Creating a **sustainable economy**

Investing in the future

Creating a sustainable economy

Colophon

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Combining Economy, Science
and Innovation for a better society

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Introductory note

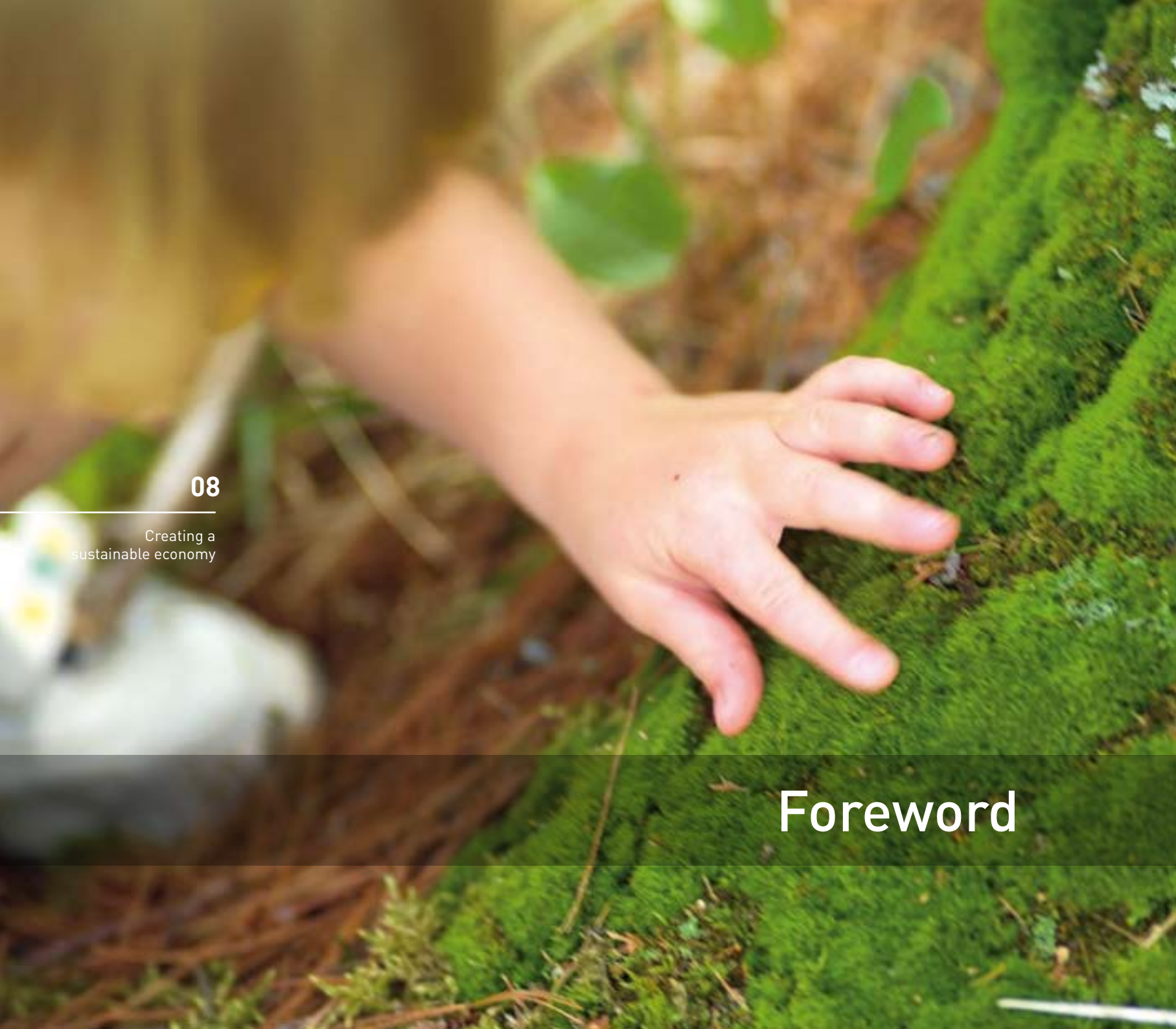
The articles bundled in this book represent only the opinion of the authors. They give an impression of what is happening in Flanders and beyond around the theme of sustainability.

More and more people and companies are actively pursuing this topic. It goes without saying that reality is much richer with respect to creativity and business sense than that which is contained in the following pages.

This publication especially wishes to demonstrate that collaboration is possible between government, the business community and science around the development of a sustainable economy. The book as such is intended to initiate a constructive dialogue around the way in which we finally can arrive at a sustainable society.

The texts provided below are, as it were, pieces to a puzzle that belong to a greater totality. What it now comes down to is creating a vision of what the puzzle should finally look like, so that we can (more quickly) put the pieces together.

More than ever, there is a need for a broad societal debate to realise this important goal over time. The broader the societal support, the greater the likelihood of success.



Foreword

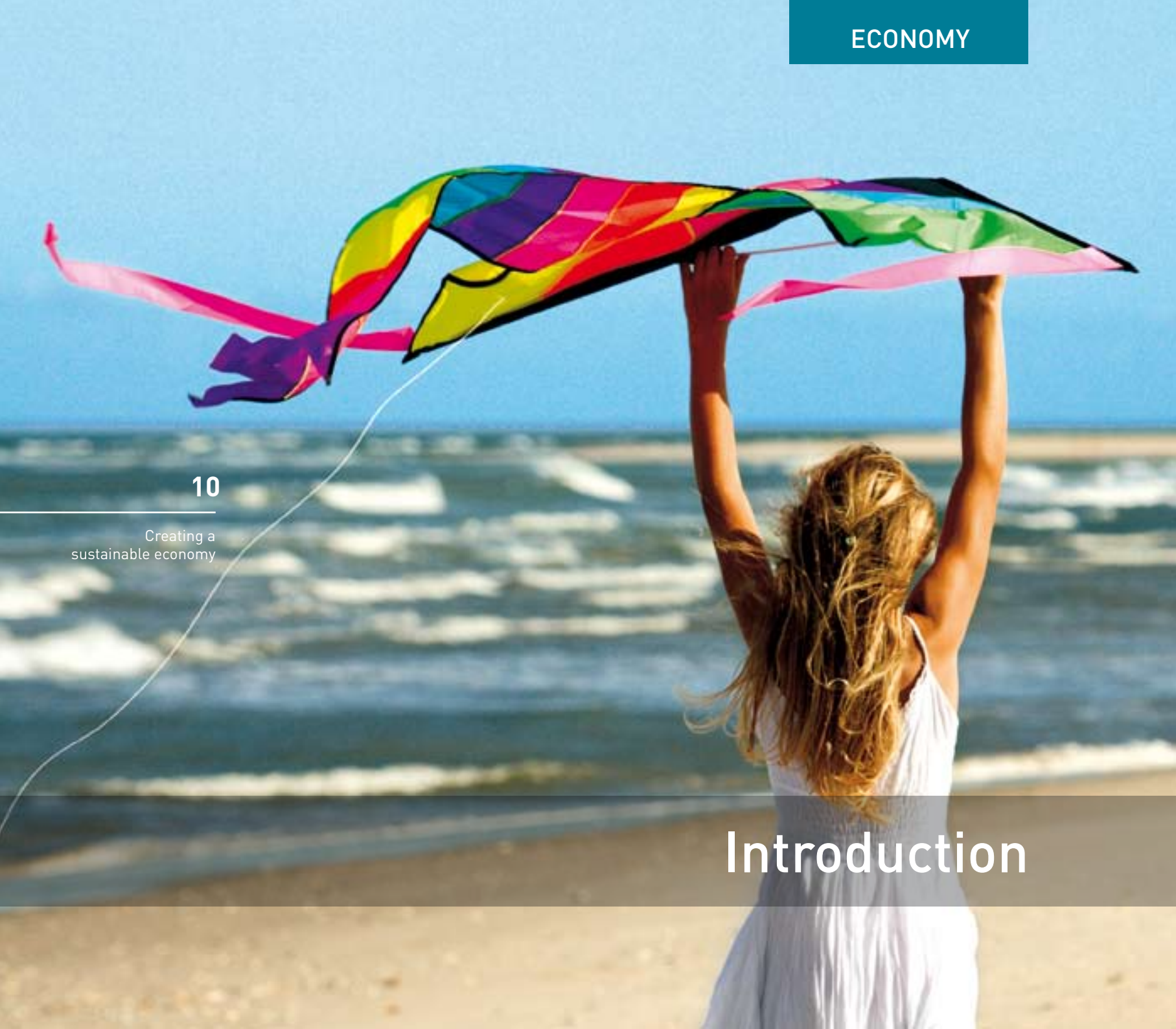
Patricia Ceysens
Flemish Minister for Economy, Enterprise,
Science, Innovation and Foreign Trade

Climate change, globalisation and high energy prices have never been out of the news in recent months. They form the no. 1 topic of conversation for many Flemish folk and business people. And rightly so, because our region faces the great challenge of continuing and consolidating our current standard of living in the future. Yet this challenge does at the same time offer many opportunities for Flanders.

In fact, the ground has already been prepared. In the field of *clean tech* for example, Europe is *the place to be*, as can be seen in the large number of patents applications lodged each year. In other words, we have plenty of home-grown knowledge, especially in Flanders, where, alongside fine universities, we can turn to strategic research centres like IMEC and VIB. But knowledge alone is not enough. It's all about research, development and enterprise (R,D&E). Added value is the message. Compared with the USA, there is still room for improvement.

This is a wake-up call to all Flemish people and companies to join forces, particularly with places of learning, in order to get a stream of green innovation under way. In setting about it, they can draw inspiration from a number of companies that have shaped their growth strategy around the new challenges. And I am personally convinced that Flanders is capable of achieving this. While a new dynamism in the domain of *high tec* was set in motion at the time with *Flanders Technology*, now – 25 years on – we must have the courage to initiate a *green tech* revolution. The greening of our economy will ensure jobs are created and offer many good international prospects for our companies. In this way, our economy will retain the nimbleness needed for sustainable growth in the future.

I hope that the various case-studies in this book will give inspiration to the reader on how we need to approach these challenges for the future.



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Creating a
sustainable economy

Introduction

Frank Vereecken
Prospective policy advisor
Flemish government, Ministry of Economy, Science & Innovation

Introduction

Almost two centuries ago, British economist Thomas Malthus suggested that our planet's reserves could not continue to meet our demands indefinitely. He warned that our very survival depends on taking this fact into account[1].

In 1972, the Club of Rome agreed with this proposition[2], albeit in a slightly less radical form. There were clear limitations to the economic growth of our society, but there was no longer talk of fatalism. Urgent measures were needed, however, to turn the tide:

"If the present growth trends in world population, industrialization, pollution, food production and resource depletion continue unchanged, the limits of growth on this planet will be reached sometime within the next 100 years."

A different approach appeared to be required. According to the Club of Rome, the earth not only has a limited supply of raw materials, but the planet also cannot continue infinitely to absorb the consequences of ever-increasing human activity.

In 1987, the UN World Commission on Environment and Development, under the direction of Gro Harlem Brundtland, reached a similar conclusion[3]:

"Over the course of this century, the relationship between the human world and the planet that sustains it has undergone a profound change. When the century began, neither human numbers nor technology had the power to radically alter planetary systems. As the century closes, not only do vastly increased human numbers and their activities have that power, but major, unintended changes are occurring in the atmosphere, in soils, in waters, among plants and animals, and in the relationships among all of these."

The Brundtland Report, however, also presented a solution to the problem. With a new approach – via sustainable development – it should be possible to better tune human activity to the limitations of the environment. Or to put it in the words of Commission Chair Brundtland herself: "to maintain human progress within the guidelines of human needs and natural laws."

Thus, the Brundtland Commission in a certain sense gave more focus to the position of the Club of Rome and pointed out the need to begin work immediately on sustainable development. Nevertheless, it still took a number of years of good intentions and empty decisions before, at the beginning of the 21st century, action was taken.

Common sense

The film *An Inconvenient Truth* by Nobel Prize Winner Al Gore, the persistent warnings by the International Panel on Climate Change (IPCC), but especially the fact that reality increasingly began to sink in, caused numerous world leaders to understand that delay was no longer possible. There is an urgent need for a global approach to the problem, a problem that clearly will not disappear of its own accord.

Sir Nicholas Stern in his – in the meantime infamous – report [4] two years ago, did not mince his words: doing nothing would come at a very high cost to our economy.

Reasons enough to roll up our sleeves and do something about it. As Jeffrey Sachs, director of the Earth Institute, repeated in the conclusion to his most recent work *Common Wealth*:

"Our generation's greatest challenges – in environment, demography, poverty and global politics – are also our most exciting opportunities."[5]

The balance between the needs of the continuously growing world population and the potential of the planet on which we live must be restored. There are various – sometimes compatible sometimes not – strategies to reach an equilibrium. Using raw materials more efficiently and developing new technologies offer the prospect of a better future: on the condition that the opportunities and technologies are actually taken advantage of.

Time is running short: based on the current trend, in 2050 there will be approximately nine billion people on earth. New technologies, but also other patterns of behaviour need approximately the same amount of time to work efficiently. Climate change, energy supplies, a rapidly growing population in Asia and the West's ageing population are major challenges.

If we can believe The Economist[6], there is, in any case, hope for a better future:

"In an age of mass innovation the world may even find profitable ways to deliver solutions to the 21st century's greatest needs, including sustainable clean energy, affordable and universal health care for ageing populations and quite possibly entirely new industries. The one natural resource that the world has left in infinite quantity is human ingenuity."

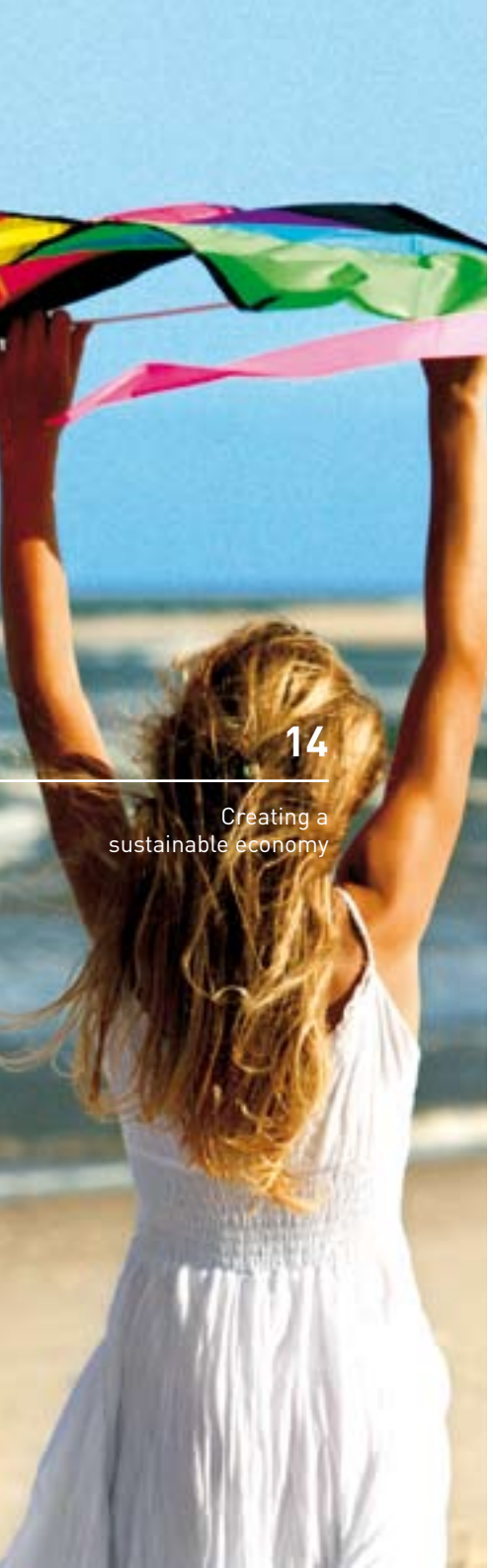
This, however, does not detract from the fact that we, as the Brundtland Commission stated twenty years ago, must take action quickly. We must change course if we wish to achieve concrete results.

Human activity is not only the cause of the problem, it also offers a solution. Economic growth is partly responsible for the extreme situation we are presently in. It is then also in this area that action needs to be taken. The economy can contribute to a large extent to the sustainable development of our society.

Corporate responsibility

An initial result of the change in mentality at the economic level is the growing success of enlightened or (corporate) social responsibility. The awareness is growing among many entrepreneurs that the internationalisation of the economy includes, in addition to limitations, also numerous opportunities. Doing business in a responsible and transparent way is not so much a cost, but more an investment, which in the end also benefits the operating results.

Another outcome of this new trend is the growing attention being paid to alternative energy. Here necessity and opportunity are very closely interrelated. Extremely large capital investments are required to bring about the needed change in the long-term. The present economic climate and the strong dependence of our economy on traditional sources of energy appear to contribute to a change in behaviour and to the development of concrete action plans.



More and more small, medium-sized and large companies are taking the risk to explore the path of sustainability. Key factors here are innovation and a healthy dose of creativity. Based on well thought-out scientific research and driven by a long-term vision, these companies develop products that offer a solution to today's challenges and contribute to a sustainable economic model.

There are numerous promising initiatives that are clearly headed in the right direction. A limited number of examples are included as illustration in this book.

The business world is slowly but surely realising that sustainable entrepreneurship offers good perspectives for the future in many sectors: on the condition that the notion of sustainability is, as it were, genetically linked to the structure of the company. It is not enough for company management to articulate a philosophy of sustainability; concrete results are also needed. A transparent, innovative policy, market-oriented research and well thought-out communication, linked to a clear vision of the future, are essential to the development of a sustainable strategic vision.

Corporate responsibility undeniably has put something in motion, something that can have far-reaching, positive effects for all of society. But while it all sounds quite nice, there is still a lot of work to be done. The interesting but occasionally divergent views on sustainable entrepreneurship as they are expressed in this book only serve to make clearer the need for a coherent, integral approach and a long-term vision.

Nevertheless, the strong gradations in experiences and perspectives offered do not stand in the way of the further development of a common sustainability strategy. In the end, a (sustainable) house is also built with strongly divergent building materials; it comes down to designing a coherent structure in which these materials can be developed into a strong totality.

"Let a hundred flowers bloom", as The Economist[7] expressed it so beautifully.

A sustainable economy

Of course, the abundance of sustainable initiatives in itself is not sufficient to provide our society with satisfactory guarantees for a better future. Moderation and adaptation measures must ensure that our society – the entire world population – not only can survive in 2050, but also thrive and be healthy.

Based on the numerous experiences in the area of sustainable entrepreneurship, we must develop an economic structure that makes possible the sustainable development of our society in the long term.

The economic actors, however, cannot bring about a sustainable society on their own. For this, a dialogue with the knowledge institutions is needed, and strategic consultations with the government is essential.

It is the government's task to stimulate scientific research and encourage creativity and innovation, to develop a sustainable long-term vision and to do everything possible to realise this vision via very concrete objectives.

The European Union as we know it today is the successful result of a plan that was initiated more than fifty years ago under the direction of Jean Monnet, a top French civil servant with vision and expertise. By laying the economic foundation for European unification, he with the support of a number of broad-minded politicians succeeded in developing a societal model that has clearly demonstrated its usefulness in the long run.

Today there is room, following this European example, to develop a prospective policy for a new economic model. Only a sustainable economy can guarantee our society a rose-coloured future.

Sustainable development is high on the political agenda of almost all Western countries. In the past years, the United Nations, the OECD, but also the European Union have made considerable efforts to draw international attention to the issue.

In the meantime, our country has also realised the crucial importance of achieving a balance between innovation, economic growth and ecology in mapping out a policy for the future.

The Flemish government clearly expressed this in its September Declaration[8] of 2007:

"Our possibilities for growth are conditioned by ecology. Dignified growth is not possible without sustainability. Intelligent inventions and wise investments will ensure that people and nature find a new equilibrium."

Flanders in Action

With the *Flanders in Action* plan, the Flemish government intends to translate this position concretely into a strategy that combines the forces of government, the business world and knowledge institutions around four central themes: innovation, talent, internationalisation and mobility.

There may be curbs on traditional forms of growth, but there is no limit to human ingenuity.

The *bottom line* here is again the sustainable development of our society. Success is only possible with the interaction of all the actors. Only by working together can we build a sustainable economy by 2020 that will ensure our society well-being and prosperity for the year 2050.

Sustainable development is not an obstacle to economic growth, but rather its motor, its mainspring: on the condition that this growth is realised in a sustainable way. Until now, the enormous adaptability and the imaginative power of humanity have always refuted the gloomy assertions of Malthus.

"There may be curbs on traditional forms of growth, but there is no limit to human ingenuity. That is why Malthus remains as wrong today as he was two centuries ago." [9]

It comes down to bringing enough insight, perseverance, creativity and courage to bear. The third industrial revolution, as it is often called, is slowly but surely gaining momentum. Our country was part of the two previous revolutions and may not be absent from this one.

To quote the Flemish government[10]:

"Flanders must be visionary, international and ambitious. We must realise dynamic economic growth, and at the same time also make social and ecological progress. Growth after all ensures our prosperity and constitutes the basis for our well-being; sustainability perpetuates this growth for the coming generations."

