development of integrated circuits, built within individual semiconductor regions, with minute dimensions. Microelectronics can currently create individual components with dimensions in the realms of 0.1 micrometre, or 100 nanometres ⁽⁵⁾.

1.2.8 **Nanoelectronics** — This is a science that studies and produces circuits that are made using technologies and materials other than silicon and that work on a substantially different set of principles ⁽⁶⁾.

1.2.9 Nanoelectronics is set to become a cornerstone of nanotechnology, just as electronics today permeates all scientific sectors and industrial processes ⁽⁷⁾.

1.2.10 **Biomimetics** ⁽⁸⁾ — This is the science that studies the laws underpinning molecular structures existing in nature. Knowledge of these laws could enable **artificial nanomotors** to be created, based on the same principles as those existing in nature ⁽⁹⁾.

1.3 Conclusions and recommendations

1.3.1 The Committee welcomes the proposals presented by the Commission to implement by 2009 an action plan for N&N in particular with regard to:

- the need to apply a sustainable, competitive, stable and durable model of development;
- the perceptible acceleration at global level of investment in nano-scale R&D and its applications;
- the need to analyse the risks and opportunities of the nano-scale approach, and the urgent need for a widely shared vision on the part both of the social partners' political and

⁽⁵⁾ Micro and nanoelectronics centre at the Politecnico di Milano, Prof. Alessandro Spinelli.

⁽⁶⁾ Ibid.

⁽⁷⁾ Investment in nanoelectronics currently totals EUR 6 billion, broken down as follows: 1/3 in nano and micro, 1/3 in diagnostics, 1/3 in materials (source: European Commission, Research DG).

⁽⁸⁾ From the Greek *mimesis*, to imitate nature.

⁽⁹⁾ For instance the independent movement of spermatozoa.

official decision-makers and, ultimately, of the general public and the media. This is in order to ensure the success of N&N, on account of their usefulness for the general public's health, safety and quality of life;

- the call for high-quality facilities and infrastructure, integrated European networks and shared databases;
- the need to provide qualified human resources in the scientific, technical and economic fields, together with scientific and industrial specialists capable of interacting with N&N;
- the advisability of creating a European focal point for promotion and coordination to serve as a stable, proactive partner for connecting industry and science in particular, both within the Union and internationally, to be supported by an operational office.

1.3.1.1 Focal point staff must possess in-depth, proven scientific and management skills, and be particularly well attuned to the general context in which N&N development takes place.

1.3.1.2 It is also true of N&N that 'Community-funded research and development activities create considerable European added value. They open up potentials that plainly go beyond the capacities of individual Member States and have already facilitated European developments of global importance' ⁽¹⁰⁾. This illustrates the importance of a Community focal point which can manage the sector, with clearly-allocated responsibilities.

1.3.2 In the light of the N&N revolution, the Committee is convinced that Europe's chances of being at the forefront in a setting where new players are constantly — and aggressively — entering the world market hinges upon its capacity for coordination and upon the creation of a securely-based European critical mass of nanotechnology.

1.3.3 In the Committee's view, it is crucial that the European Union should succeed in shaping an **N&N action plan** capable of mobilising a collective drive for **governance**, and of uniting the Community, national and regional levels in complying with the subsidiarity principle. More specifically, the plan should provide:

- a visible, transparent dialogue with civil society, ensuring awareness based on objective evaluations of the risks and opportunities presented by N&N;

⁽¹⁰⁾ OJ C 65 of 17.3.2006.

- constant vigilance to protect ethical and environmental aspects, together with the health and safety of workers and consumers;
- a single Community focal point, capable of ensuring close coordination of the various policies and between the various areas of action;
- a single voice at international level to promote initiatives for joint declarations and codes of conduct, in order to guarantee the responsible use of N&N, to ensure cooperation in basic scientific research;
- action to prevent the emergence of a 'nano-divide' (exclusion from developing N&N knowledge), together with the less developed nations;
- legal and regulatory certainty for research, application and innovation efforts on the N&N market;
- a calendar and detailed timetable for the planned actions at both Community and Member State level, with machinery to check on implementation, and with clearly-allocated responsibilities.