Endnotes

1 Thomas Malthus, *An Essay on the Principle of Population*, 1798-1830.

2 Club van Rome, *Limits to Growth,* 1972.

3 United Nations World Commission on Environment and Development, *Our Common Future,* 1987.

4 HM Treasury, Stern *Review on the economics of climate change*, 2006.

5 Jeffrey Sachs, *Common Wealth: Economics for a Crowded Planet,* 2008.

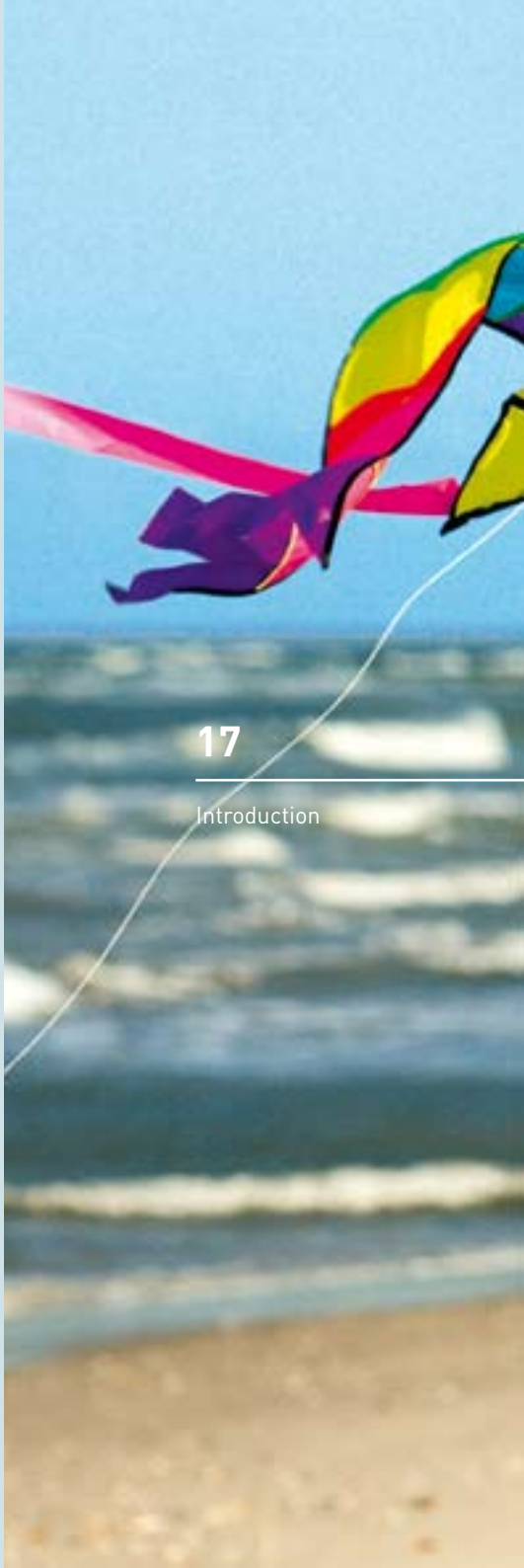
6 The Economist, *The Age of Mass Innovation*, 11 October 2007.

7 The Economist, *The Future of Energy*, 19 June 2008.

8 Flemish government, *Septemberverklaring 2007.*

9 The Economist, *Malthus – the False Prophet*, 15 May 2008.

10 Flemish government, *ibid.*



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Introduction

Innovation as a vital condition for a sustainable society

Karel Vinck
Chairman, *Flanders in Action* 2008
Chairman, Flemish Council for Scientific Policy

Introduction

"Where there is a will, there is a way. When people lack the will, they make excuses." For Karel Vinck it is crystal clear, when it comes to business, Flanders has to have the ambition to be a top European player. The growth, which we have to develop to achieve this, must not be achieved at our expense, nor at the expense of the environment or of future generations. After all, that is not necessary, because growth can also be sustainable and economically sound, states Karel Vinck.

Nowadays, many companies have already found a new balance between *profit, planet and people*. Through constant innovation in the field of products, company organisation, and institutional environment, we can ensure that Flanders enjoys a sustainable future. However, this does require open collaboration between companies, authorities, and knowledge institutions.

Karel Vinck has set the targets high. To him, FiA does not just stand for *Flanders in Action*, but also for Visionary, International, and Ambitious.

Flanders is prosperous. Our competitiveness is a source of prosperity and well-being. However, globalisation is putting our society under increasing pressure. This is why Flanders has to focus on the critical success factors of its socio-economic system; factors which are both our trump cards as well as our challenges. *Flanders in Action* underlines the ambition to hold a top European position. Our standard is not to be average, but instead to be at the top. If we are 'intelligent' enough, this will not be at our expense, nor at the expense of our surroundings or environment. Growth can also be sustainable, and environmentally sound.

In order to achieve a sustainable society and a sustainable economy we need creativity. Scientific, technological and sociological research is what is required to make innovation happen. Innovation is one of the most important resources to not only maintain our economic fabric, but also to renew it, and rejuvenate it. For Flanders, it is very important to also translate this innovation policy into sufficient new industry. Naturally, this does not mean that we should neglect existing industries. Activities and companies in sectors, which the innovation policy has seemingly passed by, deserve necessary attention. However, innovation would have to become a priority for every entrepreneur, large, small or medium-sized.

In Flanders, we have the knowledge available to take the lead, providing we dare to invest in innovation. Successful innovation can only be generated by intensive collaboration between the research institutions, the business world, and government. After all, innovation and progress are the product of an exchange of ideas and knowledge. The Flemish government mirrors its objectives to this basic premise by implicitly introducing the 'collaboration' principle in an increasing number of its policy measures.

In Flanders, we have the knowledge available to take the lead, providing we dare to invest in innovation.

It is essential and crucial that all decision-makers (business leaders, researchers and political leaders), the media, experts, pressure groups and academics, share their visions and solutions in the field of sustainable development and innovation. We have to focus on how we can really turn these challenges into real (business) opportunities, resulting in renewed growth and employment, and which will finally contribute to the creation of a sustainable economy in Flanders. We primarily want to advocate a daring innovation policy, which acknowledges and seizes opportunities. Not only in the traditional high tech sectors – such as ICT, new materials, nano-technologies, bio-technology, but also in sectors where that is not so obvious at first glance, such as healthcare and well-being, the social and cultural sector, and the logistics industry.

Sustainable business: profit, planet and people

Creating sustainable economic prosperity presupposes a strong dynamic. Companies have to adapt, employers have to change, old products are taken off the market and rebranded, and the workforce adapts to change. The most crucial factor is undoubtedly technological innovation.

The degree in which technological innovation can be introduced, creating new products, modernising processes, gaining a lead on other countries, briefly speaking, developing a sustainable economy in Flanders, will be all-important in the coming years.

The Brundtlandt commission, which prepared the Environmental Conference in Rio de Janeiro in 1992, defined 'sustainable economy' as a development which meets the needs of the current generations, without taking away any opportunities from future generations in order to meet these needs. Here sustainable refers to a total concept, with not only economic, environmental, town planning, but also social aspects. In short, we have to strive towards a balanced distribution of the three cornerstones: economy, ecology (or environment), and social/cultural, sometimes also referred to as the three P´s: *profit, planet and people*.

Companies traditionally focus on the *profit* aspect. In the past, companies primarily had to make a profit in order to be able to survive. Attention for Sustainable Business only came later. Today, we note that companies are increasingly accepting the challenge to balance out *profit, people,* and *planet*. Our economy is increasingly growing into a knowledge economy, in which the main focus is on the human capital, and in which the development of talent and competency is key. In addition, care for the environment in the media, in politics, but also in (large sections of) the business world makes us realise that we urgently have to heed the aspects of *planet* and *people*.

It is clear that many companies are changing their corporate culture in this regard. There is quite a lot happening as far as sustainable business is concerned. In this respect, multinationals have made more progress compared to the SMEs. However, many practical examples demonstrate that sustainable business can also be lucrative and feasible for SMEs. Scores of start-up entrepreneurs are only too aware of the benefits of sustainable business and implement this aspect, often coming up with original ideas. Only those companies that have an eye for innovation will be able to succeed in the future.

Triple innovation

In Western Europe a competitive economy will, now more then ever, be based on innovative ideas for products and production methods. Scientific research deserves extra encouragement. The European Barcelona objective to spend 3% of the GDP in research and development remains a priority for Flanders, in accordance with the Innovation pact. In addition, measures have to be taken to make the marketing process of the knowledge developed much smoother.

The recent report by the Soete group of experts informs us that Flemish innovation policy does not adequately target the SMEs. The latter represent a major section of the economic fabric of Flanders and they too are in need of innovation.

Today, we note that companies are increasingly accepting the challenge to balance out profit, people and planet.

This innovation not only concerns the field of products and services, but also the field of production processes, marketing, distribution, administration, and so forth. Companies have to dare to change direction and to adapt their *core business* to future trends. Only those who are prepared to put into place an innovative business model, can continue to grow into European or even world players.

Finally, there is also a need for structural innovation of the socio-economic environment: education, training, taxation, healthcare, and even culture. This structural innovation is mainly the government's responsibility, which has to create the conditions to even make possible the first two types of innovation, i.e. at the level of products, services, and processes. The Scandinavian countries have taught us that this latter type of innovation has to take place simultaneously and in harmony with the other two types of innovation. We have not quite reached this stage in Flanders.

Reconnaissance of the future: strategic choices for flanders

In order to continue Flanders' prosperity and well-being and to achieve a long-term sustainable economy, we have to aim at technological innovations which can effectively help to achieve this. In the process, we must bear in mind a globalising world, in which the innovation-driven knowledge economy will be generally accepted. If Flanders wishes to remain competitive compared to other regions, countries and economies, then we have to transform ourselves into a region with, on the one hand, an increasingly specialised industry, and on the other hand, increasingly knowledge intensive services. The options for the future are specialisation and differentiation.
We have to make strategic choices in R&D and innovation policy. Which priorities are we setting? On what will research institutions, companies, and government be focusing their efforts? On the basis of which criteria will we set those priorities, and how final will our choices be?
If we have a future-focused mindset, then we have to concentrate primarily on radical innovations, such as a process-integrated production chain or even system innovations. Furthermore, sufficient attention must be paid to technological development resulting in 'marketable' techniques, and this both on the basis of the needs of businesses as demand from potential users. After all, the results from the research have to be valorised.

If our mindset is set on the future, we have to focus primarily on radical innovations.

This can be achieved, for example, on the basis of reconnaissance studies, both by carrying out future reconnaissance and by drawing up *roadmaps*. These studies must enable identification of the market's top research needs, taking into account the criteria for the development of sustainable products, services, and techniques. On this basis, it is possible to design a clear development and business strategy. When making such choices, it is necessary to also take into

account the needs of the international market and the predictions for potential growth. The challenges and the concerns (*drivers*) of the various agencies in the relevant industries and fields, are also taken into account in these reconnaissance studies.

At the end of 2006, the Flemish Council for Scientific policy [VRWB – *Vlaamse Raad voor Wetenschapsbeleid*) performed such a reconnaissance study in order to develop the long-term frame of reference for technology and innovation in Flanders. This took into account, on the one hand, our own technological and socio-economic context, and the international trends, on the other hand. Some 130 experts from very wide-ranging fields were consulted in the process. The study resulted in a set of thirty main technological developments, which could be categorised into six strategic clusters.
This study offers all the interested parties – government, the business world and knowledge institutions – a map of all the strategic choices in the field of technology and innovation which can ensure Flanders' continued prosperity and wellbeing and thus contribute to the creation of a sustainable economy. On this basis, scenarios can be worked out, which contribute to the creation of economic or social added value for the medium and long term in Flanders. The overall vision is used as a source of inspiration and a guiding principle in designing a portfolio of policy instruments and for working out new research topics.

The thirty priority fields identified will be further refined by the Flemish Council for Scientific Policy (VRWB) as part of a follow-up project. Here the VRWB will be playing the role of facilitator/catalyst, in order to ensure that some trendsetters in a number of individual clusters take *ownership*. In real terms, these actions have already resulted in a number of project initiatives in all the three clusters, i.e. within the transport logistics cluster, the new materials nano-technology cluster, and the healthcare cluster.

The role of government

According to the American economist, Paul Romer, one of the core duties of government is to create an institutional environment in which knowledge, creativity and technological progress can flourish to the full. In the Flemish context, the innovation system is of major significance. In this respect, government has to make a commitment to institutional innovation by resolutely striving for policy integration and the combining of powers and competencies in the field of economy, innovation, and science. After all, economic growth depends on a number of factors – investment in infrastructure, education, training, R&D, health, and yes, even culture – which requires a co-ordinated stance and complementing policies.

Evolving European, national and regional legislation results in a demand for, and a response to, new technologies, and also has a positive impact on the changing economy. At the same

time, the uncertainty and unpredictability of this legislation present a risk to business activity in various sectors. Sustainable economic development requires adequate political decision-making and a suitable legal framework. The level of participation by all groups of society must increase, with extra attention being paid to minority groups. Existing structures, decision-making bodies, and legal frameworks have to be looked at critically. Where necessary, they have to be adapted in order to enable fast and efficient decision processes, which can ensure sustainable development. This is part of the *core business* and responsibility of the (European, federal, regional) authorities.

Collaboration is key

Research naturally does not automatically lead to sufficient innovation. This requires a more efficient national and regional innovation system. Innovation is the result of good interplay between research and innovation agencies. That interplay can be improved upon. We have to make the step towards an *open research and innovation system*, which focuses on active collaboration between all the agencies involved. In the current, fairly closed, intramural system all researchers are busy working on their own thing. They want to protect their own knowledge, without any potential academic or industrial partners benefiting from it. However, for efficient innovation this system is rather counterproductive. In the coming years, a very important item demanding attention in the *policy mix* will therefore also be the further stimulation of collaboration between the various agencies in the innovation landscape.

It is extremely important to fully tap into the knowledge that is available in Flanders and to strengthen it on both sides. More and improved mutual collaboration between the Flemish knowledge institutions, associations, universities and specialist colleges, between strategic research centres, competency poles and companies is absolutely necessary. It is only in this way that the European innovation paradox (which also applies in Flanders) of insufficient valorisation of knowledge into products, can be changed into a successful chain of innovation of ideas through scientific research to final application and marketing. In order to achieve this, more collaboration is therefore necessary between the agencies involved in Flanders and also beyond.
Networking alone is not sufficient. A spirit of *open innovation* and a readiness to collaborate has to be created. Finland has set an example in this regard. Finnish entrepreneurs were the first to understand the necessity to collaborate in order to conquer world markets. They saw the opportunities that ICT offered for faster networking. They were the pioneers in switching from a mentality of strict secrecy and individual competition to a sharing of competencies for worldwide competition between networks of complementary partners. The result is that Finland is currently one of the most competitive nations in the world and succeeds in combining increasing productivity with growth in employment, even in the processing industry.

Networking on its own is not enough. A spirit of open innovation and readiness to collaborate must also be generated.

Flanders has a number of valuable instruments available to help remove the innovation paradox. If we want to promote and achieve the implementation of new, sustainable technologies, then it is necessary to continue to follow up, assess and if necessary adjust the existing Flemish Innovation Instrumentarium in order to limit the risks involved in investment in these new technologies (See Soete report). Where necessary, we have to develop new policy instruments and promote innovation.

Cross-border innovation presents a second major challenge for Flanders as far as the future is concerned. On the one hand, this means that in order to achieve a sustainable economy, we have to adopt a multidisciplinary approach to R&D projects. We have to make use of knowledge and methodologies from various scientific disciplines. On the other hand, we in Flanders are faced with the major challenge of making our government-based innovation policy more international. In order to excel at international level and to take up a top European position, we have to focus as much as possible on converting knowledge into commercial products and services. By forming clusters and by strengthening innovation, we have to encourage creative and innovative entrepreneurship and create more *spin-offs*. Another crucial condition is intensive cross-border collaboration between knowledge institutions, companies, and intermediary organisations.

The influence of the European Commission on R&D is already significant due to the granting of financial support to research programmes and projects, and due to the power of the Commission to emphasise potential new market opportunities. The European Commission is targeting a third generation innovation policy, in which innovation holds a central place in the design of the entire policy: from culture through to economy, and finally to mobility, education and science.

A major challenge for the government consists in no longer remaining remote, but instead becoming involved as a regional player and partner in the network of the knowledge economy. This means acting as a driving force in close liaison with the other parties: the business world, the knowledge institutions, the trade unions and business leaders.
An original route is encouraging innovation from the aspect of demand. The government thus conducts a purchasing policy that is aimed at products/services, which are not yet in existence and for which suppliers have to engage in R&D and innovation before supply is possible – so-called public technology tenders. However, one should also not lose sight of traditional financial support for R&D by government. Public resources complement private initiatives perfectly. Furthermore, they act as a catalyst. Also, government from its independent position of authority is ideally placed to promote trust and collaboration between network partners.

Flanders in Action

In order to tackle this exceptional challenge of *Flanders in Action*, Flanders has to have Vision, be International and Ambitious. Where there is a will, there is a way. When people lack the will, they look for excuses. There is no need for us to make excuses. We simply have to find a way, and that is the 'shortest way in order to become and to remain one of the forerunners in the shortest possible time'.

Umicore on the way to sustainability

Thomas Leysen
Chief Executive Officer , Umicore

Introduction

How does one turn a historically burdened industrial company into a flagship of sustainability? How does one – literally and figuratively speaking – come clean with a less than sustainable past?
In any case, Umicore is proving that this is possible. With clear vision and by keeping its sights on the future, Umicore is clearing the decks of all its past inheritance. New policies have been laid down, based on eco-efficiency and social responsibility. The outcome is a company that is re-energised and steadfastly believes in a future that is just as sustainable as it is profitable.

In his statement, Thomas Leysen, Chief Executive Officer of Umicore, looks back at the eventful road that the company has travelled. It is a fascinating account of daring choices, open communication, and a clear vision for the future. This is a vision in which sustainable enterprise is no longer a compulsory or necessary evil, but instead a positive, strategic choice which is bearing fruit. According to Thomas Leysen "Sustainable development will make the difference between the traditional companies and the real winners".

For a mere 10 years, Umicore has been applying 'sustainable development' as a core concept in its company management. The introduction of this concept within the group coincided approximately with the time when the company left behind the very traditional name of Union Minière, and opted for a new, more forward-looking, strategic direction.

As a company with roots which go back as far as the 19th century, when the non-ferrous companies Vieille Montagne, Asturienne and Metallurgie Hoboken (later merged into Union Minière) were founded, our group has quite regularly been forced to make profound changes. Periods in which the business was thriving and flourishing were followed by deep crises.

In the early 1990's, the group again found itself in a deep slump. The mining activities in Congo, which at one time yielded great riches, had already been nationalised since 1967. The group had failed in its attempts to build a new mining empire elsewhere in the world. In 1989, Union Minière merged with its two main associated companies, Metallurgie Hoboken and Vieille Montagne. However, this emerging metals group was weighed down by a whole host of problems. The zinc and copper activities were not really able to compete in a world market, and were also intermittent. The more technologically focused materials activities, which the group had started, were still subcritical in size. The refining of precious metals at the important site of Hoboken was crippled by an out-of-date production process. In addition, the group was carrying a heavy environmental liability.

New vision for the future

The first step was to set up a socially radical but industrially ambitious restructuring plan. This plan consisted of major redundancies, linked to an impressive investment programme aimed at drastically modernising large sections of the production set-up. A number of activities outside of Europe had to be sold off to finance the plan. The restructuring was a success, and the group survived.

At the beginning of 2000, the group engaged in thorough strategic reflection about its future. We had indeed survived the crisis, but we still lacked a clear new vision for the future. After extensive debate, we recorded our vision for the future in a booklet entitled *The Umicore Way*.

We made fundamental choices. Henceforth, the group would concentrate on two activities, i.e. the development of high quality materials with extensive technology content and the recycling of precious and rare metals, which form the basis for many of these high tech materials. In previous decades, the company had already built up a certain level of expertise in this field, which was still subcritical in size.

The so-called *commodity* activities of copper and zinc, in which the group could really not stand out with technology (but which did account for half of the group turnover), would at an appropriate time be divided into focused companies, which were to concentrate on forceful cost competitiveness.

For Umicore itself, striving towards sustainable development became a primary objective. In the first instance, this applied to our way of operating, in which economic, environmental and social objectives had to be integrated as harmoniously as possible into the day-to-day running of the company's activities throughout the world. At the same, the necessity to achieve a more sustainable company was also seen as a strategic opportunity. After all, it had become clear that Umicore had the opportunity to build up unique strategic positioning by resolutely opting for the recycling of metals and to focus on *high tech* materials on the basis of special metals, which given their functionality, contribute to more sustainable development, in applications such as car catalytic converters and rechargeable batteries.

Besides a number of company management rules, Umicore's sustainability approach therefore also includes a clear strategic component.

Dealing with the past

However, before we could credibly incorporate sustainability into Umicore policy, we first had to deal with what we had inherited from the past. As a result of merging with and absorbing other companies, Umicore owned approximately ten industrial sites whose origins went back as far as the 19th century. Given that in that period, environmental awareness was virtually non-existent, extremely polluting emissions had been released into the air and water. These could still be detected in the soil and in some of the groundwater strata around these sites.

At first, the former Union Minière adopted a strictly legalistic approach. After all, the group had always acted within the law. The aim was to interpret the existing legislation with regard to decontamination as minimally as possible and to gain time. However, this approach did neither resolve the environmental problem, nor Union Minière's problems with its image. This meant that those difficulties were constantly being postponed to the future. This is why the new Umicore made a commitment to resolutely tackle the problems inherited from previous generations and to cease handing them over to the next generation.

The first successes with regard to the decontamination of the historical liability were recorded in the Netherlands, and also in Bulgaria. This is where the group had taken over a heavily contaminated copper smelting works. Together with the World Bank, a groundbreaking project was launched to tackle this decontamination quickly and thoroughly.