1.3.4 The Committee calls for the Community action plan to be accompanied by **national action plans**, providing coordination and regular benchmarking of convergence and synergies in various fields: infrastructure; training and education; risk assessment; harmonisation of standards and patents; and, lastly, dialogue with civil society, especially consumers.

1.3.5 The Committee believes that **European industry** should expand and intensify N&N research and application efforts, increasing investment to levels at least equal to those of its more advanced competitors. This could be achieved by means of the following actions: development of European technology platforms; incentives for the protection and industrial exploitation of N&N; encouragement for targeted training for small-scale entrepreneurs; development of European N&N innovation and application networks; support for multidisciplinary qualification schemes for workers and technical specialists; establishment of 'business nanotechnologies' and prototyping and certification laboratories; and creation of a common framework for technical standardisation and intellectual and industrial property.

1.3.6 The two-yearly monitoring report on the implementation of the Community action plan and its consistency with other EU policies should, in the Committee's view, be accompanied by an annual scoreboard detailing compliance with the

adopted timetable, and should include the Member State reports on the implementation of the national action plans.

1.3.7 The report should be submitted to the European Economic and Social Committee as well as to the EP and the Council.

2. Reasons

2.1 Nanosciences and nanotechnologies (N&N) represent a rapidly-expanding field which holds great promise for the conversion of basic research into successful innovation. The sector is highly significant in terms of both boosting the competitiveness of European industry as a whole, and creating new products and services capable of enhancing the well-being and quality of life of society and individual citizens.

2.2 Most analysts are convinced that by 2015 N&N-based materials, products and services will be able to generate a global market worth hundreds of billions of euros each year⁽¹¹⁾ provided that (i) scientific excellence can be successfully translated into commercially viable products, processes and services, and (ii) as emphasised by the Commission itself⁽¹²⁾, 'a repeat of the European 'paradox' witnessed for other technologies' can be avoided.

2.3 In order to achieve this, there is, in the Committee's opinion, a need to:

- reinforce and coordinate R&D through greater investment,
- create world-class R&D infrastructure,
- ensure careful risk assessment through the scientific and application-related life cycle,
- uphold complete respect for ethical principles,
- promote a favourable, proactive climate for innovation in all parts of the economic fabric and especially among small and medium-sized enterprises,
- develop qualified human resources,
- adjust normative and patent systems,
- promote partnership between public and private organisations.

⁽¹¹⁾ C.f. *Nanotechnologies and nanosciences, knowledge-based multifunctional materials & new production processes and devices*, submitted to the Euronoanoforum, Edinburgh, September 2005.

⁽¹²⁾ COM(2005) 243 final and COM(2005) 24 final.

2.4 The Committee issued an earlier opinion on this subject ⁽¹³⁾, which included the following recommendations:

- the development of joint Community/national efforts in RTD and scientific and technological training with close interaction between industry and the academic world; a special focus on industrial and multisectoral applications; greater coordination of policies, structures and stakeholder networks; safeguarding of ethical, environmental, health and safety interests; and appropriate technical standardisation;
- a strong link between N&N and society, to ensure that research results make a positive contribution to economic competitiveness, human health, the environment, safety and the quality of life;
- provision of appropriate resources under the new financial perspectives for 2007-2013 and in particular in the Seventh framework programme for R&D (FP7), and reinforcement of European technology platforms;
- the launch of a high-level Community action plan containing a clearly defined road map and timetable and an approach that ties in with that of the Member States, in order to secure consensus among all civil society players on a shared vision;
- the establishment of high-level European infrastructure for research and technology transfer geared to innovation and the markets;
- optimisation of intellectual property arrangements and the establishment of a European-level Nano-IPR Helpdesk, to meet the needs of researchers, companies and research centres and, most importantly, of civil society;
- stepping up international cooperation on the ethical, risk, safety, standards, patents and metrological aspects;
- actions designed to develop N&N-related industrial processes and increase awareness of their use, with the establishment of a European information clearing-house,

product commercialisation, technology transfer and sharing of best practice;

- an ongoing dialogue with the media and public opinion, based on dissemination of scientific knowledge, to provide the public with an assurance that the potential dangers for health or the environment are being monitored, and also to forestall misunderstandings concerning nanotechnological developments.