In Belgium itself, discussions were laborious, but after long talks and many technical studies we finally arrived at an ambitious result. In the spring of 2004, Umicore reached an all-encompassing outline agreement with the then Minister for the Environment, Jef Tavernier,

The new Umicore is dealing with problems from the past in order to safeguard future generations.

concerning the decontamination in and around the Flemish Umicore plants – the so-called 'Covenant'. Umicore made 77 million euros available for this purpose.

The agreement was that we would not only clean up the land on the sites, but also the contaminated land in the immediate vicinity of the plants (in residential areas). Together with OVAM (Flemish Public Waste Company), we set up a fund to clean up the contaminated areas up to a distance of 9 km from the plants.

Two years later – after being granted all the necessary licences – the work of digging up the contaminated soil in Hoboken, Overpelt, Balen and Olen finally went ahead. Most of the decontamination work is now behind us.

In France too, Umicore surprised the government, the local regions, and the press with its pro-active approach. In close liaison with the local authority, we are currently thoroughly preparing for the decontamination of the 150-year-old plant in Viviez. In the meantime, the decontamination of the Calais plant, which is now closed down, has also been completed.

A last aspect with regard to tackling the past, concerns the writing of the group's history. Umicore's story and that of its predecessors has, on several occasions, been closely linked with major controversial times in Belgium's world history. Thus, *Union Minière du Haut Katanga,* founded in 1906 under the impetus of Leopold II, was involved in the Katangese secession. Union Minière also supplied the uranium for the atom bombs which put an end to the Second World War. Umicore decided to open its archives to two company historians: René Brion and Jean-Louis Moureau. In 2006, their research resulted in a thick, highly readable reference work on Umicore's history, which has not skipped any of the more controversial episodes in the group's past. Umicore also collaborated fully in the task performed by the parliamentary Lumumba commission, which was set up to investigate the circumstances of the murder of the former Congolese premier.

Sustainability in the present

Given that, in the past, the group had already experienced the financial and other consequences of a not always sustainable policy, Umicore was all the more motivated in the year 2000 to include environmental and social responsibility in its policy principles.

The original environmental objectives – which between 2000 and 2005 primarily focused on the systematic reduction of emissions – were significantly extended with a whole series of social objectives for the period 2006-2010. In total, the group laid down ten sustainability objectives.

These objectives entail further improvement of the environmental and energy efficiency of each plant. Furthermore, Umicore wants to ensure permanent improvements with regard to the living environment by implementing integrated environmental management systems at all of its sites.

In addition, each plant has to develop an action plan for constructive commitment to the local community. Each plant has to take concrete steps in order to gain the status of preferred employer in its own local area. Equal opportunities is also a top priority.

Every three years, the level of satisfaction of the entire workforce is measured as part of an extensive workforce survey. Almost ten thousand employees from all parts of the world took part in the latest survey. Improvement activities are being designed on the basis of these results. Since the first surveys were started eight years ago, remarkable progress has already been achieved by adopting a systematic approach. The method used makes it possible to compare the Umicore results with a number of industry partners and with all those companies of the same country that participated in such a survey. This demonstrates that Umicore is clearly improving. Whereas some years ago, Umicore was only achieving average scores in comparison to the reference group, we are now classed as one of the better companies in virtually all countries. By 2010, we aim to belong to the absolute top companies as regards *people satisfaction*.

As part of the commitment to the local communities in which the group operates, a concrete objective was laid down for awards and sponsorship. 0.5% of the group's annual operating profits are spent supporting worthy social causes, in sponsorship or other activities linked to our company vision of sustainable development. Two thirds of this amount is spent locally on local initiatives; the remainder is awarded at group level.

Thus, Umicore contributed an amount of one million euros as a founding partner of the *Princess Elisabeth* research station, which is currently being set up on the South Pole. This is the first *zero emission* polar base which will run virtually entirely on renewable energy. The base will carry out research into the climate change phenomenon, and will in this process make use of the South Pole as 'memory' of our climate.

In addition, Umicore has, for quite a number of years already, also been the main sponsor of the *Umicore Solar Team.* This team consists of a group of students and freshly graduated engineers from Louvain, who in 2007 came second in the World Solar Challenge in Australia, the unofficial world championship for solar energy driven vehicles. The Umicore Solar Team used the Umicore supplied base materials for their highly efficient solar batteries. The team built its own car, which was able to withstand a three thousand km long race, and which was sufficiently light and aerodynamic to end at the top of the race.

All manner of local projects to support the local community have been incorporated into the *Umicare* programme. Thus, Umicore supported the reconstruction of a help centre in the area of one of its sites in Asia, and the group built a sports hall in Guarulhos, Brazil, to keep local youngsters off the streets.

As a company, Umicore is naturally also member of the World Business Council for Sustainable Development, the organisation whose membership consists of world-wide companies with a clear commitment to sustainability. The Umicore share is also part of a series of sustainability indexes, such as the *FTSE4Good*, a Financial Times index which only encompasses a handful of companies from each industry and which operates on the basis of strict selection criteria.

Umicore not only imposes a strict code of behaviour upon itself and its workforce, but also upon external suppliers. Thus, there is the example of cobalt ore from Congo. Local companies that want to supply to us have to meet a whole range of conditions: no child labour, be fully compliant with its licences, comply with international standards, etc. Compliance with these requirements is monitored by Umicore on a regular basis. More than one supplier has been refused as a business partner after failing an audit.

Sustainability as a strategy

Umicore views sustainability first and foremost as a strategic opportunity. The question of sustainability is a top priority in each strategic exercise of our various divisions. The range of technologies and competencies within the group, have in the last ten years primarily focused on products and processes which can contribute to a more sustainable society. The principle of eco-efficiency plays a major role in this, for example, by generating economic value with less environmental impact. This is achieved through lower energy consumption, reduced consumption of scarce raw materials, generating less waste and less harmful emissions.

An excellent example is the development of car catalytic converters. On the one hand, legislation imposes increasingly stringent rules upon car manufacturers with regard to the emission of harmful substances, and on the other hand, the manufacturers want catalytic converters which require as few expensive, precious metals as possible. This is a dual task for Umicore as a leading manufacturer of car catalytic converters, for which enormous efforts are made every year in research and development at our research centres in Belgium, Germany, the United States, and Japan.

The question into sustainability is a top priority in each strategic exercise.

Recycling – as a form of managing scarce raw materials – also plays a central role in the company strategy. Given that metals are infinitely recyclable, materials solutions offered by Umicore can often be brought back into the value chain, and this time and time again. The

importance of recycling in these times of high demand for materials is emphasised by the high increases in prices of precious and rare metals, such as platinum, rhodium or indium. These materials are becoming more important for increasing the efficiency of everyday high tech applications.

In Hoboken, Umicore built the largest recycling plant for precious metals in the whole word. In the past ten years, more than 250 million euros have been invested to make the plant even more efficient. The plant is supplied with electronic scrap, old mobile phones and used catalytic converters, which are then given a 'second life'. The technology at the Hoboken plant is unique, and is the result of years of perfecting. The high profitability of the Hoboken plant proves that economics and environment do not have to be at loggerheads.

Recycling also offers the advantage in that it is much more efficient than the primary extraction of metals. Recycling requires approximately 75% less energy compared with the production of metals from mined ore or minerals. Thus, an independent institution has calculated that Umicore Hoboken saves approximately 350,000.00 tons of CO_2 in comparison to the production of an equal quantity of metals from the traditional chain of supply.

For many years already, Umicore has generally been focusing on the development of materials solutions for the so-called 'clean technologies'. Some 80% of our research and development effort is spent on the development and perfecting of materials for fuel batteries, highly efficient solar batteries, car catalytic converters, rechargeable batteries, and catalytic converters for combating industrial greenhouse gases, and the continuous perfecting of recycling technology.

This strategy is bearing fruit and the figures speak for themselves. Almost one in three cars in the world runs with a Umicore catalytic converter. One in four laptops and mobile phones works on rechargeable batteries whose ingredients were supplied by Umicore. And the bulk of satellites launched use our highly efficient germanium disks in their solar panels. Furthermore, Umicore collaborates with the Norwegian company Hydro in order to develop new, more energy efficient breakthrough technology for the production of pure silicium for solar batteries. Finally, Umicore is also developing a catalytic converter which can counteract the majority of greenhouses gases during the production of artificial fertilisers.

Today, just over half of the Umicore turnover and profits is derived from this wide range of *clean technologies*.

Today, just over half of the Umicore turnover and profits is derived from this wide range of clean technologies.

Transparency and open communication

Transparent reporting is crucial in Umicore's approach. By publishing clear objectives and by

Communication on environmental aspects has equal status with information concerning economic results.

making a commitment to communicate progress to the public at least once a year, it is clear to the entire organisation that it means serious business. Less environmental efficiency in a division, or the lack of progress on a number of social parameters is reported just as clearly to the outside world as disappointing business figures. This on its own has already triggered an enormous dynamic towards progress.

In 2005, Umicore opted to replace the traditional annual report to the shareholders by a broader report to the shareholders and society. As a first for Belgium, this included the environmental report which was placed on an equal footing with the business report. In 2006, that report was awarded the prize for the best sustainability report, awarded by Business & Society and the Institute for Company Auditors.

Every year, Umicore also organises a 'general stakeholders' meeting' in Belgium, just after the annual shareholders' meeting. Guests invited to this meeting include a number of organisations and individuals who have an interest in our activities, such as local authority representatives of the towns around our sites. The top management of Umicore then elaborates on this report, followed by an open discussion.

The main sites world-wide are encouraged to publish local living environment reports for their area.

Conclusion

Umicore has covered a lot of ground in a relatively short time. The group has made a far-reaching commitment to clearing up historical contamination and has spent significant amounts of money for that purpose. This decision has enabled the group to clear up its past and not to burden future generations.

Year upon year, progress is recorded in achieving the objectives in the field of sustainable development. And these objectives do not form the ultimate goal, just as the legal requirements only represent a minimum threshold for Umicore. Where possible, Umicore will exceed its targets and aims to be a trendsetter.

The sustainability logic, so powerfully bound together under the concept of 'eco-efficiency' – economically and environmentally efficient – is weaving its way throughout our entire organisation. And the outside world is slowly but surely starting to recognise and identify with the new Umicore and *The Umicore Way*.

The course has been set, the voyage has been planned, and the group is well equipped. However, there is still a long way to go. Umicore's heart-felt ambition is to belong to the top international companies in the (materials) technology industry. This therefore requires that our entire workforce fully subscribe to the Umicore vision. This also applies to the many employees who have come on board as a result of fast internationalisation. This is not always so straightforward. In some regions which are in full economic development, a sustainability approach can sometimes be considered as a mere luxury, a rich people's way of thinking.

The shareholders have certainly already judged the Umicore story on its true merits. Since the year 2000, the share value has increased six-fold. This also immediately demonstrates that the financial markets are not just interested in the short term. Umicore is one of the few Belgian *blue chip* companies that does not publish any quarterly figures. Such a success story is only possible if the company management adopts a clear vision and communicates it clearly and unambiguously.

Of one thing we are convinced: sustainable development will make the difference between traditional companies and the real 'winners'. Those winners work entirely to a focused strategic vision. They are able to motivate others and thus to attract the best staff, who have the talent that is necessary to make our future society *really* sustainable.

Notes

[1] Thomas Leysen is currently the CEO of Umicore. On 19th November 2008, he will take on the role of Chairman of the Board of Directors of the company. On 17th April 2008, the author also became the Chairman of the Federation of Belgian Businesses [Verbond van Belgische Ondernemingen (VBO)].

Sustainability in the technology industry: from cost-efficiency to innovative partnerships

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Introduction

As the federation of the technology industry, Agoria wants to play an active role in the sustainability debate. Agoria provides information, heightens awareness, organises, manages, and provides support. There is a definite need for this expertise. Sustainability has now grown into much more than the purely efficient use of raw materials and energy.

Companies are on the lookout for partners to enter into long-term project agreements. Where large-scale investment goes hand in hand with commercial risk, coalitions are being entered into in order to limit those risks.

In the technology industry, these developments have already led to tangible results. The article below lists examples in the field of materials, energy, mobility and infrastructure. These real-life cases from the construction sector, the car industry, and the healthcare sector speak for themselves.

For Agoria the situation is as clear as day. Companies are changing their way of thinking. Sustainability is becoming a deliberate choice.

Major challenges, major consequences

In 2050, the earth will be home to nine billion people. Each individual will aim to have the same living standard that we are currently enjoying in the West. It is expected that in 2050, the seven strongest up-and-coming economies will be 75% larger than the seven biggest economies we see today[1]. For example, from an economic point of view, Indonesia and Mexico will carry more weight than the United Kingdom or Germany. Therefore, in the coming decades, the economic centre of gravity will have shifted away from Europe and the U.S.

We will see a spectacular rise in the demand for raw materials and energy, and this when in the coming years we will be reaching the peak in oil production and the reserves of our most important source of energy will be starting to decline. The now already high energy prices will remain structurally high. Companies, families, the transport sector, etc. will naturally be producing in more energy efficient ways and will make more rational use of energy. However, this will not suffice. The structure of our energy mix will have to change, and will have to become more varied. Furthermore, we will also have to review the organisation and the integration of the different production sources. Renewable energy will become a dynamic market in its own right. There is great opportunity here for new players and existing companies.

The reality of climate change is now generally recognized. Its impact can hardly be predicted. With so much insecurity, it is wise to be prudent. Environmental and energy standards are being tightened up, and justifiably so. The *stakeholders* have all come to realise the sheer magnitude and the complexity of the challenge, and companies are also trying to anticipate this context.

Scientific and technological changes and the need for cost control will also bring about drastic changes in our healthcare system. Some are predicting heavily decentralised health systems, with increased focus on preventative medicine. However, others visualise the growth of real hospital cities. In quite a number of Western countries, and certainly in Flanders, the impact of an ageing population will be strongly felt. This both from a financial as well as from a social dynamic point of view.

In recent years, we have seen scientific and technological innovations, but also innovations in business organisation and business models have arrived in quick succession. Markets are often particularly dynamic and unpredictable – the ICT sector being a good example of that. No company is able to build up all the necessary know-how in-house. This is why companies are increasingly opting for open innovation models, whereby large companies act as a technological platform for a network of smaller innovative partner companies. This not only applies to companies, as universities are also organising themselves internationally. Collaboration is key in the global economy.

Cost-driven environmental and energy policy

Despite increasing their production, industrial companies from the Agoria sectors are gradually reducing their electricity consumption.

Originally, companies' sensitivity about sustainability was primarily a defensive reaction to the changing environmental and energy context. More stringent environmental and energy standards and also particularly high energy prices, have for quite some years already increased energy and environmental efficiency in the technology industry.

A three-yearly survey by Agoria into the environmental and energy efficiency of its members[2] clearly proves that the industry has made and continues to make major efforts in this area. Despite increasing production, industrial companies from the Agoria sectors are gradually reducing their electricity consumption, and are also using less water, for example. Things are also looking up with regard to a whole range of emissions. As a federation, Agoria itself runs campaigns to support companies in their efforts to adopt a more frugal attitude towards raw materials. For example, just recently we have seen the development of the *Pluviotest*, which is a tool to help companies to calculate whether it would be financially viable to use rainwater instead of mains water.

With regard to the implementation of environmental and energy standards, companies are now playing a much more active role. Systems, such as the benchmark and audit covenants and the creation of emission offsetting or working with specific certificates, are not only leading to a more optimum distribution of the effort, but are also encouraging companies to go in search of new technologies. The financial flows created by this, are generating an investment framework which quite a number of economic players are keen to take advantage of. We are now witnessing the successful creation of CO_2 and other green investment funds, which will no doubt grow in importance. This is also immediate proof of the cultural turnaround that has been achieved with regard to sustainability, which is also noticeable in industry.

Innovation-driven approach

Industry's approach to sustainability has undergone major change in recent years, and this not only in the field of environmental and energy management. Sustainability – in the wider sense of the word – is increasingly becoming a strategic driving force, instead of people having a reactive attitude to it. Companies are realising that a long-term approach in an innovation-driven economy is an essential component of the company's own strategy.

Naturally, short-term results are still important, especially when company shareholders are primarily focusing on generating short-term value. However, shareholders increasingly have

an eye for the longer term and for the bigger picture. Some of the larger pension funds with carefully targeted sustainability focus are a good example of this. *Stakeholders* are also having a more tangible effect on companies.

A number of major, often global changes are resulting in companies developing other products, adjusting their market approach, and even amending their own business model. The ultimate aim to achieve is sustainable growth.

A combination of innovative techniques can also contribute to sustainable growth. Thus, Volvo Europe Truck became the first CO_2 free company in Belgium to opt for a combination of bio-mass heating, electricity production by wind turbines, and hot water supply by solar energy to meet its energy needs.

It goes without saying that companies are not always able to come up with answers to the larger, long-term changes themselves. Moreover, it is appropriate to share the risks and expense of specific strategic choices. Joint ventures are therefore a logical step when companies want to integrate *sustainability as a guiding principle* into their own strategy.

Examples from the technology industry

Within the Agoria sectors there are quite a number of examples of concrete collaboration on sustainable projects. It is not a rare thing to see joint venture agreements incorporating both innovation projects as well as actions aimed at *business development* in more mature markets. This seems logical, given that companies must always be able to reconcile output with a more strategic and proactive approach. We not only notice this in new sectors of growth, but also in the more traditional sectors.

Materials

Metals can be recycled ad infinitum.

Flanders has long held a leading role in the production of non-ferrous metals at European and global level. In recent years, companies from this sector have invested heavily in technology in order to further limit their environmental impact, and also to address historical contamination. These investments have often led to new technologies, which are recognized at European level as the *Best Available Technology* and thus become a benchmark.
The *cradle-to-cradle* principle in the design of applications for metals and materials is becoming more widely accepted. This focuses on maximum recycling. For example, metals can be recycled ad infinitum. Flanders' enormously strong position in metal and materials recycling is a major asset.

Sustainable use of materials goes even further than recycling. Concepts, such as *ecodesign*, and the search for higher application functionality, *doing more with less*, are important and are already being adopted to the full by a whole host of companies in the sector. A plethora of innovations in base metals and materials are helping to create applications which offer major added value. Just thinking of catalytic converters for cars, rechargeable batteries, soot filters, solar batteries from light materials for the aircraft construction and transport industry.

In this respect, Agoria acts as a platform for networking and exchanging experience, with strong integration into the European network. Thus, the necessary knowledge is built up and disseminated. A concrete example of this is the development of a suitable methodology for gauging the risks associated with metals. The build-up of knowledge through projects such as MERAG[3] will, for example, help to comply with the far-reaching obligations imposed by REACH or to guarantee better support for environmental quality objectives for metals in surface water. It is also not a rare occurrence that important content input can be provided to government. Another example is the social agreement at European level concerning the problem of inhalable quartz sand. Here the foundry sector has itself taken the initiative for a voluntary metering campaign, in order to acquire the necessary know-how to subsequently achieve a considerable reduction in exposure on the work floor, in liaison with the *stakeholders*.

In addition, Agoria itself also particates in prospective networks aimed at the longer term, such as the transition network for sustainable materials (the so-called 'Plan C'). This offers the possibility of joining in with the development of highly innovative concepts, which represent added value both for the companies as for Flanders. Thus, Flanders will, in the long term, remain a forerunner in sustainable materials.

The metals and materials sector clearly demonstrates that legal requirements directly result in real innovations, which are also finding their way into Europe. Such technological breakthroughs can, in the long term, bring about major change in a sector – such as the materials industry. If the sector manages to successfully withstand this transition, this again means a strategic asset for the sector and for Flanders.

Renewable energy

By 2020, Belgium must source 13% of its energy from renewable sources. The overall European standard is 20%. In countries of growth, renewable energy is also receiving increased attention. Even in the U.S., a whole movement has got underway in recent years.

At present, it is unclear which renewable production technology will turn out to be the most successful. It looks as if several, strongly diverging technologies will be necessary to meet this energy shift: wind energy, solar energy, biomass, biofuels, etc. The development of so-

At present, it is not clear which renewable production technology will be the most successful.

called *intelligent networks* between the decentralised production units with maximum storage and distribution of the available energy will be of decisive importance.

The Generations II project, which is also supported by Agoria, is in the first instance aimed at making a proactive contribution to the Flemish industry acquiring a greater share on the international market for renewable energy technology through innovation and strategic market positioning. Building up a stronger position on the international market will naturally also put renewable energy production in Flanders on the map.

On the Generations II project, the industry federation, suppliers of components and materials, engineering agencies, energy suppliers, project developers, universities and knowledge centres and service providers work together on the screening of concrete O&O projects and market opportunities. This also includes *technology watch*, and it actively promotes the sector of renewable energy.

The Agoria business club (AREC) was recently founded in connection with the Generations II project. Its focus is on business development at home and also abroad. Experience has shown, for example, that a collective approach is useful when applying for large tenders. Main contractors and authorities issuing tenders often prefer to work with well-organised groups of suppliers.

Rational use of energy

Besides renewable energy, rational use of energy also represents an important aspect of sustainable energy policy. In this respect, the industry has already made major efforts. However, many energy-saving opportunities still remain unexplored.
The largest clear-cut potential, the most controllable cost, and the main cost-effective savings can be achieved in commercial buildings (tertiary sector). This represents on average approximately 30% of total energy consumption.

So-called active components represent a very important aspect of rational energy use in homes but also in office buildings. These are reactive components which adapt to changing internal and external conditions. For example, lighting controlled according to the strength of incident light or the presence of people. These can make a major contribution to achieving the set objectives; i.e. reducing greenhouse gases and increasing energy efficiency. These energy-efficient techniques can sometimes already be available today, being technically proven and perfectly feasible from a financial point of view.

In order to promote these solutions and services for these underused opportunities, Agoria has launched a platform to bring together companies operating in active com-

ponents for the tertiary sector. The emphasis is on market development, given that there is already a plethora of opportunities available with the existing products and technologies.

Mobility and infrastructure

Everyone is clear about the fact that Flanders has a mobility problem. The situation threatens to become untenable in the long term. Large-scale investment in road infrastructure is becoming rather an exception in Flanders, despite increasing traffic and increasingly saturated roadways. The policy talks about filling in the gaps, such as the linking of the Antwerp Bypass. There is increasing interest in the use of traffic technology and telematics – also known as Intelligent Transport Systems (ITS) – to meet the growth in the number of journeys made and to manage traffic flows in a sustainable way. This same ICT infrastructure is used for a virtually unlimited number of applications and services, which equally have an impact on traffic safety, traffic flow, accessibility, and the environment. These developments are taking place both in the public as well as in the private sector.

Major challenges and files facing the Flemish authority are, for example, a master plan for traffic management (variable signage, traffic centres and detection equipment in all locations which suffer from structural traffic queue problems), a toll system for lorries (extendable to all cars) and so-called co-operative systems (technology whereby vehicles communicate with each other and the roadside, such as with traffic lights). Together these developments represent government investment to the tune of several hundred million euros.

In addition, the private sector will play an increasingly important role in the field of traffic management. Drivers now prefer to follow their GPS system rather than the local authority signs, a trend which will increase even further with the introduction of *connected navigation.* For quite a number of private applications coming onto the market, the government will have to develop a framework in which private players can compete to supply these applications – often with government support. Examples are multimodal travel information (the extension of navigation by road to a multimodal context), eCall (automatic emergency calls from cars) and intelligent speed information (the use of an up-to-date, public speed signs database by the private sector).

The authority – as the administration – is by definition not always well placed to implement this transition to new solutions itself. The message here is also to form partnerships. The Agoria partner organisation Telematics Cluster/ITS Belgium (Intelligent Transport Systems Belgium) has therefore drawn up a design for a test and research centre for ITS and telematics, in which different parties can develop new technologies together and perform extensive tests. Support of such a test field must, from the authority, offer a facilitating framework for managing complex ICT files to that same authority.

The private sector will play an increasingly significant role in the field of traffic management.

The lighter the vehicle, the less energy it needs to move.

Product development vehicle construction

A beautiful example of joint innovation on sustainability is Flanders' DRIVE, the competency pool and innovation platform for the vehicle industry in Flanders. It aims to strengthen our competitive position at European and global level by focusing on innovation. It therefore assists suppliers to the car industry with knowledge and infrastructure. Flanders' DRIVE is an initiative of a whole range of companies: manufacturers and suppliers, Agoria Flanders, as well as other knowledge centres. The competency pool is supported by the Flemish authority (IWT).

Vehicles are becoming increasingly comfortable and safer. Unfortunately, this also adds to their weight, which means that they require even more fuel and therefore emit even more CO_2. The car manufacturing industry endeavours to resolve this, for example, by producing more economical cars. However, that on its own does not suffice. The total weight of a vehicle has to be reduced. The lighter a vehicle, the less energy it will require to move. That is why lightweight materials play an important role in vehicle production. At the same time, innovation in this field can bring about progress in the field of design and functionality. With this in mind, Flanders' DRIVE works out two business cases, in collaboration with Agoria Flanders, the Institute for Promoting Innovation through Science and Technology in Flanders (IWT) and the industry.

The first *Integrated Lightweight Door Concept*, is aimed at the development of lightweight doors for mass produced vehicles (especially cars). This market is enormous and in Flanders there is considerable know-how available, even though the threshold is high. Collaboration is therefore key. For consumers the new door concept naturally offers clear added value. A weight saving of 40 kg in a four-door car means approximately 2.7% of the total weight. This results in an energy saving of 1.8%.

The second project, *Weight Reduction Design and Production Solutions for TBI* (Trucks & Trailers, Buses, Industrial, Agricultural, Recreational & Special Vehicles), is aimed at the smaller-scale sector. This is indeed a niche market, but one which is well represented in Flanders. In contrast to cars, the decision-making centres are located here.

The TBI industry has the same requirements as that of the car manufacturing industry. Here too, there is a desire to reduce fuel consumption and to limit CO_2 emissions. There are even specific additional requirements: lightweight buses offer extra loading capacity, lighter caravans require less driving force. In such vehicles, an average weight saving of 5% results in a 3.5% reduction in fuel consumption. TBI manufacturers are currently hardly working together in this field. A supplier working for bus manufacturers rarely exchanges ideas with his colleague who supplies to recreational car manufacturers. Yet again, a manufacturer of combine harvesters does not enter into a dialogue with bus manufacturers. There is therefore an enormous potential for synergy between these parties. Flanders' DRIVE wants to combine the research into common technological requirements. This favours large-scale working, which each company on its own would not be able to achieve.

In any case, these examples from the vehicle industry demonstrate how sustainability and the economically strengthening of a highly competitive industry can go hand in hand, by combining product development.

Sustainable construction, accessible construction

16% of the population have some disability, and the population is ageing quickly. In 2030, approximately 25% of Belgians will be more than 65 years of age. This steadily growing section of the population requires mobility, safety and comfort, and rightly so.

An accessible living environment and services are basic rights resulting in full social integration and participation by everyone. Full accessibility means that all buildings, the entire environment, and all services are accessible and usable by everyone. This presents quite a number of challenges: suitable lighting and logical signs, new communication tools, increased equipment user-friendliness, speedy availability of vertical transport, completely different services, and so forth.

Existing products and technologies are often not sufficient. Products, however, are more efficient than ever, but they are not necessarily user-friendly for the 9-99 age bracket.

The importance of a drastic rethink of building products goes beyond the company level. Highly specialised knowledge is often indispensable. That is why companies are working together on joint research projects. Sometimes cross-pollination between industries and disciplines can be necessary in this process. A concrete example is the use of lifts in the event of a fire, which is of vital importance to people who are less mobile. Bringing such fireproof lifts onto the market requires lift designers to collaborate intensively with specialists in fire protection technology.

Agoria sets up platforms to support these innovations. There companies are encouraged to brainstorm among themselves about specific changes, and also to initiate cross-pollination between technologies or collective O&O projects. In addition, the platforms create a synergy between government and business action. The creativity of all parties concerned is used to the full. In the long term, this results in an impressive network, which actively supports the sustainability and accessibility policy.

A concrete example of collaboration between different companies and government is the non-profit organisation ENTER. This is a collaboration project based on the theme of life-long living. It was launched by the Flemish administration together with five partners, including Agoria Building Products. In the first instance, Agoria heightens awareness in the industry regarding the importance of developing products which are suitable for life-long living. The intention is for the concept of 'designing for everyone' to become more widely adopted by a larger group of companies and naturally to bring actual products onto the market.

Drastically rethinking building products surpasses the interests of the individual company.

The needs of human beings and society therefore go far beyond energy-wise, environmental-friendly and safety-conscious thinking. For companies, inclusive and full accessibility has become an integral part of fully implementing the concept of sustainability.

E-health: innovation in healthcare

The eHealth platform was launched by Agoria ICT at the end of 2006. The platform promotes innovation and collaboration between ICT companies in the healthcare sector. The aim is to develop and to promote innovative products, services and solutions for the Belgian and international market.

The basic premise was that, in order to improve patients' healthcare and to reduce costs associated with this, it was necessary to further develop the range of technological products available in the medical sector.

Starting from a strategic thinking exercise based around a number of healthcare trends (for example, online monitoring, high quality home care, and a more personal approach, changing the patient-institution-doctor relationship through more efficient knowledge and data management, sophisticated diagnostic display systems, etc.) a number of concrete projects have been designed which companies will implement together.

Examples of the selected projects are: an integrated platform for follow-up of blood products *(Blood Products Tracking)*, a system for quality measurements in hospital management *(National Balanced Scorecard)*, improved follow-up of hearth diseases with the help of technology *(Chronic Heart Failure)*, design of a standard package for monitoring using illness sensors *(Smart Health Surroundings Platform)*, and electronic data exchange regarding medication between healthcare institutions for the elderly and pharmacies.

The accompanying brainstorm sessions actively involve industry and experts, and also a whole range of *stakeholders*, such as doctors, nursing staff, hospitals and rest homes, government institutions (Knowledge Centre of Social Security, the National Sickness and Invalidity Insurance scheme - RIZIV, the Federal Government Department for Public Health), and knowledge centres. The input for the actual projects therefore came both from the manufacturers and the users. The international perspectives were also included in the selection.

The input for the actual projects came both from the manufacturers and from the users.

What is important is to jointly create economic added value (new local and international markets) through the creation of social-societal added value (the integration of technologies in a patient-friendly manner in a relatively cheaper and more sustainable healthcare system). In this case too, we see that companies are opting for collaboration in order to develop sustainable solutions.

Together for sustainable growth

The changes outlined above will have extremely significant consequences for our society and companies. If we want to maintain our prosperity and buying power and achieve sustainable growth, then we have to make choices. These choices are strategic in nature, and also have implications for companies which reach far beyond mere short-term efficiency considerations. Whereas to industry sustainability initially meant efficient use of raw materials and energy or the correct implementation of environmental obligations, companies themselves are now increasingly becoming *stakeholders* in the wider sustainability debate.

What is noticeable is that companies are often seeking out partnerships for projects which are further on horizon. This can be partly explained by changing innovation strategies (open innovation). Furthermore, it is also logical that in a situation of increasing commercial insecurity and increasing developments costs, companies are starting to share these risks through joint ventures. However, a significant number of companies seem to have also changed their way of thinking. This is due to the realisation that the changes outlined are also positive for the company itself. This is sustainability as a conscious choice.

As the federation for the technology industry, Agoria tries to support this process of 'coalition forming' based around sustainability. This is achieved by providing information, by heightening awareness and also by setting up, managing and supporting various formal and more informal collaboration projects itself.

Endnotes

1 In buying power parities, source: The world in 2050, PCW, March 2006.

2 Environment and energy in the technology industry – Analysis and vision, 2006; with examples from Alcatel Bell, CMI, Etap Lighting, General Motors, Heraeus Electro-Nite, Nexans Benelux, Philips, Umicore, Volco Cars and Volvo Europa Truck.

3 MERAG: Metals Environment Risk Assessment Guidance document.

CO_2 neutral production: the future started yesterday

Patrick Collignon
General Manager, Volvo Europa Truck

Introduction

Volvo Europa Truck is the first CO_2 free company in Belgium and the first CO_2 free *automotive* manufacturer world-wide. This not only looks good on the company's business card, but it also proves that sustainable business is indeed possible. After all, what once seemed like an inachievable dream to General Manager Patrick Collignon, has now materialised.

The driving force behind this magnificent achievement is the conviction that a company also has a duty to society. The business world cannot and must not ignore the challenges facing humanity. Environmental protection must become a core value in every business, as it has been the case at Volvo since 1972.

The story of Volvo Europa Truck demonstrates that there are alternatives available. Not in a very distant future or in a very distant land, but today and in our very own country. "It is a question of dare and do", says Patrick Collignon.

The power of a core value

A truck manufacturer announces that the factory will henceforth perform all of its activities without causing any CO_2 emissions. It seems like an unrealistic dream. To be quite honest, initially I myself also did not believe that we, specialists in building trucks, would succeed in manufacturing CO_2 free.

However, in September 2007, we achieved our dream and today we are effectively manufacturing without generating any CO_2 emissions. Unrealistic? Well, certainly not. A dream? Yes indeed, but you can make some of your dreams come true.

Environmental protection has been a core value at Volvo since 1972. Following the conference on the environment held by the United Nations in Stockholm, the then president of Volvo, Pehr Gyllenhammar, issued Volvo's first environmental statement.
Since then, we at Volvo have travelled a long road of gaining awareness, creating awareness, action plans, and continuous improvement. A core value, such as 'Environmental Protection' is a stimulus and provides the right *drive* to really tackle projects such as reducing CO_2 emissions.

We started this project in the belief that we, as an industrial player, had a role to play in society. Our aim was to make a contribution to the fight against global warming. We wanted to take our responsibility with respect to the future generations.
Switching to renewable fuels has become vital. Moreover, it is perfectly possible to do so. The technology is there, and the examples are there. It is a question of dare and do!

The industrial *footprint* of a company will in the future also be determined by environmental aspects. This is currently mainly determined by labour costs. This is why we transport materials all over the world and use valuable fuel.
In the future, we will have to switch over to a more market-focused set-up, in which right-sourcing and clustering of business activities are necessary for economic growth. Especially a country such as Belgium, which risks becoming a distribution country with only few industrial activities, needs the right type of industrial anchoring.

The government must establish a long-term socio-economic policy, to provide businesses with a platform to commit to sustainable business. We have a need for positive legislation, that is not discouraging to people. Legislation which makes innovation possible and which facilitates the licensing process.

Pro-active measures are also needed. The appropriate agencies could, for example, investigate and stipulate which areas in Belgium are the most suitable for building wind turbines, so that businesses merely need to apply for building permission. In addition, there is a need for improved follow-up of new technologies, so that these can be adapted faster.

As a truck manufacturer we are conscious of the fact that we are part of the problem. However, we are also providing part of the solution, without this having to be a hindrance to further economic development. This is proven by our project to achieve a CO_2-free company, and our studies and actions which are carried out in order to make our products sustainable.

A perfect example of this is the EcoCombi, which is a truck combination of 25,25 metres instead of 18 metres. This effectively means that two of these 'supertrucks' can transport the load of three of our current trucks. Furthermore, Volvo is combining its transport flows with other modes of transport, such as Eurobridge (shipping between Göteborg and Ghent) and Train 8 (train journey between Ghent and three cities in Sweden). In addition, mid-2007 Volvo Trucks introduced seven trucks which run on various alternative fuels. All we are waiting for now is the relevant statutory legislation.

We are part of the problem, but we are also providing part of the solution.

The start of the CO_2 story

One of Volvo's core values is environmental protection. Rational energy consumption has therefore always been a point of focus for Volvo. The Swedish parent company has imposed a series of short and long-term objectives upon the various Volvo plants. With regard to energy, these group objectives are categorised as follows:

- Development of energy-efficient products.
- Manufacture based on sustainable energy.
- Communication about the environmental approach.

In order to ensure that we manufacture world-wide using sustainable energy, Volvo imposes three guidelines:

1. We have to increase the use of CO_2-free energy.
2. We have to reduce energy consumption.
3. We must no longer heat using coal or fuel oil.

In 1989, the company switched over from fuel oil to natural gas. The first two guidelines constitute the CO_2 story.

The quantity of CO_2 emissions that we are saving is equivalent to the power required to heat 1,100 homes.

Renewable energy sources

Volvo Europa Truck uses all renewable energy sources: solar energy, hydropower, wind energy, and biomass.

Biomass is a term which refers to biodegradable products and waste. This may mean wood-chips, olive pips, and even used deep-frying oil. This source of green energy is used as fuel. Burning this is CO_2 neutral, because it only releases that CO_2 which was absorbed whilst the plants and trees were growing.
Prior to September 2007, Volvo Europa Truck used natural gas for heating. In 2005, this released 4,020 tons of CO_2. This quantity is equivalent to the power required to heat approximately 1,100 homes. The new systems and those adapted for biomass fuels have reduced these emissions to zero.

Approximately 50% of the electricity is produced by three 2 MW wind turbines. The windmills have a mast height of 100 metres and the radius of the blades is 40 metres. The three wind turbines are installed onto the Volvo site. The other 50% of electricity is bought in, and here we have resolutely decided to guarantee green hydroelectricity.

Since the installation of the wind turbines and the biomass power station, Volvo Europa Truck has been manufacturing CO_2-free. However, our challenge is still to consume even less energy. To achieve this, we are investigating and applying various environmentally-friendly projects.

Less energy consumption

A first project relates to the thermographic study of all of the buildings in order to detect heat losses. Thermography is a method which shows a building's temperature losses in the form of an image. This requires photographing the buildings from the air using an infrared camera. The images highlight where there are heat losses. The darker the colour, the less heat loss there is. The lighter the colour, the more heat is escaping from the building. In other words, the dark areas indicate where the building is well insulated, and the light areas show us where we still have work to do.

On the roof of the new biomass power station we have installed 150 solar panels in series, each supplying 200 Wp (peak power). This provides a total installed peak power of 30 kW. The electricity generated is used to start up the wood pellet furnace (biomass).

The sun is also an inexhaustible source of energy and heat. Despite our climate, the sun often shines long enough to make use of it. Solar boilers convert sunlight into heat. A solar boiler system consists of a solar collector on the roof and a boiler tank located somewhere inside of the building. The company is currently running tests to generate the sanitary hot water for the showers and the washbasins using solar boilers. For the test installation we have installed two collectors with a total area of approximately 5 m^2 and a buffer tank which has a content of 300 litres in order to produce the daily requirement of 160 litres of sanitary water at a temperature of 65°C.

Other projects which reduce our energy consumption are insulated glazing and controlled solar blinds, renewing our cooling machines, installing a new building control system and new lighting controls on the assembly floor.

Sustainable business is vital to ensure our industrial future. Moreover, it is certainly not impossible. Businesses can encourage each other and act as an example to others. The government can take measures to facilitate sustainable business. We all have to work towards continuous improvement on a permanent basis. Only this will ensure our future and that of future generations.

Businesses can encourage each other.

Technological research for a sustainable economy

Introduction

Research and development are indispensable in the evolution towards a sustainable economy. The independent Leuven research firm IMEC – established in 1984 – is the largest in Europe in the area of nanotechnology and nanoelectronics. More than 1,500 employees from throughout the world work together on tomorrow's technologies.

IMEC has ultra-modern research labs in Leuven. Its two *cleanrooms* are the company's showpiece. Here research takes place into chip process technologies with the most advanced equipment in the world.

IMEC works together with more than one thousand partners from all over the world. Specialists from fifty countries combine forces in multidisciplinary programmes. At the request of the Flemish government, IMEC also develops spin-offs. Some twenty such spin-offs have already been created. In all fields where it is active, IMEC intends for its research to be three to ten years ahead of the needs of industry. An introduction.

Small technology for a great future

The fact that everyday electronic products such as DVD players, digital cameras and mobile phones are increasingly becoming less expensive, use less power and/or have more functions is thanks to the chip industry and the continuous miniaturisation of transistors. The physical limits of the existing technology, however, are being approached and further transistor miniaturisation presents major challenges to process technologies. IMEC takes on these challenges, together with the world's largest chip producers, and equipment and material suppliers. Together they examine the possibilities of new materials, new transistor architectures and new lithography techniques. IMEC is also looking still further into the future with its research into, for example, carbon nanotubes, nanowire, spintronics, germanium and III-V substrates. These might provide a solution when the traditional techniques to reduce the size of transistors can no longer be applied.

Package and interconnection technology

Chips are becoming ever smaller, but the number of input and output paths has not decreased. This makes it increasingly difficult to mount the chips on a printed circuit board. To deal with this, IMEC has developed a technology that consists of several thin layers of metal with insulation layers between (multilayer thin-film technology). This technology can also be used to protect vulnerable structures on a chip, such as microelectromechanical systems (MEMS), via packaging at an early stage. To build still smaller systems with even more functions, IMEC is developing a technology to stack chips. All of this expertise is bundled in IMEC's *Advanced Packaging and Interconnect Center* (APIC).

Organic electronics

Polymer electronics is also in IMEC's portfolio. It is a promising technology for foldable, portable and inexpensive systems. The first applications are already on the market: screens with organic, light emitting diodes. Future applications include memories, smart clothing, RF identification labels (for example for quality control of food), sensors and solar cells.

The research into pentacene-based transistors and circuits is done in collaboration with the Dutch research institute TNO, as part of the systems-in-foil programme line at the Holst Center.

Solar cells

By 2050, 20 to 30 percent of energy demand could be delivered by solar cells. For this to happen, however, a drastic decrease in the price of solar cells is needed. This is only possible via a refining of the technology. This is why IMEC developed its Solar+ programme of solar cells based on crystalline silicon, organic solar cells and stacked solar cell modules with high efficiency. The goal is to make the production of solar cells less expensive and to increase their efficiency so that they are able to generate more energy from the same amount of sun. The architecture of the electricity grid and energy storage systems is also being looked into in this programme.

Wireless autonomous sensor networks

Small autonomous sensors, interconnected in a network, can be used for monitoring our health, for industrial process control, in vehicles, for manufacturing smart clothing and for food quality control. Such sensor systems contain various technologies and functions: detection, data processing, energy generation and storage, and wireless communication.

IMEC is developing the basic technologies for these autonomous sensor networks, and for this has combined its expertise in data processing with low power consumption, wireless communication, integration and packaging, alternative sources of energy and sensors. This research is done at IMEC's sister company IMEC-NL at the Holst Center in Eindhoven.

Technologies for the multimedia mobile phone of the future

Portable multimedia and communication devices must have low power consumption, be flexible and capable of executing millions of operations per second. In addition, consumers are not prepared to pay a fortune for them.

IMEC is developing the basic technologies to accomplish this: new process architectures and compilers, development software for multiprocessor systems-on-chip, new development methods that take into account increase in process variations of new chip process technologies, software-defined radio, 60GHz radios, multimedia encoding...