2.5 N&N in the new Member States

2.5.1 Over the last five years, the European Commission has used Community resources to support some 30 centres of excellence in connection with the various thematic priorities under the Community's Framework Research Programme: many of these centres involved in developing N&N ⁽¹⁴⁾ are linked to universities, research bodies and enterprises in the new Member States.

2.5.2 The Committee considers it important for the European Joint Research Centre to continue providing support and encouragement for centres of excellence in the new Member States and the applicant countries, particularly in the N&N sector, specifically including this aspect in their work programmes.

2.5.3 In the Committee's view, the Commission should also support the growth of European N&N innovation, application and prototyping networks, especially for small businesses, which represent the bulk of Europe's industrial fabric.

2.5.4 More specifically, specific service packages should be provided to help entrepreneurs to identify opportunities and links in N&N applications, and multiply successful initiatives such as Gate2Growth ⁽¹⁵⁾ and Minanet ⁽¹⁶⁾; new sources and methods of risk funding should therefore be identified, together with guarantee systems to supplement existing ones.

2.5.5 The Committee also believes that the PHANTOMS Community initiative — a network of excellence on nanotechnologies set up under the IST/FET Community programme — for Information Society Technologies merits further development and a higher profile.

⁽¹⁴⁾ Leading centres of excellence include the DESMOL Centre of Molecular Studies, the High Pressure Research Centre and the CELDIS centre of the Polish Academy of Science's Institute of Physics; the KFKI-Condensed Matter Research Centre and the Research Institute for Solid State Physics and Optics of the Hungarian Academy of Sciences; and the Centre for Advanced Material Research and Technology (CAMART) of the University of Latvia's Institute of Solid State Physics.

⁽¹⁵⁾ The Gate2Growth Community initiative provides a package of services and networks to help make access to investment for new innovative businesses faster and cheaper, through pan-European thematic networks of investors and intermediaries, such as I-TecNet.

⁽¹⁶⁾ Minanet is an accessible on-line database on European research projects in the field of microsystems and nanotechnologies. It includes N&N projects in the Czech Republic, Poland, Slovakia, Hungary, Bulgaria, Lithuania, Latvia, Cyprus and Romania.

⁽¹³⁾ (OJ C 157 of 28.6.2005).

2.5.6 Furthermore, the EESC considers that, in the light of the need to give greater impetus to research and innovation in the new Member States and applicant states, greater synergies should be built up with the EUREKA and COST initiatives, under which many of these countries are conducting N&N activities.

2.6 The international picture

2.6.1 **Overall spending** at global level by governments, businesses and the financial world on research and development in the N&N sector was estimated to stand, in January 2005, at some EUR 7 billion per annum⁽¹⁷⁾ (more than half from public funds), of which approximately 35 % was spent in North America, 35 % in Asia, 28 % in Europe and 2 % in the rest of the world.

2.6.1.1 Although the differences in public investment at the end of the 1990s were, in per capita terms, very small (roughly EUR 1 in the US and Japan, in the EU half this amount), by 2005 per capita spending in the US stood at EUR 5, in Japan at EUR 6.5 and in the EU at EUR 3.5. Forecasts to 2011 suggest a level of more than EUR 9 in the US and Japan, and EUR 6.5 in the EU⁽¹⁸⁾.

2.6.2 **Spending by industry** at world level amounts to more than EUR 3 billion per annum, of which 46 % is carried out by US companies, 36 % by Asian companies, 17 % by European companies and less than 1 % by businesses from the rest of the world. Some 1 500 companies have declared a strong commitment to N&N research and development: of these, 80 % are represented by start-ups, of which more than half are North American. Media coverage of nanotechnology affairs has risen from about 7 000 articles a year to the current 12 000⁽¹⁹⁾.

2.6.3 Over the five years between the end of 2000 and the present, the federal government of the **United States** has invested more than US \$ 4 billion in nanotechnologies. For 2006 alone, the Bush administration has requested US \$ 1 billion for N&N research to be allocated to the eleven federal research agencies. As pointed out in the 2005 report on *The National Nanotechnology Initiative at Five Years*, 'the United States is the acknowledged leader in nanotechnology R&D' at world level, with annual public and private investment of US \$ 3 billion, accounting for approximately one third of world spending.