Bio(medical) electronics

At IMEC, chemists, electronic engineers and biologists join hands in the development of biosensors, medical technologies based on gold and magnetic nanoparticles, and neuroelectronic systems. The applications are numerous: the detection of disease markers in the blood, the detection of cancer cells in the body with new molecular imaging techniques, and the fundamental study of brain processes, for example in the case of the Alzheimer's disease.

Cooperation, innovation, training and information

Collaborative efforts in Flanders, Europe and the rest of the world are vital to the continuing success of the chip industry and the development of a knowledge economy. For this reason, IMEC has grouped many partners around it, including chip producers, device and material suppliers, system houses, universities and other research institutes.

A unique collaboration model, based on sharing knowledge, talent, costs, risk and intellectual property rights, integrates company researchers into IMEC's research teams. They combine forces around the technological challenges facing the entire chip industry.

IMEC contributes to the development of a strong Flemish industry. Every year it establishes spin-off companies. Flemish companies can call upon IMEC for joint research projects, feasibility studies, processes, product innovation, training and technology transfer. More than one hundred Flemish companies, including many SME's, have already called on IMEC for guidance in innovation.

IMEC's *Microelectronics Training Center* (MTC) organises courses and workshops for a wide range of target groups. Subjects from chip process technology and chip and system design to basic knowledge of chip technology, biology and multimedia. IMEC also supports teachers at Flemish schools and universities. In addition, IMEC offers an international platform, the *Center for Advanced Learning in Information Technologies* (CALIT), where managers, policy makers and scientists can meet and exchange ideas.

Progress in science and technology can increase well-being and prosperity. For this to happen, however, this knowledge must be distributed and transferred. IMEC wishes to use its expertise in nanoelectronics and nanotechnology to contribute to scientific and technological learning in Flanders.

The Roger Van Overstraeten Society (RVOS), established in memory of IMEC's founder, stimulates interest in technology and encourages youth to pursue studies in technology. At IMECEXPO, an interactive do-center, schools and IMEC's visitors can experience how technology makes our daily lives more pleasant and comfortable.

When science, governments and the business community combine forces

Johan Nijs
General Manager, Photovoltech

Introduction

A sustainable economy rests on the collaboration of universities, research centers, government institutions and the business community. The story of Photovoltech is a classic example of this. The Tienen-based company was set up in 2001 as a *spin-off* of the research center IMEC at the request of the Flemish government.

Not only do the origins and the collaboration around Photovoltech testify to a sustainable economy, so does the product that is made there. The company manufactures multicrystalline silicon photovoltaic cells that convert sunlight into solar energy. General Manager Johan Nijs recounts the story of Photovoltech, one of many Flemish companies working on a sustainable economy.

As a new spin-off, we worked based on the cell technology that was developed at the IMEC research center.

The cellars of the university

The story of Photovoltech started in the cellars of the ESAT department of the K.U. Leuven in Heverlee. After an internship for a number of months at Philips in Leuven, I started in 1977 a doctoral degree on crystalline silicon solar cells, with Prof. Roger Van Overstraeten and Prof. Robert Mertens as supervisors. These professors had begun research into solar cells a number of years earlier. Initially five people worked on the project, but interest grew, the research widened and diverse doctorates were awarded, including my own. I gained additional experience during a post-doctoral stay at IBM in New York.

In the meantime, Roger Van Overstraeten had established IMEC in 1984, the K.U.Leuven research center in Heverlee. IMEC conducts research in the area of micro and nanoelectronics and associated technologies. I was made responsible for solar cell research.

IMEC creates spin-offs at the request of the Flemish government. Spin-offs related to solar cells had been established earlier: *Soltech*, which develops photovoltaic products and systems, and *3E*, a consultancy firm for renewable energy. A new spin-off would focus on solar cell production based on the cell technology that had been carefully developed for years in the IMEC pilot line.

Various parties in Belgium and abroad were approached. Since the Flemish government had contributed directly and indirectly to the development of this technology via diverse channels, it was logical that the new company would be located in Flanders. Electrabel, together with the "Vlaamse Milieuholding" (Flemish Environmental Holding Company) and Soltech, and a bit later also Total, showed interest in the project. Neither of these wished to join the project alone, so after some consultation, both parties became main shareholders. The large energy companies' interest was based on their wish to further expand their presence in the area of solar energy, which had already been established with Soltech and Total Energy (today Tenesol) respectively. IMEC injected the solar cell technology, and Photovoltech was born in 2001. In the business plan there was then talk of production up to 6 MWp per year. Well things certainly can change!

A spin-off with ambition

Three pioneers who were there from the beginning put their weight behind the project: Louis Frisson, Jozef Szlufcik and myself Johan Nijs. First, we carefully chose a site. It needed to be an easily accessible production environment, with full facilities and close enough to technology supplier IMEC. Tienen was chosen, fifteen minutes from IMEC. The foundation stone was laid in October 2002. Production started in November 2003, first with a single shift, then in five shifts,

good for an annual maximum capacity of 13 MWp. Cell efficiency contributes more than 16 percent and the cream of the crop is the *back contact* (SC) solar cell, a process that Photovoltech was the first to market and that has become the company's showpiece. The process was developed by IMEC and licenced to Photovoltech. It allows the manufacture of multicrystalline silicon photovoltaic cells with higher efficiency, improved aesthetics at a lower production cost.

Working on higher efficiency, better aesthetics and a lower cost of production.

The first expansion was ready at the end of 2007, and together with the original production line, production capacity increased to 80 - 85 MWp. An additional investment of 30 million euros was required for this. Top managers Gérard Mestrallet (Suez) and Christophe de Margerie (Total) came to Tienen for the inauguration, underscoring their great ambitions in this fast-growing sector. Both multinationals each now control 47.8 percent of the shares, with IMEC owning 4.4 percent.
At the end of 2007, Photovoltech was home to one hundred twenty employees. The largest markets in 2007 were Germany, Spain, Italy and France, followed by the rest of Europe, including the strongly growing market in Flanders and Belgium. Photovoltech customers are module producers, thus we work in a B2B environment. In addition to other wafer contracts, in 2007 Photovoltech also concluded a multiyear contract valued at approximately 700 million euros for the purchase of wafers. These wafers are the basis of the solar cells produced by the company. Turnover in 2007 amounted to just over 65 million euros and EBIT around 10 million euros. Photovoltech's share in the world market is slightly less than 1 percent.

Technological lead as trademark

However, it doesn't have to stop here. The ambitions of Photovoltech and its shareholders are great. The following expansion is already being announced: by the end of 2009, production capacity must be further increased to at least 140 MWp, and at least two hundred people will be working at Photovoltech. This will be needed to meet promised deliveries. In 2008 and 2009, the entire sector was faced with difficulties in the delivery of purified silicon for the production of the silicon wafers because the market has grown tremendously with annual growth percentages of 30 to 70 percent and some players were unable keep up with demand. But capacity must increase to 140 MWp since delivery of this amount of wafers is already guaranteed for Photovoltech beginning at the end of 2009, and the corresponding solar cells have already been sold until 2015. Fortunately, Photovoltech was able to lay its hands on an adjoining lot where this and several future expansions can be realised.

Within the coming five to ten years, Photovoltech intends to be among the top 10 solar cell production companies world-wide. Necessary conditions for this are, on the one hand, that we grow as quickly as possible in order to enjoy the enormous economies of scale and are able to finance

this growth, and on the other hand, continuous and increasing investments in research and development of the solar cell.

Photovoltech has a number of trump cards in its hand: there is a solid commitment to reach the goal, shareholders are powerful and large enough to provide Photovoltech with the requisite resources, and our technological lead has been assured thanks to increased internal research and development efforts, and thoroughgoing collaboration with IMEC as well as with other institutions.

This technological lead has always been Photovoltech's trademark. To achieve this, risks needed to be taken along the way. More than once Photovoltech has been a pioneer in adopting innovative production processes. A recent example is the development, together with IMEC, of a new process to produce solar cells on very thin wafers, to 130 µm and thinner, while current technology is limited to approximately 180 µm. This new technology will be the basis of the second expansion that, as indicated above, should be ready by the end of 2009. This is an important evolution, because making the wafers thinner is an irreversible trend toward using fewer grams of silicon per wafer and thus per unit of power. At the same time, increasing cell efficiency remains a continuous focal point.

Photovoltech aims at a production capacity of 1 GWp by 2015. To realise this growth, we are presently examining the possibility of producing most of our wafers ourselves. If required, our shareholders would also handle the purification of silicon. Most probably then major investments would follow upward in the value chain.

Closing reflection

Prices are decreasing and thin-film solar cells are appearing on the market. Nevertheless, Photovoltech believes that until 2020 the largest market segment will remain crystalline silicon solar cells. Strongly declining prices have been incorporated into all of our business plans. At present, the energy payback time for photovoltaic solar panels/modules is between one and a half and three years, depending on where in the world the system is installed. The life of solar panels/modules is guaranteed by the supplier to be at least twenty-five years. Photovoltaic solar energy has already reached grid parity with peak electricity in Southern Europe. Grid parity is expected for Central Europe between 2012 and 2020. Until then, successful *incentives* such as cost-covering reselling compensation or cost-covering green energy certificates, to be sure with annually declining values, remain an absolute *must*. Their disappearance

constitutes the biggest threat to continuity. In any case, the theoretical potential for solar energy is enormous: each year the earth receives light energy that represents approximately five thousand to ten thousand times the total world requirements for primary energy consumption.

CO_2: problem or opportunity?

Jan Vansant
General Manager Sales & Strategy, ACP Belgium plc

Introduction

CO_2 harmful for the environment? We cannot deny it, even if it seems too early to say so. As Shakespeare said: "There is nothing either good or bad but thinking makes it so."
After all, CO_2 is used in quite a number of industrial applications, which indeed offer significant added value. For example, in the field of food safety, health (transport of medication, blood and organs), and treatment of industrial effluent. Furthermore, in the form of dry ice CO_2 can present a high-quality and environmentally-friendly alternative to harmful solvents and cleaning products.

Since 1897, the Belgian SME ACP has been working with CO_2 as a raw material and a product for very varied applications. CO_2 production has over the years undergone drastic change. For more than forty years already, ACP has been extracting the required CO_2 from waste products which originate from ammonia factories. In this way, it even reduces CO_2 emissions, through valuable recycling.
CO_2 as a problem, a challenge, or an opportunity? Or how sustainability and innovative thinking can sometimes produce surprising results.

Background history

In 1897, ACP was founded as l'Acide Carbonique Pur. The company wanted to produce carbon dioxide and other food products.
Carbonic acid (H_2CO_3) is obtained by combining carbon dioxide (CO_2) and water (H_2O). The necessary CO_2 is initially produced by burning lime in lime kilns. Later the production switched to burning coke, and later still to burning heavy fuel oil.

The definite turn-around took place in 1968. From then on, no more CO_2 molecules were produced for the CO_2 commercial applications. This was the end of the polluting method of burning fuel oil. Henceforth, the CO_2 would be extracted from the waste streams from ammonia factories. After all, ammonia production releases a by-product which is rich in CO_2, from which it is possible to distil liquid CO_2 offering a very high degree of purity.

This first occurred at the ACP plant in Willebroek, and later also at Carbocentre in Tertre (B) and Carbolim in Geleen (NL). Gradually, the production and the storage capacity were expanded. In 1995, the headquarters were moved to a brand-new plant in Heusden-Zolder (B). Three years later, in 1998, the company invested heavily in Tertre, where the new production plant Carbodour now replaced the outdated Carbocentre.

The international breakthrough came in 2001. ACP acquired the CO_2 activities of ANWIL in Włocławek, Poland, and all the CO_2 business of Wolfsfellner Gase in Germany, Czechia, and Austria.
A second major step followed in 2004 as a result of the formal joint venture entered into with Cold Jet Europe, which also moved into the headquarters in Zolder.
In 2005, ACP built a new CO_2 production unit in Włocławek (PL). Two years later, we also opened a research centre in Poland, boasting a *state-of-the-art* analytical laboratory. In the space of hardly six years, the Polish site has grown into a centre that is equivalent to that in Belgium.

In the summer of 2008, a third production line was launched in Geleen. This was linked to a fully-fledged railway terminal. This now enables the high-speed transport of large quantities of liquid CO_2 from Geleen to all of the outposts of Western and Central Europe, without overloading the motorways. Naturally, in case of emergency, we now also have the possibility of importing liquid CO_2 to Geleen by rail, from our own Polish plant, for example.

At present, ACP is the largest, and the most independent CO_2 producer in Europe. ACP is still a Belgian, family-run SME, which is both strategically and operationally run by a professional team in close liaison with a shareholders' representative.

When outlining the policy and the associated investments, the company takes into account the interests of all of the *stakeholders*. The main objective, also that of the shareholders, is to pursue the sustainable growth of the company at a steady pace through prudent geographical expansion and continuous improvement in everything we do.

Entering into partnerships with companies which offer the opportunity of increasing CO_2 applications in our current geographic fields of action is an essential component of our strategy for further growth. Different partnerships, large and small-scale, have already been explored and some have been tested out. The most successful to date is our joint venture with Cold Jet.

Cold Jet is a world-wide market leader in the field of dry ice blasting technology. Cold Jet, LLC is a non-listed American SME with headquarters in Loveland, Ohio, USA. The limited liability company Cold Jet Europe bvba is now located at the ACP headquarters in Heusden-Zolder. With more than twenty years' experience, specialising in dry ice blasting and its applications, Cold Jet increasingly manages to develop specially adapted applications for wide-ranging industrial environments.

CO_2 production

As outlined above, ACP has its own production plants which produce liquid CO_2 on an industrial basis with the aid of high tech systems. The 'raw' CO_2 gas which is generated as a by-product of ammonia production, is processed by ACP and conditioned into liquid CO_2 which has a very high degree of purity. By adopting this method, ACP re-uses gas streams which would otherwise be released into the atmosphere. This means that, since 1968, ACP no longer causes any additional CO_2 emissions as a result of its activities, but instead reduces emissions.

ACP ensures that, before CO_2 molecules from ammonia waste products are released into the atmosphere, they have fulfilled another role as part of a valuable CO_2 application.
For specific applications the CO_2 is fixed and is finally not released into atmosphere at all. Examples of this are the use of CO_2 in water treatment (conversion into bicarbonate), the use of CO_2 in greenhouses to promote photosynthesis (conversion into organic material), the use of CO_2 as a raw material for chemical products (synthesis of polycarbonate, or methionine, 'Precipitated Calcium Carbonate', etc.).

ACP is a forerunner as far as this production method is concerned. Many other producers are still making use of underground sources of CO_2 or are still producing CO_2 by burning fossil fuels. In both cases, additional CO_2 is brought into circulation, thus resulting in additional environmental damage.

For specific applications the CO_2 is fixed, and is finally not released into the atmosphere at all.

Approximately 7% of CO_2 emissions are caused by human activity.

CO_2 as greenhouse gas

The gas atmosphere around our earth forms a protective layer around our planet. Specific gases in the atmosphere ensure that the earth's temperature is suitable for living beings. These gases particularly absorb the infrared radiation emitted by the earth and reflect them back to earth. In this way, they prevent solar energy from being released into space too quickly and cause a rise in temperature on earth. The most important of these gases (the greenhouse gases) is CO_2, besides methane and ozone, for example.

The main sources of CO_2 are of natural origin: the breathing process of plants and animals, breakdown processes of organic materials, volcanic activities, etc. Approximately 7 percent of the CO_2 emissions are caused by human activity, such as energy generation, transport, and industry. This additional and still increasing contribution to the CO_2 emissions increases the CO_2 concentration in the atmosphere (currently approximately 0.038 percent) and reinforces the greenhouse effect. Consequently, this causes a rise in the average temperature on earth.

The Montreal and Kyoto agreements make it binding upon the industrialised countries to reduce their CO_2 emissions by an average of 8 percent over the period 2008-2012 compared to 1990. Given that CO_2 emissions in Belgium have risen by 7 percent since 1990, this signals a commitment for Belgium to a net reduction of 14 compared to the 2001 level. As far as this is concerned, the EU directive for the period of 2013-2020 will present an even greater challenge to the industrial world. ACP will naturally be happy to share its experience in the field of CO_2 treatment, storage, and processing with any projects which can help to solve this problematic issue.

ACP does not issue any statements on political agreements, energy taxes, CO_2 taxes, and so forth. However, it is clear that even in a limited field such as ours, the Kyoto standards do not always reflect the real efforts which companies have to make as far as reducing greenhouse gas emissions is concerned, including CO_2. Many countries are still burning natural gas to extract CO_2 from the flue gases. A simple switch-over to recover CO_2 from other, fatal streams, immediately results in a reduction of the CO_2 emissions. ACP introduced this switch-over more than forty years ago.

In the near future, the experience acquired over several decades by companies such as ACP in the purification, concentration, pressurising, storage, and further processing of significant CO_2 streams, will no doubt be useful for controlling the considerable CO_2 streams which will have to be removed from our energy generation and industrial applications. Tests on underground storage in coal strata or empty gas and oil fields are now in progress in various countries.

Industrial CO_2 applications

Refrigeration and freezing using CO_2 promotes food safety and quality.

CO_2 is used in various industries. There are both liquid applications as well as dry ice applications.

Soft drinks carbonisation

This is by far the most important and most renowned application. CO_2 is soluble in water. It adds a refreshing taste and offers protection against the growth of fungi and bacteria.

Refrigeration and freezing

Fast and gradual refrigeration of foodstuffs is important for reasons of food safety, food quality, and to maintain the external appearance of a product over a prolonged period. At a temperature below 4°C, the microbiological activity of disease-generating and poison-producing germs stops. This microbiological activity reduces exponentially, as the temperature decreases. During the freezing process, the water in the product is converted into ice. The process of freezing slowly creates larger ice crystals, which damage the cell walls. This causes loss of flavour, moisture, and nutrients. Fast freezing is therefore essential. However, this also has to take place gradually. Sudden and significant differences in temperature result in tension, causing the formation of fissures on the product surface. The recommended solution is therefore to refrigerate and freeze using CO_2.

Furthermore, especially cryogenic batch freezing using CO_2 is an energy-saving process compared to mechanical freezers, because the freezer is switched off once the product is frozen. Starting it up again only requires a few minutes. Mechanical freezers, on the other hand, have to remain permanently switched on.

Water treatment

Water treatment using CO_2 is a technique that offers many advantages from a technical, environmental, and financial point of view. CO_2 dissolved in water forms the gas hydrogen carbonate, also referred to as carbonic acid (H_2CO_3). This weak acid is the only mineral acid that occurs in natural waters. Carbonic acid reacts with the basic components in the water and neutralises the alkaline water.
The applications include the treatment of industrial effluent, of drinking water, of process water, and swimming pool water.

CO_2 in horticulture and greenhouse cultivation

Carbon dioxide is indispensable for photosynthesis in which green plants convert light energy and CO_2 into water and sugar. CO_2 increases the productivity by stimulating the growth and the strength of the plants. To the greenhouse horticulturalist, CO_2 is plant food.
For most types of greenhouse growing, photosynthetic performance increases when the concentration of CO_2 is increased from 340-1,000 ppm (parts per million).
Using liquid CO_2 offers the advantage that it does not contain any impurities, thus avoiding any risk of damaging the crops.

CO_2 cylinders for the catering industry

The catering industry is by far the biggest user of carbonic acid cartridges. Given the increasingly stringent safety and hygiene requirements, the ACP subsidiary Eurocylinder decided to opt for aluminium cylinders many years ago already. As a result of successive crises in the food industry, quality assurance has become a top priority.

Dry ice

Dry ice (Carboglace®) is a unique product. It is the solid form of CO_2 and exists as such under atmospheric pressure at a temperature of -78.5°C. Its high cooling capacity, the absence of any liquid residue at atmospheric pressure, and its reasonable price have contributed to the product being used extensively in many industries.

The main applications are:
- Sending of samples: frozen products, chocolate, vaccines, medication.
- Catering: in the airline industry and railways to keep meals cool.
- Transporting blood and organs.
- Keeping transport containers cool.

Dry ice is more environmentally friendly than most traditional solvents.

Dry ice blasting

Dry ice blasting is an effective cleaning method and surface treatment with applications in many industries. It is a non-abrasive, non-flammable and non-conductive process that is used for removing biofilms, oil and other impurities, without damaging the surface to be treated.
Compressed air from the dry ice blasting machine projects the dry ice in accelerated fashion onto the surface to be treated. Industrial cleaning of injection moulding dies for plastics, welding

robots on a car assembly line, biscuit moulds to electrical cables and printed circuit boards, are some of the standard fields of application of dry ice blasting.

The main advantages are that the process does not generate any secondary waste products, and that dry ice affects the underlying surface to be cleaned significantly less than abrasive blasting products, such as sand. Furthermore, the dry ice used is much more environmentally friendly than most solvents used in traditional industrial cleaning processes. Additional benefits are the bacteriostatic and dielectric properties of CO_2.

Innovation with CO_2

A real challenge is to replace traditional solvents with CO_2. The most efficient way of using CO_2 as a solvent is in its supercritical state. The CO_2 then behaves as a fluid and as a gas and demonstrates quite a number of attractive properties which can be used in wide-ranging applications, such as dry cleaning, extraction of caffeine or hops, powder formation for pharmaceutical applications or even fractionation of polymers.

As a fully-fledged coolant, CO_2 can replace all dangerous or polluting coolants, for example, such as Freon in cars. Even if this only represents a small quantity per car, when multiplied by the number of cars on the roads on this planet, this becomes a considerable amount of coolant fluid which can no longer be released into the atmosphere.
The previously mentioned applications of dry ice blasting show that quite a number of waste streams (solvents, water, sand, etc.) can be avoided by using dry ice blasting as a cleaning technique.