2.6.3.1 The US also comes first in the number of business start-ups, publications and patents. At federal level, it is felt that spending on new knowledge and infrastructure is both

'appropriate and wise', likely to generate 'substantial economic payoffs over the long term'.

2.6.4 Annual spending in **Japan** in 2003 stood at about EUR 630 million, with 73 % provided by the Ministry of Education and 21 % by the Ministry for the Economy, Trade and Industry. Research is focused primarily on nanomaterials. In terms of nanotechnology venture capital, Mitsui has decided to invest almost EUR 700 million over the next four years, while the Critical Technology Fund will channel some EUR 30 billion to N&N research⁽²⁰⁾.

2.6.5 Still in Asia, **Taiwan** too plans to invest more than EUR 600 million between now and 2008, with 800 companies involved with N&N; it is expected that production will rise to EUR 7.5 billion in 2006, with a rise in the number of businesses in the sector to 1 500 and new product development of up to EUR 25 billion in 2012, particularly in the various nanoelectronics sectors.

2.6.5.1 The prerequisite for this expansion to take place is that intellectual and industrial property problems be resolved.

2.6.6 **South Korea** is one of the first countries whose companies have successfully marketed N&N based products⁽²¹⁾. The country, which has a potential domestic nanotechnologies market estimated to be worth some EUR 2 billion, has launched a Next Generation Core Development Program on N&N, with a budget of EUR 168 million. Its priorities include nanomaterials, nanocomposites and bionanotechnologies.

2.6.7 More than 30 N&N companies have been set up in recent years in **Australia**, and their numbers are continuing to grow by 50 % a year. Public and private spending on N&N research amounts to nearly EUR 60 million a year, focusing mainly on new materials, bionanotechnology and medical and therapeutic applications.

2.6.8 According to a report recently published in Beijing on nanotechnology development in **China** in the 2005-2010 period, with forecasts up to 2015⁽²²⁾, the country is one of the world's leaders in terms of new N&N business registrations,

⁽¹⁷⁾ Lux Research and Technology Review on Nanotechnology 2005.

⁽¹⁸⁾ C.f. <http://cordis.europa.eu.int/nanotechnology>; European Commission, Research DG, Unit G4 (8.12.2005).

⁽¹⁹⁾ Lux Research and Technology Review on Nanotechnology 2005.

⁽²⁰⁾ In terms of private N&N investment, some 60 Japanese companies spend approximately EUR 170 million annually on nanotechnology R&D, an increase of 20 % since 2003.

⁽²¹⁾ Samsung launched its Flash Memory Chips, containing 90 nanometric components, as far back as 2002.

⁽²²⁾ Beijing Report 2005 on Nanotech Development to 2010-2015.

publications and patents, with an internal market for N&N products and systems estimated at more than EUR 4.5 billion, and set to grow to more than EUR 27 billion by 2010, and more than EUR 120 billion by 2015 ⁽²³⁾.

2.6.9 The EESC believes that the international picture serves to highlight the importance of ensuring a proactive climate favourable to research and innovation in all EU countries, in order to be able to share successfully in research and development investment in the sector.

3. Comments

3.1 The Committee has always argued that stronger efforts to achieve an increase in absolute and relative terms of R&D investment in Europe are necessary as part of the effort to achieve the 3 % Barcelona objective. In the light of international trends, it is convinced that such an effort is necessary first and foremost in the N&N sector.

3.1.1 The Committee believes that the effort would be weakened if not made as part of a robust process of European-level coordination of national and regional N&N research programmes, partly via the ERA-NET and ERA-NET PLUS ⁽²⁴⁾ schemes. It should be backed by actions to raise awareness and support for research centres, industries and universities through the COST ⁽²⁵⁾, ESF ⁽²⁶⁾ and EUREKA ⁽²⁷⁾ programmes, and with EIB loans.

3.1.2 The Committee is of the view that such **European coordination** and cooperation should also cover **Member State actions** designed to develop interdisciplinary infrastructures and centres of N&N skills and excellence, which should also aim to link up with a pan-European network to multiply synergies and prevent wasteful duplication.

3.2 Community level

3.2.1 The Committee is convinced that if the Community action plan is to be effective and credible, it should contain a calendar and detailed timetable, which would facilitate more stringent checks on the progress achieved in the following spheres:

- increasing investment in N&N research, innovation and training, at Community, Member State and regional level,

⁽²³⁾ According to the above report, China's share of the world market will be more than 6 % in 2010 and 16 % in 2015. The race to bring out finished products will depend heavily upon convergence in nanobiotechnological and nanoscientific applications, and on the practical research of the three major national research centres and more than 20 nanotechnology institutes.

⁽²⁴⁾ European Research Area: cooperation and coordination of national or regional research activities. The ERA-NET programme, with a budget of EUR 148 million, provided for calls for proposals every six months, up to 2005, targeting projects in which legal entities of at least three Member States were involved. ERA-NET Plus has been introduced for the coming years, building upon its predecessor.

⁽²⁵⁾ COST: European Co-Operation in the field of Scientific and Technical research.

⁽²⁶⁾ ESF: European Science Foundation.

⁽²⁷⁾ EUREKA: European initiative for the development of market technologies.

always however tied in with a robust European coordination process conducted by the Commission, and with a stronger commitment on the part of industry;

- including a focal point for European coordination into FP7, to serve as a stable, proactive partner both within the Union and for the purposes of international cooperation and dialogue, with a European 'Nano-Janus' ⁽²⁸⁾ centre equipped with sufficient resources;
- providing qualified human resources with multidisciplinary profiles in the scientific, technical and economic fields, and boosting the presence of scientific and industrial specialists aware of the N&N approach;
- ensuring the acceptability and success of nanosciences and nanotechnologies through a visible and transparent dialogue with civil society, not only for the sake of their contribution to European competitiveness, but also of their usefulness in terms of citizens' health, safety and quality of life;
- introducing toxicological and ecotoxicological risk assessment mechanisms and the appropriate training mechanisms to cover all phases from the drawing board to implementation;
- submitting research and public funding proposals to an ethical monitoring system, as already envisaged for the framework programme, to identify all ethical issues which may arise in connection with N&N;
- preserving the proper balance between the need, on the one hand, for social development, dissemination for scientific and practical purposes, and health protection and, on the other, the demands of intellectual and industrial property.

3.2.2 The Committee strongly advocates a substantial increase in investment in N&N research, innovation and training, at Community, Member State and regional level, in parallel and in close coordination with the Member State and regional levels.

3.2.2.1 In this connection, the Committee would emphasise that, in contrast to the situation in other research sectors, the amount of Community funding channelled to N&N is equal to that from the Member States (where, for general research, Community resources account for 4-5 % of overall European research expenditure, while Member State resources represent 87 %).

⁽²⁸⁾ Cf. the National Nanotechnology Office set up in the US in 2003 under the Nanotechnology Development Act.

3.2.3 The Committee considers that no less than 10 % of the resources allocated to the specific 'Cooperation' programme under FP7 2007-2013 should be earmarked for the N&N thematic priority.

3.2.3.1 Within the 'Capacities' programme, due place should be accorded to SMEs for N&N research and innovation, particularly for 'nanotechnology districts', infrastructure for excellence and N&N foresight activities.

3.2.3.2 The proper place should be given to training and mobility for N&N researchers, within the specific 'People' programme, and the same should apply to the work of the Joint Research Centre with regard to safety and metrology, as well as to prospective technological studies.

3.2.4 For its part, the Competitiveness and Innovation Framework Programme should, from 2007 onwards, be able to devote — even with the limited resources available to it — some of its efforts to fostering a culture of entrepreneurship geared to the organisational applications of N&N research.

3.2.5 The Committee strongly supports the establishment of European technology platforms, modelled on those already in place for nanoelectronics and nanomedicine; these platforms are in fact ideal instruments for mobilising all the public and private players across the different sectors (science, training, technology, industry, finance) in Community, national/regional or joint projects and initiatives, underpinned by a shared and proactive forward-looking vision.