One of the most recommended methods of reducing CO_2 emissions in the atmosphere, is the use of CO_2 as a raw material, for example, for the synthesis of CO_2 of polymers, carbonates, and so forth. A considerable amount of research is exploring this avenue.

Innovation in an SME

Developing large-scale, innovative applications is not within the scope of a geographically limited SME, such as ACP. Due to our size, we are forced to limit the number of our projects. We are therefore forced to make choices.
Furthermore, our small (direct) sales market means that the leverage effect is too small in comparison to real multinational or global companies.

Developing large-scale, innovative applications is not within the scope of a geographically limited SME. We are forced to make choices.

For scientific research centres and industrial polytechnics there are still quite a number of subjects that can be explored for fundamental and applied research. Much of this research will within the foreseeable future lead to new technologies, which can be used world-wide. Developing useful applications which remove large quantities of CO_2 from the atmosphere for a prolonged period, and preferably permanently, will lead to the creation of new companies with healthy growth prospects.

Recycling the CO_2 from power stations to combine it with residual heat and solar energy to cultivate algae on a large scale by photosynthesis, to provide fuel for energy generation, is only one example of a sustainable approach to the energy issue in the industrial world. It is CO_2 neutral and it makes us independent of fossil fuel supplies for our own energy requirements. ACP has participated in various test projects on this topic, and would also like to collaborate on the further development of such applications in the future.

Innovation by deepening and broadening

For a few years now, different European networks have been combining all the activities of industrial and academic groups. Similar efforts can be found in Japan and in the United States. For an SME, such as ACP, it is already quite a task to just remain informed of the overwhelming amount of research that is being carried out on the different aspects of the CO_2 issue, both at universities and in large companies.

After all, innovation is not the exclusive playing field of technical product development or applications development. In the daily processes too, inventiveness can lead to innovations which are useful to the economy.

ACP has also focused on this. Thus, as a result of the Coca-Cola crisis in 1998, a completely new quality assurance system was designed and put into practice, in joint liaison with our customer's quality department and with the purchasing department. This *Safe-for-Food* quality system was subsequently developed further to incorporate all CO_2 supplies for human consumption, therefore also for the small deliveries by mini-tanks or by cylinders to the catering businesses where the soft drinks are prepared on site, by mixing water, syrup and CO_2 just prior to filling the beakers of the consumers. This unique quality assurance system guarantees not only the identical composition of the end product, but also the traceability right up to the soft drinks vending outlets.

In daily processes too, inventiveness can lead to innovations which are useful to the economy.

For a traditional Belgian SME, geographical development also demonstrates an innovative approach. The manner, the correct timing, the well-considered strategy and the conscious choice of the objectives also mean all the difference here between 'muddling' and successful

innovation. Thus, ACP did not take that step to Central Europe, particularly to Poland, before or at the same time as most of our competitors, but only years later, after careful consideration and with sharp focus. With a relatively cheap product which is expensive to transport, it cannot be the intention to manufacture in low-wage countries in order to then export it back to rich Western Europe. The objective of geographic diversification is to explore a new market and to develop it to the same level as the home market. ACP's position on the local Polish market is now, six years after our first formal acquisition, just as strong as on the Benelux market.

Further growth is not only generated by geographic expansion, but also by making the most of the value of the countries in which we already have a strong presence. It is less risky and cheaper to do more business with existing customers, than to acquire new customers. That is why we are constantly on the lookout for new fields of application, alone or with partners. This is how our joint venture with Cold Jet came into being. In this case, innovation was translated into a synergetic way of working together, leading to a virtual symbiosis in Zolder with common demo rooms, one commercial approach and reporting, and the sharing of commercial leads, and so much more.
In a similar manner, a special form of intense collaboration has been created with specific, innovating customers.

It remains a challenge to efficiently remove CO_2 from industrial waste streams. However, to portray it purely as a problem, would be somewhat too easy.

Because, what is CO_2 after all? A problem, a challenge, or an opportunity?

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Sustainable enterprise is becoming anchored into Flemish business

Marc Van den Bosch & Jan Van Doren
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Adviser, Voka Knowledge Centre

Introduction

The future is here. In the last ten years, scores of Flemish companies have discovered that sustainable business as a strategy offers great opportunities. This information is supported by surveys carried out in 1997, 1998, and 2007 by the Flemish Economic Association VOKA – an employers' organisation and lobbying group – among its membership. Economic viability and care for the environment and social aspects increasingly go hand in hand. The large enterprises are taking the lead in this respect, but the SME's are clearly catching up.

In their contribution, Marc Van den Bossch and Jan Van Doren are taking a closer look at the survey results. In addition, they are giving attention to the Belgian bi-annual environmental prize for business and to the *European Business Awards for the Environment*. These initiatives also appear to be extra motivation for our companies to put sustainable business into practice.

Introduction

Until just a few years ago, sustainable development only came up as a topic for discussion in environmental and social settings. However, these days, sustainable development, and therefore also sustainable business, has become a major topic in society, and also among employers.

Naturally, businesses have to pursue profits. After all, a company that is not profitable will not survive. Nowadays, however, survival explicitly entails other aspects compared to, let us say, ten years ago. The number of variables in the business environment has grown significantly. We now have more players to reckon with.
Thus, a freer mindset and action on the part of the individual has sharpened society's criticism. Open media channels are making it possible for anyone to make their views known quickly and efficiently throughout the entire world. This freedom in itself is a positive thing. However, it does require some adjustment on the part of businesses and government, for example. Now more than ever, they have to take into account the opinions held by society as a whole. Now more than ever, the social stakeholders determine whether a business is still granted a *licence to operate*. This requires a positive and a proactive approach to dialogue and open communication in general.

Naturally, sustainable development is not just a business issue. Government, education, trade unions and citizens all have to realise that we must not head into the future going backwards. It is a matter of continually striving together towards a good balance between what is desirable from an economic, social and environmental point of view. Sustainable business must not be a façade, but instead must be a permanent frame of reference for decision-making. It is clear that this frame of reference is closely interlinked with cultural values, with what we refer to as social capital. Openness, transparency, dialogue, commitment and public mindedness, that is what makes the difference between success and failure.

This also implies that everyone therefore has to dare to look far beyond today, and also beyond their own personal interest. For example, when a company is currently faced with the choice of cutting jobs or closing down tomorrow, there is no question that cutting those jobs is the most sustainable solution. Trade unions, for example, should in cases of re-structuring pay more attention to retraining and outplacement than to high individual redundancy payments.

In any case, support for sustainable business has increased tremendously in recent years. A few years ago, Voka organised conferences on this topic, at a time when scores of businesses still considered sustainable business as a *soft* story, far removed from economic reality. Last year, the trade unions, employers and the Flemish government lent their support to a common vision on this issue. Sustainable business is indeed one of the cornerstones of *Flanders in Action,* the future project which the Flemish government is currently designing in liaison with the trade unions and representatives from the business world.

Now more than ever, businesses have to take into account society's opinions.

However, businesses themselves are becoming increasingly sustainable. This is demonstrated by a survey organised last year by Voka. Experience with regard to annual environmental prizes has shown that companies are increasingly concerned by the concept of sustainability, and are finding more creative ways of addressing the issue. In this contribution, we are exploring this survey in greater detail, as well as a number of Voka initiatives and some prized business cases. In doing so, our main focus is on the balance between business and the environment. Naturally, this does not take away the fact that sustainable business in the full sense of the word implies a balance between economics, the environment *and* social issues, based on the premise that none of these founding principles must be at the detriment of the others.

Increasing environmental protection in business

In September 1997 and April 1998, the VEV (now VOKA – Flemish Economic Association) carried out two surveys on Flemish environmental policy and environmental policy within businesses. Ten years later, another poll was carried out into the opinion of business people concerning environmental policy and its evolution. The questionnaire covered five different topics: environmental protection within the company, government environmental policy, environmental expenditure incurred by businesses, environmental licences and compliance. In this article we shall concentrate, in view of the topic, on the results in the field of implementation of environmental protection within the company.

In 2007, 257 businesses took part in the questionnaire. In 1997, there were 331 that took part, and in 1998 this number stood at 280. The distribution on the basis of category, size, sector and province is covered below. For 1997, we only have a description based on size and sector, for 1998 on the basis of category, sector and province. Broadly speaking, we can state that the groups of respondents were comparable. However, there was greater participation on the part of category 1 companies. As regards size, the group is relatively equally divided. The province of West-Flanders and the category 3 companies are under-represented.

Environmental protection as an integral part of business policy

Care for the environment has now become an integral part of business. This was already the case for 81 percent of businesses in 1997. This figure has in the meantime risen to 89 percent, and another 7 percent of respondents say that this topic is still in progress.

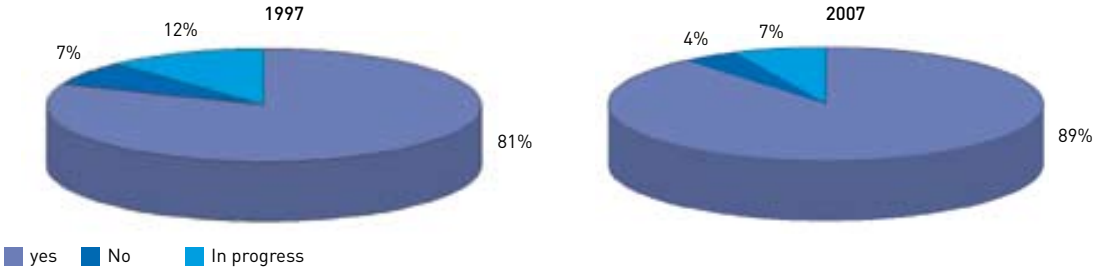
The 4 percent of companies where environmental protection is not yet an integral part of business policy, are all small or medium-sized businesses (SME's). Of the eleven companies which

Businesses have succeeded in integrating environmental policy into their business policy.

do not yet have an environmental protection system in place, 8 are SEs and three MEs. Among the group where environmental protection is still in progress, the SEs form the largest group (nine out of seventeen). We can therefore state that among the large, and to a great extent also among the medium-sized businesses, environmental policy has become an integral part of business policy. Those businesses have succeeded in integrating environmental policy into their business policy. Small businesses are also busy catching up. The environmental charter will certainly have been useful in this respect. The eco-efficiency programme is primarily aimed at small businesses, but it is still too early to gauge its impact. In recent years, the environmental charter has also evolved towards the smaller businesses, and will therefore certainly contribute to bringing about further positive change.

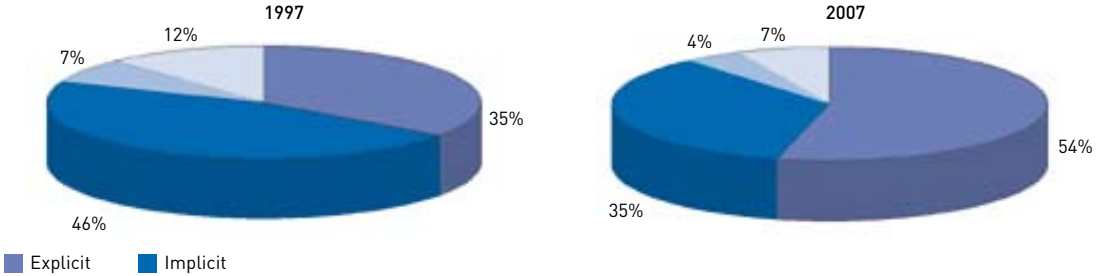
When environmental protection becomes an integral part of business policy, this does not necessarily mean that these businesses also have a certificated protection system in place. This is why we have asked

Environmental protection within the company – Comparison 1997 versus 2007



Question: Is environmental protection an integral part of your business policy? If so, please state, implicitly or explicitly?

Environmental protection within the company – Explicit versus Implicit



Implicit = regularly addressed, but not laid down
Explicit = laid down, i.e. EMAS, ISO 14001, part of the mission statement, environmental charter

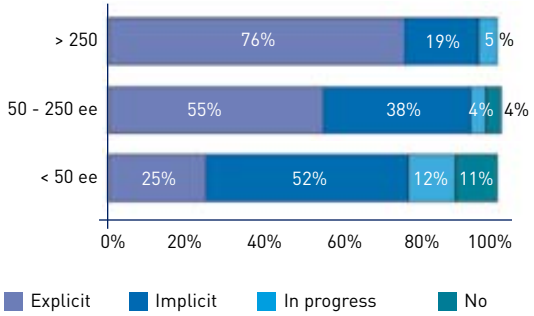
Source: Voka Knowledge Centre

companies where environmental protection is an integral part, whether this is explicit or implicit. *Explicit* means that this is laid down in, for example, a certificated environmental protection system such as EMAS or ISO 14001, but it may also be that the company takes part in the Environmental Charter or that environmental protection is part of the company's 'mission statement'. *Implicit* means that environmental protection is regularly addressed, but is not laid down.

The main difference with 1997 is that, nowadays, more than half of the businesses operate an explicit environmental protection system, whilst this was only a third in 1997. Here we therefore note an increase of approximately 20 percent.

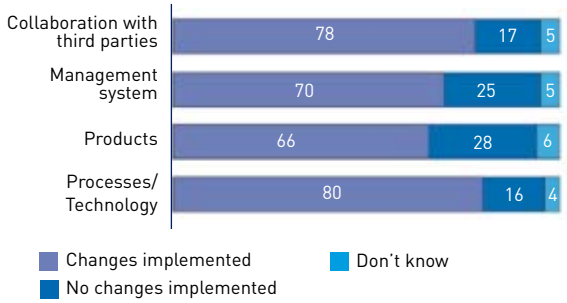
If we divide the results according to company size, we can see that mainly the large enterprises have an explicit environmental protection system in place. These have significantly grown in number since 1997. At that time, 48.2 percent of large enterprises had an explicit environmental protection system, compared to 76 percent of the enterprises now.
The increase is partly due to the fact that, in 1997, the position of environmental manager had only become compulsory one year prior (1996), and that this measure had therefore not yet been fully implemented, whereas it is now. However, our survey does not show to what extent extra environmental support grants for operating an environmental protection system have contributed to the increase.

Environmental protection within the company
In % based on company size



Environmental protection and business processes

Environmental protection has clearly resulted in major changes in the field of



Source: Voka Knowledge Centre

Environmental protection as an impetus to change business processes

In general, we can state that environmental protection leads to major changes in the various business management processes.

Attention to environmental protection has in approximately four out of five businesses led to changes in their collaboration with third parties, and changes in their processes and technologies. This is a slight increase in comparison with 1997 (75 percent).

However, products still present the most difficulty. Saying this, in two out of three companies environmental protection does lead to changes in the products. This was already the case in 1997. That is also why it is a positive thing to pay attention to the field of products as part of the eco-efficiency scan programme, besides the other fields such as management, processes, market and chain, and waste recycling. Innovation programmes could also pay attention to this.

Environmental protection to improve the company or product image

Seven out of ten companies are using environmental protection as an instrument to improve their company or product image. Compared to 1997, this is only a slight increase (1997: 65-70 percent).

This means that not all companies who implement environmental protection as an integral part of their business policy (89 percent), also use environmental protection to improve their product or company image. There are, therefore, still further potential companies who could highlight their environmental services.

Environmental Protection and Company Image

7 out 10 companies use environmental protection as an instrument to improve their company and product image.

Question: Is environmental protection deliberately used to improve the company image or products (for commercial purposes, in relation to partners, surrounding residents, etc.)?

Environmental Protection and Trading Results

The majority of businesses has reaped or expects to reap the benefits of environmental protection on their trading results.

Question: Do you believe that environmental protection has a positive impact on your trading results (profits, market share, etc.)?

Source: Voka Knowledge Centre

Effect of environmental protection on trading results

According to our survey, the majority of businesses has reaped or expects to reap the benefits of environmental protection on their trading results. A like for like comparison with 1997 is difficult because the questionnaire was different as compared to what it is now. At that time, the survey concluded just the opposite, as the majority believed that environmental protection would not have any positive impact on their trading results.
Even though the questions then and now are different, for this question we also notice a change in perception among businesses.

We note that companies have become more pro-active. Whereas in the past environmental protection was purely considered as a cost, now businesses are at least busy optimising this by working more pro-actively at integrating environmental protection, and in so doing improve their trading results (Consider, for example, how major soil contamination can have an impact on trading results).

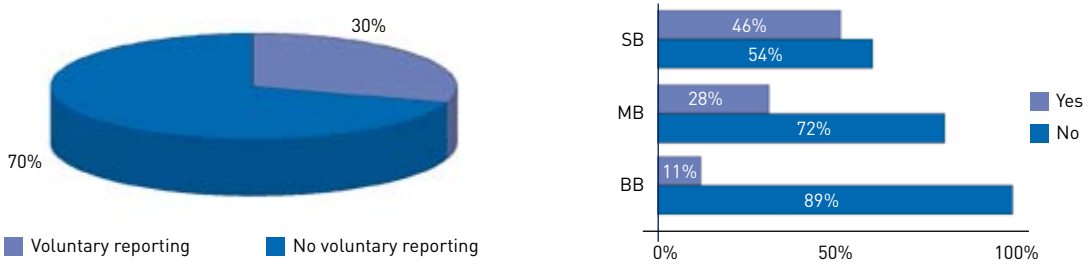
More and more companies are publishing their environmental or sustainability reports.

Public reporting on environmental endeavours

Percentage of companies engaging in voluntary public reporting	1997	2007
Small businesses	7.41%	11%
Medium-sized businesses	8%	19.25%
Big businesses	40%	46%

Public Reporting on Environmental Protection Endeavours

3 out 10 companies engage in voluntary public reporting concerning efforts made in the field of environmental protection.



Question: Does your company voluntarily engage in public reporting about environmental protection endeavours?

Source: Voka Knowledge Centre

In 1997, one company out of four voluntarily published such reports. Today this figure stands at three out of ten. The slight rise is more or less equally distributed over the various business sizes. Thus, large enterprises (LEs) still engage in voluntary public reporting more frequently compared to small enterprises (SEs). However, here we also note that the small and medium-sized enterprises are busy catching up.

The large enterprises are certainly underestimating the importance of their own public reporting. More and more companies are publishing environmental or sustainability reports. A bill (at federal level) was recently proposed to make the publication of environmental information compulsory. Companies (certainly the large ones) are already providing very extensive reports. It is therefore not necessary to make this compulsory. A compulsory public environmental report in addition to the existing integral environmental annual report and the public *European Pollutant Emission Register* (EPER) website is not desirable.

Conclusions on environmental protection within business

We dare to say that business environmental policy has come to maturity. It has found its place within business management. In nine out of ten companies environmental protection already forms an integral part of business policy. More than half of them engage in this explicitly, for example, through a certificated environmental protection system such as ISO 14001 or EMAS or an environmental charter, or a mission statement... This is 20 percent more compared to 1997. The group in which environmental protection does not yet form an integral part of business policy, only includes small and medium-sized enterprises. Business people clearly realise that environmental protection is essential to their business operation.

Environmental policy has led to important changes in business policy. Most companies have adjusted their processes and their collaboration with third parties (8 out of 10). However, major changes have been made to the management system (70 percent) and to the products (60 percent).

Seven out of ten businesses indicate that environmental protection is used to improve the image of the company and its products. According to half of the businesses, environmental protection has a positive impact with regard to environmental inspections, environmental licences, and trading results (or a positive impact is expected).

Compared to 1997, we note a slight rise in the percentage of companies engaging in voluntary reporting. Half of the large enterprises engage in voluntary reporting and the small and medium-sized businesses are busy catching up.

Charters and environmental awards are increasing support

Presti and environmental charter

As part of the European PRESTI 4 programme, business organisations were able to receive a subsidy to set up systems to encourage companies to protect the environment. The systems effectively had to ensure that companies achieved continuous improvement with regard to their environmental performance. This required businesses to programme in and implement actions on an annual basis.

One project was implemented per province. In Limburg, the project was implemented by the Centre for Quality Care (CKZ – Centrum voor Kwaliteitszorg); in West Flanders by the Charter – South-West Flanders in collaboration with the Environmental Department of the Regional Development Agency; in the other three provinces by the Chambers of Commerce. In the period 1998-2004, more than 250 companies took part in this programme and thus achieved the environmental charter. The targets were set high. The basic premise was that businesses had to at least comply with the legal requirements, which are more stringent than an ISO procedure, for example. When support by the Presti project was finally withdrawn, the environmental charter was continued in three provinces (Antwerp, East Flanders and West Flanders). This clearly indicated that businesses needed support with making the change towards environmental protection.

The most recent change is that in West Flanders a pilot project is being implemented to transform the environmental charter into a Charter for Sustainable Business. Depending on the results of this pilot project and any necessary adjustments, this initiative may evolve into a Flemish Charter for Sustainable Business by 2010.

The Belgian environmental prize

In order to encourage companies to continue working on environmental protection and sustainable business, the association of Belgian Enterprises (VBO - Verbond van Belgische Ondernemingen, the Flemish Economic Association VOKA, the employers' organisations UWE and VOB, organise a bi-annual Belgian environmental prize for businesses and institutions who have distinguished themselves through their services and/or any special action taken in the field of sustainable development, more specifically in the field of environmental technology or strategy. The projects submitted are adjudicated by an independent jury. In 2007, this environmental prize was awarded for the eleventh time.

The Belgian nominees for the environmental prize can also represent our country at the *European Business Awards for the Environment*, organised by the European Commission.

There are four categories at EU level:

– The *Prize of Management for Sustainable Development* is in recognition of the important role of business management, with constant attention to improving environmental performance.

- The *Prize of Products for Sustainable Development* recognises that careful design of products and services can promote sustainable consumption and can create new business opportunities.