3.2.6 The Committee considers investment in advanced education and training to be crucial. The new post-2006 Community programmes should make specific provision for areas of action providing multidisciplinary support for N&N.

3.2.7 The Commission should facilitate industrial exploitation by introducing the following by 2007, under the FP7 N&N work programme:

- a Nano-IPR Helpdesk, as proposed by the EESC in its previous opinion on N&N;
- a European clearing house for exchange of best practices and monitoring of patents and new applications on the world market;
- a Digital Library, as proposed in the communication under discussion;

- CEN-STAR ⁽²⁹⁾ tenders for pre-legislative and co-normative technical research projects;

- pilot schemes to demonstrate the industrial applications of N&N.

3.2.8 The Commission should immediately strengthen the ethical monitoring system, to ensure that all ethical issues are identified which may arise in connection with N&N, especially in the fields of medicine, the agri-food industry and cosmetics.

3.3 Member State level

3.3.1 The Committee emphasises how important it is for Community action plans to be matched by national **action plans**, which are to be submitted to the European Parliament, the Council and the Commission by the end of the first half of 2006. The purpose is to ensure coherence and synergies in the fields of infrastructure, training and education, as well as harmonisation of standards and patents, risk assessment and, lastly, dialogue with civil society, consumers and the media.

3.3.2 The Committee believes that the Member States should allocate a greater proportion of their available public and private investment to N&N, and should submit regular reports to the EP and the Council on the progress made in investment and in implementing national plans.

3.3.3 These reports should be included in the two-year Community report, with specific reference to:

- the creation of a regulatory and legislative environment which is favourable to the new cycle of industrial applications of N&N to new business concepts, new qualifications and training requirements for entrepreneurs, workers and technical specialists, standards, product certification, ethical issues and transparency, particularly with regard to medical and scientific training, accessibility and equal opportunities;
- incentives for innovative N&N applications at local and regional level, with the development of networks of prototyping, certification and risk assessment laboratories which are accessible to all businesses, official bodies, universities and research centres; to this end, dedicated start-up and venture capital measures of a financial nature should be implemented, especially in cohesion regions, and information centres with a public profile should be set up to explain the risks and opportunities generated by N&N;

⁽²⁹⁾ CEN: European Committee for Standardisation. STAR: working group on standardisation and research.

— the introduction of initiatives to prevent a 'nano-divide', particularly in structural and cohesion fund intervention areas and in island and outlying regions, accompanied by measures to prevent less developed third countries being excluded from N&N development.

3.3.4 The Committee considers that the Member States should act to preserve a proper balance between two imperatives: on the one hand, the need for cooperation and dissemination for scientific and practical purposes, geared to health and environmental protection and, on the other, the need to safeguard the confidentiality of inventions and intellectual and industrial property.

3.3.5 In the Committee's view, this again highlights the disadvantages of the lack of a Community patent and a single Community patent law. This concerns not only the question as to what can be patented in the Member States, in terms of inventions in bionanotechnology, but also simple access for stakeholders to information about new inventions and patents.

3.4 International level

3.4.1 The Committee fully supports the guidelines set out in the action plan for building up structured cooperation and dialogue at international level. It would add the following suggestions:

- holding regular international forums under EU auspices to broaden opportunities for dialogue, exchange and communication, with a view to strengthening the international scientific, industrial and academic community;
- developing European leadership skills in order to promote initiatives for joint declarations and codes of conduct regarding the responsible development and use of N&N;
- creating an electronic archive within the EU of worldwide scientific and technical publications on N&N by 2008;
- including capacity-building actions for partners in developing countries, training actions for scientific personnel and actions to prepare local skills to receive N&N in European development cooperation policy guidelines: the purpose of these actions being to prevent the emergence of an 'N&N divide' (exclusion from developing N&N knowledge);

— fostering user-friendly synergies with European initiatives — such as EUREKA — and international initiatives — such as Human Frontiers — in the N&N field.

3.5 Company, labour and civil society level

3.5.1 The Committee believes that companies, especially SMEs, can derive enormous benefit from N&N research work and its direct dissemination to technology transfer, especially by taking on board energy efficiency and environmental technologies, IT nanotechnologies, new materials applied to processes, products and services, and the converging nano-, bio-, and infotechnologies.

3.5.2 The Committee considers that **European industry** should expand and intensify N&N research and application efforts, increasing investment to levels at least equal to those of its more advanced competitors: this effort should be given strong backing by the creation of a favourable regulatory and legislative environment at both Community and national/regional level.

3.5.3 The Committee is convinced that this approach, which advocates strong business involvement, is vital to N&N research and development and application, provided that arrangements are made for support actions at European, national/regional and, most of all, the joint level, aimed at:

- transparent, simple and clear information on nanotechnology scouting of research results, applicable in a permanent and safe manner for workers, technical specialists, consumers, the environment and health; these results must be guaranteed by certification which is fully acceptable to both society and the market;
- implementing training initiatives focusing on the difficulties of businesses, especially small ones, through the assimilation and informed use of N&N, complying with the requirements of the new production processes which apply them⁽³⁰⁾;
- supporting multidisciplinary training and qualification schemes for technical and scientific personnel, on the new business concept and organisation applying new nanotechnological production processes and related services, and on the necessary precautions to counter toxicological and ecotoxicological risk;

⁽³⁰⁾ The EESC welcomes the paper and CD format publications of the DG responsible for innovation, and their educational content, which is addressed to an interested, but so far uninformed, public.

- sounding out, in a clear and predefined way, the opportunities and limits of industrial and intellectual property to guarantee a proper balance between cooperation and competition; production confidentiality and the dissemination of N&N-related progress, publication and free movement of new knowledge within the European and international scientific community, and protection of intellectual property rights;
- facilitating access by businesses, especially small ones or those located in island and outlying regions, to JCR⁽³¹⁾ institutes, to prototyping, certification, measurement and testing laboratories and infrastructures. Access to national and European technical standards bodies, which are authorised to draw up internationally recognised and accepted standards will also be important;
- under the EIB, EIF, CIP⁽³²⁾ and the Community's Structural Funds, strengthening access for businesses, especially SMEs, to financial support measures, start-up and venture capital, and initiatives to promote spin-off from academic research, with a view to creating new enterprises and jobs in the N&N sector and the setting up of acquisition, production and distribution networks for N+N services;
- establishing closer links between universities, research centres and businesses, especially SMEs, by establishing joint management skills centres for the various application sectors, taking on nanotech experts in businesses, and organising training courses under the new Marie Curie Programme actions.

3.5.4 The Committee emphasises that, especially in the field of N&N, workers and technical and scientific specialists represent — and must continue to represent — the greatest asset of socially responsible businesses.

Brussels, 20 April 2006

3.5.4.1 The Committee would also highlight, in this respect, the importance of steps to ensure safe production environments and processes, appropriate training for the relevant human resources, particularly in the medical diagnostics and therapeutics sectors, with a special focus on prevention and *ex-ante* risk prevention and assessment aspects. This could be achieved with the help of technical conduct manuals, certified at European level.

3.5.4.2 The impact on workers of the new working patterns needed to apply N&N in economic life, and of the training and health and safety requirements, must be carefully evaluated and researched by the European Foundation for the Improvement of Living and Working Conditions in Dublin.

3.5.5 The European N&N dialogue with all stakeholders should be put on an official footing by 2007, by establishing a consultative body or forum which should have the necessary visibility and transparency to act as a qualified and recognised partner for the media and civil society.

3.5.6 The successful awareness-raising pilot initiatives should be consolidated by 2007. They should be made visible as of now by linking them to the Europa web portal, and publicised among the European institutions, particularly the EP and the Council. They should also be given an international dimension with the establishment, in 2008 of the 'Interdisciplinary N&N Prize', to be awarded annually on the occasion of 'European N&N week'.

3.5.7 In 2006 the Commission should introduce certified methodologies to identify risks in the application and/or use of N&N and, in the first half of 2008, propose European guidelines in this area.

The President
of the European Economic and Social Committee
Anne-Marie SIGMUND

⁽³¹⁾ JCR: Joint Research Centre.

⁽³²⁾ CIP: Competition and Innovation Framework Programme (c.f. EESC opinion INT/270, rapporteurs: Mr Welschke and Ms Fusco.