- The *Prize of Technologies for Sustainable Development* underlines the important role of research and innovation in the development of sustainable production technologies which provide benefits for the environment, the economy, and society as a whole.

- The *Prize of International Partnership for Sustainable Development* aims to encourage collaboration between organisations at business level, government, universities and non-governmental organisations with focus on a large number of objectives, including the sharing of knowledge and experience, transfer of clean technologies and social development.

In the past, winners of the Belgian environmental prize have also distinguished themselves at European level. Agfa Gevaert was the winner at the 1999-2000 event in the best product category. This Belgian entry also won the European Prize in that same year.

Three prizes (gold, silver, bronze) in various categories have been awarded since the last event. This year's winners are highly representative of the 2007 Voka survey results.

The gold medal was awarded to AGC Flat Glass Europe (formerly Glaverbel) for the development of an environmentally friendly third generation mirror (the MIROX 3G). This mirror is the result of extensive specialised research in and striving towards environmental excellence. Its production process requires less lead and solvents, and the mirror also no longer contains any copper. At the same time, quality has improved, due to high resistance to detergents and wear and tear. In this project, we find several aspects of sustainable business. It is a case of manifest innovation, a new project that is both more environmentally friendly and offers better properties of usage. One of the main challenges for companies is to integrate the sustainability criteria into product development.

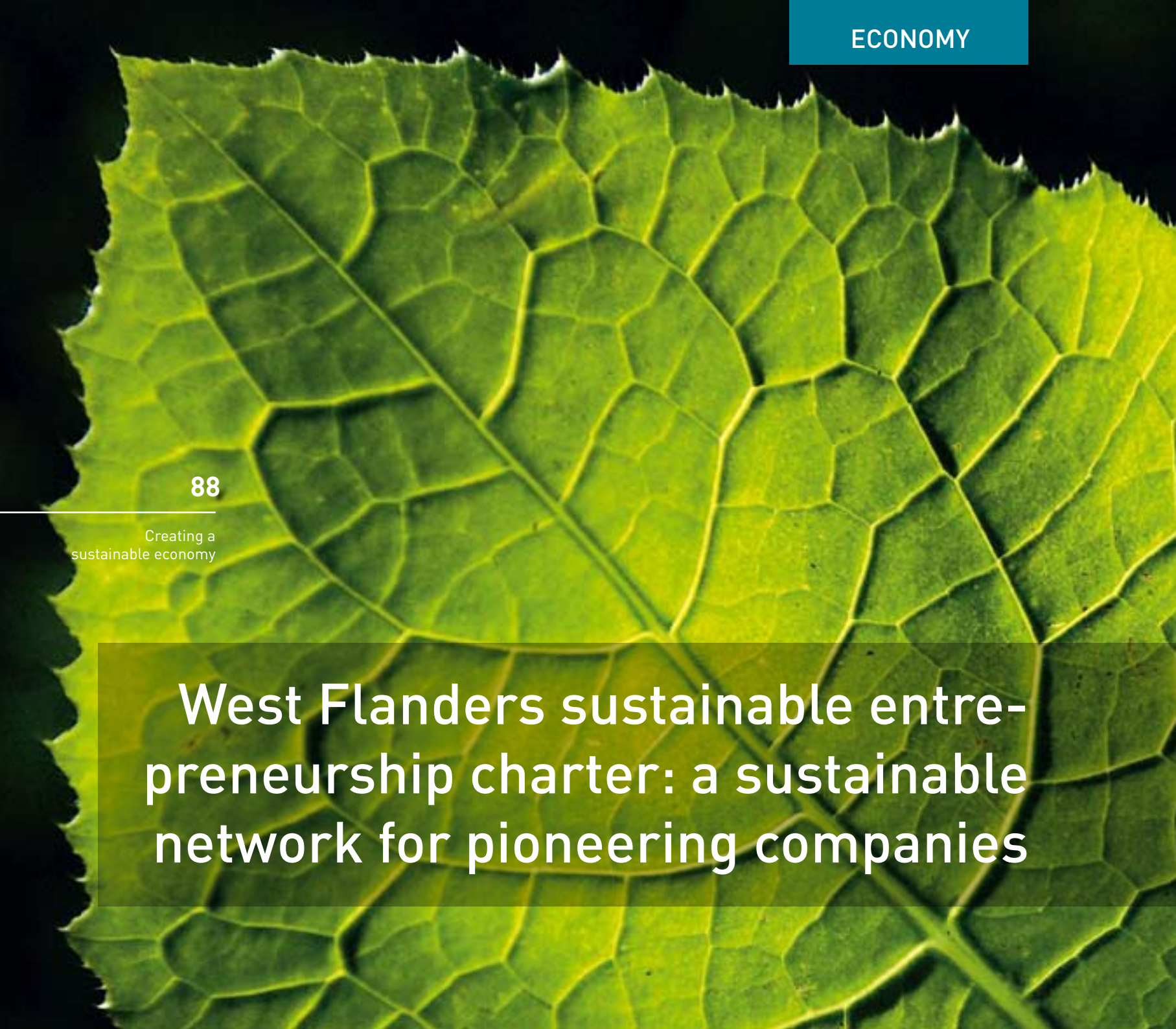
The silver medal was awarded to the food group Alpro nv in Wevelgem for structurally embedding the concept of sustainable development into the company organisation: from mission statement and energy plan right up to sustainable relations with suppliers and soya producers. This is an exceptional project that implements the sustainability criteria throughout the entire business management – economic, environmental, and social. The environmental aspect is fully incorporated into the purchasing of the base products (soya). The social aspect, with explicit attention for the North-South divide issue, is just as remarkable as it is rare. (The Colruyt Colibri project also covers this aspect.)

The bronze medal was awarded to Fonval SA, a franchisee of the Carrefour chain in Remouchamps, for a project aimed at saving energy and reducing CO_2 emissions. This project illustrates that SME's have started to catch up. It proves that an SME can collaborate on technological development benefiting both the economy and the environment.

In a few other nominated projects, greenhouse gases and the issue of climate change is remarkably noticeable. A perfect example of this is the CO_2 neutral factory project of Volvo Trucks. This is the first large-scale project in Flanders where a site's own energy is generated by sustainable sources (wind and biomass), thus eliminating the use of fossil fuels and allowing a large-scale production plant to operate by CO_2 neutral methods.

Sustainable business is a business case offering plenty of opportunities

Even though our survey only goes back in time by ten years, the differences are astonishing. Both the survey and the examples demonstrate that entrepreneurs are increasingly considering the living environment issue – and by extension sustainable business – as a business case which also offers businesses opportunities. By adopting a proactive policy, various businesses have already succeeded in recording excellent results, integrating not only economic viability, but also environmental and social aspects. In an SME region such as Flanders, it is after all not a mean feat that SME's have started to catch up in the field of environmental protection. The step towards sustainability will undoubtedly follow. These companies deserve support in bringing about this change. If they are successful, the future looks sustainable.



West Flanders sustainable entrepreneurship charter: a sustainable network for pioneering companies

Philippe Tavernier
Acting General Manager, POM West Flanders

Introduction

Companies that opt for sustainable entrepreneurship no longer stand alone. Numerous umbrella and sector organisations offer advice and practical assistance. These include the West Flanders Provincial Development Company (POM).

Already in 1993, twenty companies in West Flanders had embraced the province's Environmental Charter. In 2008, the charter was expanded and renamed the *West Flanders Sustainable Entrepreneurship Charter.* Companies that sign up, agree to apply the six policy principles of the charter by planning yearly objectives and actions related to ten concrete sustainability themes.

Companies that meet these objectives receive – after a thorough evaluation and an audit – an annual certificate with quality label. This way of working ensures that dozens of companies together realise more than one thousand concrete actions yearly. It makes them pioneers for a sustainable economy, says Philippe Tavernier of the POM.

In 1993, twenty companies signed the West Flanders Environmental Charter. The initiative of the Provincial Development Company (POM) was quickly copied and today already more than four hundred companies throughout Flanders have signed a provincial Environmental Charter. The *West Flanders Sustainable Entrepreneurship Charter* was introduced in 2008. The philosophy remains largely the same as that of the Environmental Charter, but six new policy principles and ten new themes constitute the heart of the new charter. The charter is available to all companies, regardless of size and sector. The renewed charter had immediate appeal to the business community: in June 2008, it was already subscribed to by some seventy companies.

Six policy principles...

Companies participating in the *West Flanders Sustainable Entrepreneurship Charter* commit themselves to six policy principles:

1. The company proactively integrates sustainable entrepreneurship in its policy and strives for continuous improvement in economic, social and environmental performance. To measure and evaluate this improvement, the company develops relevant performance indicators.
2. The company is aware of its social responsibility and capitalises on societal evolutions and regional diversity.
3. The company works continuously on meeting social and environmental regulations.
4. The ten themes of the *West Flanders Sustainable Entrepreneurship Charter* are converted into objectives specific to the company. The company translates these objectives into a yearly action plan, with the results reported to the Evaluation Committee of the *West Flanders Sustainable Entrepreneurship Charter*.
5. The company agrees to inform its employees about and involve them in participation in the charter. This creates support within the company for the implementation and follow-up of the actions.
6. The company bears an exemplary function with respect to sustainable entrepreneurship via external communicating about the policy and the actions taken. It actively takes part in exchanging experiences with other companies in order to widely distribute good practices.

... and ten themes

There are ten themes around which the work is focused:

1. Follow-up of and conformity with the social and environmental regulations must be demonstrated. This includes developing the relevant performance indicators or measuring instruments that allow follow-up of continuous improvement in economic, social and environmental performance.
2. There is open communication with personnel, public authorities, the neighbourhood and other relevant stakeholders concerning the sustainability policy and the results achieved.
3. People friendly entrepreneurship comes first. The company has an eye for the quality of the work and the safety and well-being of employees. There is an equal opportunity policy. Employees are motivated and given the chance to follow training and engage in career development.
4. Sustainability is also integrated into the development of company infrastructure, investment and purchasing policy, as well as process and product development.
5. The company uses eco-efficient raw materials, additives and packaging. It limits waste and seeks useful applications for the waste flows.
6. A rational energy policy results in limiting consumption and monitoring CO_2 production. The company makes optimum use of environmentally friendly and renewable energy.
7. Water is used in a rational way, alternative sources of water are optimally utilised. The company limits emissions to the surface water.
8. The company develops emergency procedures to limit the impact of disasters on people and environment.
9. The company limits nuisance to the surroundings, visually as well as concerning noise, vibrations, light, dust, odour and emissions to the air and ground. The use of space is optimised.
10. The company makes efforts to reduce the impact of business activities on traffic, and to contribute to sustainable and safe mobility.

The benefits for the companies

Participation in the *West Flanders Sustainable Entrepreneurship Charter* yields numerous benefits for the companies. The charter provides support and structure in developing a policy around sustainable entrepreneurship. The charter stimulates the companies to define and realise objectives and actions on a yearly basis. By working around ten concrete themes, new aspects also receive attention. What's more, implementation of the principle *measuring is*

Evaluation by external experts prevents organisational blindness.

knowing leads to insight in and improvement of performance. A number of companies are even explicitly participating in preparation for introducing a management system such as ISO 14001. The annual audit by the Evaluation Committee leads to the formulation of bottlenecks and recommendations, allowing companies to concretely address weaknesses. Companies value this annual audit of their performance and policy by external experts. It prevents organisational blindness and constitutes a motor for continuously improving performance. The presence of representatives from diverse government agencies in the Evaluation Committee also simplifies communication between the company and government. Both parties work together constructively.

The charter is even functioning more and more as a network in the region. Exchanging experiences is foremost, but commercial joint ventures are increasingly occurring.

In addition, signing the charter serves to raise employee awareness. It involves them in the policy. This involvement leads to an increase in productivity and a decrease in absenteeism. In other words, positive efforts are made with respect to efficiency. A sustainable company after all is a much sought after employer.

And a policy around sustainable entrepreneurship also pays economic dividends. Think of the direct savings provided by rational energy use and the higher productivity due to committed employees.

Finally, honouring the efforts made with an annual certificate and a quality label is an incentive for participating companies to continue along the road already travelled. The annual presentation of these certificates in a festive academic session results in a favourable profile for the company with its customers, the press, government and the immediate surroundings. The logical outcome of this is the building up of a sustainable image.

Pioneers in sustainable entrepreneurship

Each company can submit an application to sign the West Flanders Charter for Sustainable Entrepreneurship. In practice, primarily the service sector, wholesale trade, the food sector, the waste treatment sector and the plastics/chemical sector have the strongest representation.

The application must include the motivation and a copy of all current environmental permits. Each application is carefully investigated. Only after a detailed evaluation and discussion does the Evaluation Committee decide whether a company is eligible for signing.

If the company receives the green light, it must prepare an action plan. This plan contains the objectives that are proposed per charter theme. In addition to these basic objectives, the company may also formulate company specific objectives. These are then concretely translated into actions that will be started and/or implemented during the coming year.

The Evaluation Committee studies the action plan. The Committee can impose additional conditions. If the action plan receives a positive assessment, the company is allowed to sign the *West Flanders Sustainable Entrepreneurship Charter.*

Of course, the action plans must also be realised. The Evaluation Committee carefully follows up everything. Detailed audits occur, after which a report is drawn up. Only the companies that realise their ambitions in the area of sustainable entrepreneurship are awarded the annual certificate.

The participants in the *West Flanders Sustainable Entrepreneurship Charter* are pioneering companies in the area of sustainable entrepreneurship. In 2007, more than 1,100 actions were realised by 37 companies in West Flanders. Themes that received the greatest amount of work were energy (197 results), waste (147 results) and communication (140 results). The actions can inspire many companies in developing their policy around sustainable entrepreneurship. And the initiative continues to grow. In 2008, some 70 companies in West Flanders signed the charter.

For the West Flanders Provincial Development company, the charter in the meantime has become a leitmotiv in working for sustainable entrepreneurship. Instruments resulting from other projects – such as the MVO scan, the water scan and the sustainable industrial building audit – have been taken over by the charter companies. And conversely, the charter companies are also often the spearheads in other company strengthening projects of the POM, such as cooperation related to business sites, the POM sessions around environmental policy and the POM information days. These are all pieces of the same puzzle. In this way, the Charter for Sustainable Entrepreneurship fully benefits the participating companies, the operations of the POM and society as a whole.

Only companies that achieve their ambitions are awarded the annual certificate.

Alpro Soya has sustainability in the genes

Interview with Jean Cornet & Basiel De Bruyne
Marketing & Innovation Director, Alpro
SD Coordinator, Alpro

Introduction

When Alpro Soya was first founded in the early 80's, the topic of sustainability hardly came up for discussion in the business world. Yet, Alpro Soya decided to rigorously apply the basic principles of *people, planet and profit* from day one. Sustainable business is therefore in the company's genes. "We had been implementing the principles of sustainable development for years, without actually realising it", state Jean Cornet and Basiel the Bruyne.

Now that the topic is definitely at the top of the agenda, Alpro Soya wants to go yet a step further. Thus, the company aims to make its production plants CO_2 neutral by 2020. They are currently already investing in alternative energy supplies to secure the future.

All these investments in sustainability are taking place based on a healthy long-term vision. However, in the short term those costs are quite heavy to bear, and that is why Alpro Soya is quite keen to enter into a discussion on the environmental cost of products.

How did Alpro come into being?

Jean Cornet and Basiel De Bruyne: Alpro Soya is the result of Philippe Vandemoortele's dream. He felt great empathy with those who were suffering hunger in the world, and more specifically with the shortage of protein among certain sections of the African population. Many people there do not even have cow's milk or meat. Philippe knew that the high vegetable protein content of soya could compensate for this shortage of animal protein.

In order to make his dream come true, he set off for Africa and started a soya factory in Madagascar. Upon his return to Belgium, Philippe Vandemoortele wanted to start a similar project in Flanders. It was pure coincidence that at that time vegetable products were becoming increasingly popular in Europe. This really benefited Alpro Soya's launch in the early 80's.

So Alpro's image is closely linked to topics such as the environment and public health?

JC and BDB: Indeed. Philippe Vandemoortele's concern about hunger in the world and his real commitment have from the very start helped to determine the company's image. Our planet's health also plays a large part in that. The *People* aspect also comes into play, because after all, the company is about healthy products. At first, Alpro products were only sold in pharmacies. They offered a solution for people suffering from allergies.

Many companies make reference to sustainable development, even if their activity shows no direct links with it. Alpro, on the contrary, can be very proud that its products are a guarantee for healthy nutrition. The company is as it were genetically interlinked with sustainable development.

In other words, people and planet were there at the outset. So, did *profit* only come later?

Alpro is as it were genetically interlinked with sustainable development.

JC and BDB: At Alpro as a family-run business, our main focus has always been on long-term vision. We were convinced that the company had a future. The pressure to achieve profits in the short term was less of an issue.

The early years proved to be very difficult. The product design still had to be finalised, and we had to seek access to large-scale distribution. So it took some time before Alpro launched mainstream products onto the market.

We were deeply convinced

How important are research and innovation in the production process?

JC and BDB: It may sound like somewhat of a paradox, but even though soya milk has been available in Asia for thousands of years, it has still been very difficult to develop the product on an industrial scale. We spent years of research and development on making soya milk taste good, and in making it drinkable. The main issue was not the manufacturing of the product as such, but to do this on a large, industrial scale.
Originally, the company was located at a rather outdated Vandemoortele plant. After Alpro's first commercial success at the end of the 80's, we started on the construction of a new plant. It was only from that moment onwards that we could talk of industrial production, which of course remains based on a natural production process.
Soya milk can be produced in two ways, by using isolates or the full soya bean. During those first years, we mainly focused on finding a method to produce a drink as naturally as possible. Finally, production based on the full soya bean seemed the most appropriate.
Afterwards, we still had to invest considerable time in producing a tasty end product. The general public mainly knew Alpro from the pharmacy, and it took people a long time to appreciate the product, not only as a healthy, but also as a delicious nutrient.

Is Alpro now openly playing the sustainable development card?

JC and BDB: Yes, and this from deep conviction. Even though the topic is only recently being discussed so openly. However, we had already been working on it for years without actually realising it.
The fact that Alpro resolutely refuses the use of genetically modified products, and that our processed soya beans must not in any case come from protected rain forest, this has grown from Philippe Vandemoortele's conviction. It is a carefully considered process, and not something that has entered our minds suddenly purely on commercial grounds.
By working together with the same farmers year in and year out, this has finally led to long-term partnerships, without us ever making a big fuss about that. Now it seems that this actually favours sustainable development, and naturally it encourages us to continue to develop and to improve such production methods.

Sustainable business has not entered our minds purely on commercial grounds.

Alpro works with companies in the producing countries, but also in our own country?

JC and BDB: A number of years ago, we gave the first impulse to this by achieving the West

Exchanging information and knowledge on sustainable enterprise.

Flanders Environment Charter, a project which also fits into the *Planet* aspect. It was a two-fold challenge: on the one hand, to reduce energy consumption in the production process, and on the other hand, to strive towards an environmentally friendly energy policy.
Even well before there was any mention of CO_2 neutral production processes, Alpro had already opted for that direction. As a result of years of knowledge acquired on the topic of sustainability, we are now in a very strong position. We have come to grips with our emissions in all of the branches of our company, thus anticipating up-and-coming legislation on CO_2 standards. In doing so, we can finally adapt the entire production process to the sustainability standards of our future society.
For quite some time already, we have been working with the company Tetra Pak for the packaging of our products, a collaboration in which the sustainability aspect naturally plays a big part. This partnership enables us to learn from their approach, which fits in perfectly with our way of working. This enables us to exchange information and knowledge on sustainable enterpreneurship. Because our ultimate target market is the same, we have recently also been in contact with the company Ecover. We wanted to get to know each other better. It is not a matter of engaging in large-scale collaboration, but rather a matter of exchanging *good practices*, both from the point of view of production as well as marketing.

Is it becoming more common for companies to exchange good practices?

JC and BDB: This trend towards closer collaboration on sustainable business between companies and sectors is indeed on the increase. It is also with this prospect that Alpro has become a member of Business & Society Belgium, a network of companies that are active in the field of socially responsible business.
The original intention was to gain more knowledge about sustainable enterprise through this network, but it quickly became obvious that we ourselves belonged to the pioneers. This has strengthened our conviction that we have indeed selected a good strategy. That has given us more self-confidence.
As far as sustainable business is concerned, Alpro has recently also been awarded quite a number of prizes. Many people were surprised that we had not spontaneously publicised our achievements. It is indeed true that, for a long time, we had not fully realised how well we were actually doing.

Investing in our own energy generation

Is Alpro now also subscribing to the 'hype' about sustainability?

JC and BDB: In a sense this has not been necessary, because we have been on the right track for years. However, the hype has ensured, for example, that we are now also taking action to

reduce our CO_2 emissions. Al Gore's film, *An Inconvenient truth,* has left a deep impression on a number of people at Alpro, and we have therefore resolutely decided to strive for CO_2 neutral factories. This is not something we can achieve in the short term, because the production process is fairly energy intensive. However, the intention is clearly there.
The film has in the meantime been shown to all six hundred blue collar staff, white collar staff, and members of the management. The aim to make Alpro CO_2 neutral has been made clear to the entire workforce. We have worked out a programme to tackle the technical aspects of the dossier. By the year 2020, the production plants have to achieve major reductions in CO_2 emissions, and the remainder will have to be compensated for. In this way, we will reach a neutral CO_2 balance.

What is the role of government in the sustainability debate?

JC and BDB: Two aspects are important when discussing CO_2 emissions: electricity and natural gas. In the short term, we can replace electricity with green energy. This has already taken place at the Belgian Alpro plants. Abroad, that is a lot less evident, given the limited access to such energy sources at present.
In our home country, we are also wondering about the future evolution of green energy consumption. After all, we do not know whether there will be sufficient renewable energy available in the future to continue to meet increasing demand. We are currently drawing up a plan to generate our own electricity, even if only partially. We already want to invest in that now.

We have also commissioned a study on the use of wind energy. It is a fairly complex process, given that the necessary licences will have to come from local, regional, and federal bodies. In this respect, we not only need the good will, but also a great deal of determination. This can be discouraging. In any case, we are continuing to work on this topic.
Another option is to invest in solar panels. If we wish to achieve our objective in 2020, then we will also have to do all the necessary in this field. Naturally, the investment will depend on the degree to which we can obtain licences or subsidies.

Generally speaking, there is of course also the fairly complex problem of CO_2 duties. As a former top man of Exxon once stated: "Communism collapsed because the pricing system did not take into account the economic reality – capitalism could go under because prices do not take into account the environmental reality".
Flying is becoming cheaper, but the prices of flight tickets do not in fact take into account the harm that is being caused to the environment.

It is up to the government to take initiatives to ensure that the environmental cost of consumer goods is accounted for. This environmental cost has to be processed into the economic value.

Prices are not taking into account the environmental reality.

If we finally achieve such an environmental standard, how would this translate into the cost of an Alpro product?

JC and BDB: Soya originates from faraway countries, but that in itself is not immediately a problem. The beans are imported from South-America by cargo ship, which limits the damage to the environment to some extent. If we were to import the soya by truck from Southern Europe, the damage would certainly be much greater.
Our vast experience in the field of sustainable business has shown us how to bring a product onto the market in the most responsible way. At local level, but also for exporting our products, we will in the future transport increasing amounts of goods by rail or by water. We will make less use of road transport. As far as this is concerned, we are already closely collaborating with other companies both at home and abroad. By joining forces, we aim to reduce our transport costs and to reduce our environmental impact.
In our battle against the environmental impact of our products, we are therefore not only working on the CO_2 emissions in the production process, but also on the logistics. This is a big challenge requiring major investment. However, the advantage is that we will finally be able to control our own future in this field. This does not take away that government investment can significantly encourage the development of alternative routes.
One also must not forget that, in our industry, our competitors currently do not, or hardly, have to take into account any of the costs which we are supporting now for a sustainable company strategy. If we took into account the environmental cost of traditional dairy products, then these would probably be less competitive compared to our products. The environmental impact of vegetable protein is at least ten times less compared to animal protein to obtain the same nutritional value. If that environmental impact were to be processed into the price to consumers, then our ratio compared to that of the competition would naturally look completely different.

Crucial years

If these environmental aspects are becoming increasingly important, then the future looks good for Alpro. With your experience, you are already ahead on sustainable development?

JC and BDB: In our research and development and in all of our innovation projects we, at Alpro, always take into account sustainability. Every project is assessed on a number of sustainability criteria.

When we invest, we do not only consider the economic cost, but also the environmental impact. This may range from energy consumption to the type of packaging that we use. Finally, our aim is to develop a strategy that is as sustainable as possible.

After all is said and done, Alpro sells healthy nutritional products. In our society, people are becoming increasingly interested in healthy nutrition. Besides all of the environmental concerns, our company growth will in all probability be able to continue to build on this, even if there is no lack of competition on the market.

Our experience in the field of sustainable development offers good future prospects, especially now that this issue is given more importance within the business world. Naturally, we will have to make the necessary investments, including in the field of communication and innovation. We must not rest on our laurels. If in the long term we want to be successful with Alpro, we have to continue to improve our strategy and actively monitor all further developments in our industry.
The future holds two major challenges: global warming and world population growth. Both topics are inextricably linked. How can we continue to feed the increasing number of people on this earth, taking into account the climate? This is already imposing a number of restrictions upon us, both in terms of production as consumption.

The next two decades will be of crucial importance in this respect. The response of the world population to climate change is too slow. This is leading to unease. Even if in Europe people are already reasonably aware of what has to be done, our presence in other parts of the world has shown us that this is far from being the case elsewhere. We ourselves will therefore have to look beyond our own continental borders.

This year's harvest in Brazil could be disappointing, as temperatures have never been so low there at this time of the year. Such a phenomenon has an enormous impact on food production, but finally also on consumers on the other side of the globe. Even if the latter, due to their buying power, are not (yet) feeling the negative consequences of this in the short term.

It is therefore necessary to urgently focus on repairing this (im)balance, especially as it takes a few years before positive measures actually bear fruit. Finally, it also requires a good dose of political courage, and as Raymond Barre once said: it is preferable to have a policy that is unpopular, rather than one that is irresponsible.

We too have to continue to invest in sustainability, innovation, and communication.

Fighting pollution with windmills

Frank Coenen
General Manager, Evelop Belgium plc

Introduction

By 2020, Belgium must source 13% of its energy from renewable sources, as required by the European Commission. In order to achieve that standard, three off-shore wind parks have already been planned. One of those wind parks is Belwind, a project by Evelop Belgium nv.

General Manager, Frank Coenen of Evelop Belgium places the construction of the Belwind wind park within the wider context of the European projects run by Evelop and its parent company Econcern. For our own country, Frank Coenen can see further opportunities, at least if the government succeeds in building up a stable support policy for renewable energy.

Evelop develops and manages sustainable energy projects on both the national and international market. The company is active in wind energy at sea and on land, and in bio and solar energy and seawater air conditioning. Evelop also designs utility construction, housing and energy infrastructure in which sustainable energy forms a founding principle.

Evelop is part of Econcern, a world-wide sustainable energy project development company with as its mission: Sustainable Energy for All. With its Zaventem branch, Evelop also has a foothold in Belgium.

Working on the basis of its innovative project approach, Evelop aims to develop successful initiatives for sustainable and lucrative projects. Evelop is involved in all of the project stages, from design up to supply, and is now focusing entirely on generating electricity.

Wind park at sea

In 2008, Evelop Belgium finally received the green light from the Belgian Authority for the construction and operation of the Belwind off-shore wind park. With a total capacity of 330 megawatt, this sustainable power station can power up to 330,000 homes. The wind park, located at 46 kilometres from the coast of Zeebrugge, is the first fleet in the world situated so far away from the coast.

The wind park will be positioned on Bligh Bank. This sandbank lies in an area specially allocated by the Belgian Authority for off-shore wind parks. C-Power and Eldepasco will also be installing a wind park in this area. The area is positioned outside of the shipping lanes and almost entirely outside of the 12 mile zone (territorial waters). This stretch of sea is described as the Belgian Economic Zone (BEZ).

The turbines will be connected to two maritime substations by 70 km of 33kV sea cables. These high voltage stations will be connected to the Belgian high voltage network via two 150kV cables. Annual power production will amount to 1.2 terawatt hour. The total investment will require more than 900 million euros. The total area covered by the fleet will be 35 km², and the depth of construction will vary between 20-35 metres.

The Belwind Wind Park will be supplying power to 330,000 homes.

The construction of the Belwind wind park fits in perfectly into Belgium's strategy to meet the ambitious European objectives in the field of renewable energy. After all, the European Commission has already set a target of 13% renewable energy by 2020 for our country. With its three wind parks, Belgium aims to already increase its present share of 2.2 percent to 7 percent by 2013. Early 2010, Belwind will start supplying power.

Belwind is certainly not the only project that forms part of Evelop's growth strategy. In Europe, Evelop is currently developing thirteen off-shore wind parks. This makes Evelop the world leader in off-shore wind energy. Q7 (120 megawatt), one of Evelop's largest projects, has already been supplying power since December 2007. Evelop is also developing a wind park along the English east coast – within the English 12 mile zone – offering a total capacity of 315 megawatt. In Germany, Evelop is working on off-shore wind parks Gode Wind I, Albatros and OWP West. The total Evelop development portfolio now runs up to more than 6,000 megawatt.

Opportunities for the future

A long-term government vision can create new opportunities.

By building a wind turbine you have not yet developed a sustainable economy. This requires a long-term vision on the part of the government. A vision that provides incentives to build up an industrial and commercial network focused on renewable energy. That would make it possible not only to erect energy installations, but also to play a greater role in its production and in building up a distribution network. From Maldegem, Evelop's sister company Ecostream is currently setting up a vertically integrated distribution and installers network for the whole of Belgium, with a 25-strong team. This in the full conviction, and fully supported by the mission of our group (sustainable energy for all), that solar panels will become an integral part of future building materials. Thus, the group has turned innovator in Flanders.

In Denmark, a country with a population of 6 million people, the government support policy is built up in such a way that a new industry has been created for the manufacture of wind turbines. This sector now accounts for 30,000 jobs in Denmark. At present, Belgium is not taking full advantage of its opportunities in this regard.

Daring to invest in a sustainable future

Jos Peeters
Managing Partner, Capricorn Venture Partners

Introduction

The switch to a sustainable economy requires investments: investments in scientific research at universities and research centres such as IMEC and VITO, but also investments in promising knowledge companies in domains such as alternative energy, waste treatment and biomass. The capital for this comes partially from the government, but also from private initiatives and venture capital funds.

In 2006, Jos B. Peeters launched the venture capital fund Capricorn Cleantech Fund for environmental and renewable energy technologies. The fund invests in young, innovative companies with the capacity to grow to a market leader in their sector. It is a market with unprecedented possibilities for growth. A sustainable economy after all also functions according to market principles.

The Capricorn Cleantech Fund was established as venture capital fund within the larger framework of Capricorn Venture Partners, an independent pan-European fund manager that invests in innovative European companies with a strong technological basis.

The Capricorn Cleantech Fund focuses on growth companies that own or are developing breakthrough technologies in the area of sustainable development: renewable energy, energy efficiency, CO_2 reduction, advanced biomaterials, water purification, waste reduction and the like.

The criteria applied by the investment fund extend further than purely environmental considerations. First, Capricorn must be confident of the financial feasibility and long-term perspectives of the growth companies being invested in. In this, the capacity and the quality of the company's management team play a crucial role. Moreover, the accent is on the major growth opportunities of these companies within international markets. The growth potential and strategy of the candidate company must be focused on becoming a market leader in the sector. The company must also own the intellectual property rights of a technology with proven potential. Finally, presence in or a strong link with the European market is also a criterion.

Growth markets

The Capricorn Cleantech Fund came at the right time. In recent years, sustainable development has become a priority for industry, government institutions and the consumer. Concern about the depletion of existing sources of energy, rising oil prices, our major dependence on clean water, the impact of pollution on our quality of life, the first effects of climate changes, the agreements within the Kyoto Protocol, the growing awareness that we must have greater respect for the environment... all of these elements guide and stimulate the economy in the direction of sustainable processes and products. Sustainable, clean technology is indispensable to achieving a sustainable world. Investing in this sustainable, green technology is thus an investment in the future.

The Capricorn Cleantech Fund is based on the conviction that investments in companies that develop and market innovative, green technologies will yield a greater return. The greatest part of the innovations after all will continue to come from small private companies, with the support of smart investors. Large companies will gradually become more dependent on these new, clean technologies if they wish to remain competitive. The growing number of mergers, takeovers and IPO's in cleantech sectors will only increase in the coming years.

Investments in green technology can yield a greater return.

Cleantech sectors expand

The growing diversity of cleantech companies points to a healthy maturity.

At its creation in 2006, the Capricorn Cleantech Fund targeted fifty to one hundred million euro in resources. In 2008, these expectations were exceeded, with a total of 101.5 million euro. Investors include Electrabel/Suez, French-Belgian Dexia Bank, Ethias, the Solvay Group, the financial holding company Participatiemaatschappij Vlaanderen (PMV), the Limburg investment company LRM, M.R.B.B (the holding company of the Belgian Farmer's Union), the EU's European Investment Fund (EIF), a number of European pension funds and some twenty private investors.

The Belgian fund is part of a broader European and global trend of investments in sustainable development. Total venture capital investments in European cleantech sectors grew in 2007 by 20 percent to a record 977 million euro. Remarkable in this regard is the growing diversity of cleantech companies. Growth figures are striking especially in the materials, transport, energy efficiency, waste treatment and recycling, and production/industry sectors.
This growing diversity is a healthy evolution that reflects the strength and maturity of the European cleantech economy. This sustainable economy will only increase in importance in the coming years.

Bridging the gap between science and society

International Polar Foundation

Introduction

Reports on climate change and all the doom and gloom associated with it sometimes seem so disheartening, that a vital decisive response may fail to materialise. This is also the concern of the International Polar Foundation, which was founded in 2002.

The IPF is convinced that a global response to global warming is what is needed. Science plays a major role in this. After all, research in the Polar Regions can provide us with deeper insight into the climatological processes. The more in-depth knowledge we have about our ecosystem which keeps everything in natural balance on our planet earth, the better equipped we will be to face future challenges.

By building the Princess Elisabeth research station on Antarctica, the IPF is putting its words into action. Under the direction of civil engineer and explorer Alain Hubert, the scientific world, the Belgian government, and the business world have joined forces for this first research centre which runs entirely on renewable energy. The construction of this station is a unique and powerful signal of belief in a sustainable future.

Science for increased sustainability

The International Polar Foundation (IPF) was established in 2002 as a public utility foundation. The organisation focuses on three main aspects:

1. The IPF aims to ensure that science is given its rightful place in society. Science constitutes a source of human and technological development. It plays a crucial role in the fight against climate change, and in the evolution towards a sustainable society.
2. The IPF aims to influence public opinion and to make the general public more aware of climate change, and the role which scientific research can play in this field. Scientific research can provide a better insight into the processes which govern climate change. The more we know about these processes, the more our actions can be targeted at reducing the effects of climate change.
3. The IPF aims to chart the problems that cause global warming. The foundation wants to join forces in order to collaborate on the intelligent management of the environment, to achieve a sustainable society for the whole of humanity.

The IPF particularly focuses on scientific research in the Polar Regions. After all, both the North Pole as well as the South Pole offer a wealth of information about the climate, the eco-system, and the fragile balance which makes living on planet earth possible.

Time is pressing

Global warming urges us to question our relationship with the planet that is giving us life. Finding a coherent response is becoming a matter of urgency. Especially climate change should cause us major concern.
The impact of human activity on the finite, fragile biosphere, upon which our survival depends, has thoroughly disrupted the natural cycles. The processes ensuring our survival are part of an extremely intricate set, and are difficult to predict. In order to safeguard our future, it is important that we chart the complex interaction of human impact and natural reactions as objectively and as clearly as possible. The longer we postpone in taking decisive action, the less choice will be available to us. And still the world continues to drag its feet...

Finding a coherent response is becoming a matter of urgency.

In the meantime, researchers in the Polar Regions are endeavouring to explain the gaps in our knowledge in the field of climate change. Science can answer questions relating to the speed, the power, and the consequences of global warming for life on earth. Research on the ice plains of Antarctica (South Pole) and Greenland has already shown a causal link between CO_2

emissions from human activity and climate change. Global warming is causing the ice caps to melt, thus releasing millions of tons of water, which will cause the sea level to rise.
The North Pole sea ice offers a wealth of information. The ice is particularly sensitive to temperature variations. That is why it is an ideal signalling tool that warns us about any possible acceleration in the global warming process. At least, for as long as there will be sea ice.
The crucial role of the Polar Regions in keeping the global climate in balance makes it necessary to continue our scientific efforts in situ. The general public has to be informed of the results of that research.

That is why the IPF is active at three levels:

1. *Informing* the general public about the importance of the scientific research to provide a better understanding of climate change, and about the results of that research.
2. Developing *educational* tools which ensure efficient communication on this complex issue, and which can give impetus to the social debate, including in education.
3. Promoting initiatives in the field of sustainable development by *demonstrating* concrete examples of good practice.

Climate change without frontiers

Prior to the twentieth century, humanity hardly gave any thought to the possibility that the impact of its activities on the environment could disrupt the global equilibrium. However, the last century's growth in population has led to a dramatic increase in energy consumption, transport, agriculture, industry, and mining activities. Initially, the negative consequences for the environment were still considered as inevitable fringe phenomena of progress. We now know that the long-term effects on the environment do not remain restricted to local or regional problems, but that they endanger the overall balance on our planet earth.
In 1987, the World Commission on Environment and Development, under the direction of Gro Harlem Brundtlandt, published a report which bore the important title of *Our Common Future*. The report outlined the challenges facing the world. In its wake, international groups of experts were set up, which carried out extensive scientific research into climate change. In 1997, the Kyoto Protocol was signed, which stipulated that CO_2 emissions had to be reduced by 5% by 1990. It took until 2005 before the agreement was ratified. By that time, it was already obvious that the Kyoto agreement did not do enough by far. At present, there is still no international consensus on how much CO_2 emissions should exactly be reduced by in order to counteract the acceleration of global warming, let alone the way in which we should achieve this reduction in CO_2.

It has long been clear that the Kyoto protocol does not go far enough.

In the meantime, scientific observations in the Polar Regions are markedly clear. Large-scale changes in the environment caused by human activity are taking place now. Satellite images clearly show that the amount of mature sea ice is fast reducing. The melting of the permafrost is threatening life on the North Pole. Species of animals are moving away or are fighting stressful changes which are happening far too fast for the animals to be able to cope with.
At first glance, these changes on the North Pole seem to have little significance to life outside. The truth is that life on our planet earth is a question of equilibrium, in which everything is interconnected. Changes in one region will inevitably have an impact on all other regions on the planet. The accelerated melting of the ice caps is causing a rise in the sea level. Weather conditions will change, increasing the number of storms and their intensity. Furthermore, the melting of the ice will further accelerate global warming, which can finally irreparably upset the balance.
The scientific data available to us today is much more alarming compared to those of twenty years ago. However, the conclusions are the same. It is primarily the speed of the changes that has increased, due primarily to exponential population growth and unbridled economic growth, which is putting more demands on an eco-system that is finite.

Not losing heart

At the beginning of the 21st century, the earth is undergoing changes at a rate never seen before. We are heading for an uncertain future and the possible scenarios which we face, seem to be so discouraging, that they have completely undermined the collective belief in, and the readiness to adopt a co-ordinated approach. However, that co-ordinated approach is vital.
Science is working at refining predictive tools, which make it possible to develop a coherent international strategy to counteract the consequences of climate change. The challenges can only be met at international level, with collective responsibility to our planet earth.
In the meantime, at international level the realisation is growing that the agreements laid down in the Kyoto Protocol are but a first step and that they do not go far enough. New forms of sustainable development are gaining ground. Environmentally-friendly alternatives are being sought and found in numerous industries. Authorities worldwide have been hesitating for far too long about introducing drastic changes into their energy policy, for fear of economic consequences. However, it is now clear that even that argument no longer cuts the ice, because the economic cost of not responding to climate change will be exponentially greater than the cost which a significant reduction in CO_2 will incur. The debate that has to take place today is how we can jointly achieve

the necessary reduction of 60% in CO_2 emissions, regardless of how difficult it was to arrive at an agreement on a 5% reduction.

We have a collective responsibility to our planet earth.

Princess Elisabeth on Antarctica

In 2007-2008, the Belgian government commissioned the IPF to build the Princess Elisabeth research station on Antarctica. Civil engineer and explorer Alain Hubert is the pioneer of this project. The Belgian South Pole base, Princess Elisabeth, is the first 'zero emission' research station on Antarctica. The station is a summer base, which will be manned every year from November until February by a maximum of twenty scientists.
From November 2007 until March 2008, Alain Hubert and a specialist construction team have braved the cold and perilous living conditions on the South Pole in order to erect the outer structure of the Princess Elisabeth station, which looks out onto the granite mountain range over Utsteinen in Dronning Maud Land.
The building work was preceded by four years of preparation. The research station is the first not to produce any carbon dioxide emissions. It is designed extremely energy-efficiently and runs entirely on renewable wind and solar energy.
The second and last phase of the construction of the Princess Elisabeth station will take place from November 2008 until March 2009. That is when all the functional systems will be installed, such as an optimum energy management system and an effluent purification system. By March 2009, the station will be fully operational.
But even before this, two international research expeditions will set up their base camp at the Princess Elisabeth station. At the end of 2008, Dr. Frank Pattyn, glaciologist at the Université Libre de Bruxelles, will lead an expedition to study the loss of mass of the Antarctic ice cap within the context of climate change. At the start of 2009, the microbiologist Dr. Annick Wilmotte from the Université de Liège will lead an expedition to chart the diversity of the micro-organisms in the field of Utsteinen.

The Princess Elisabeth station is a unique project in the field of sustainability. In the first place, because it is a prime example of a joint venture between the government, the scientific world, and the business world. After all, the station and its operation will be largely funded by private companies. In the second place, it is also unique due to the clever design and the ingenious construction, which finally makes the station Belgium's environmental and technological calling card. Last but not least, it is also an example of international collaboration, a joining of forces to safeguard our common future.

Belgium's environmental and technological calling card.

Leading the way to the Third Industrial Revolution

Jeremy Rifkin
Chairman, Foundation for Economic Trends

Introduction

The world is ready for the Third Industrial Revolution. According to Jeremy Rifkin, this revolution rests on four pillars. The first pillar is renewable energy. Pillar two is the conversion of buildings to a type of power generating station running on solar energy, wind energy and other sustainable sources. Pillar three consists of new energy storage methods, for which hydrogen is presented as *the* solution. And pillar four is reforming the electricity network analogous to the Internet. People will be able to produce renewable energy themselves and share it with each other, as is done today in producing and sharing information.

The major economic changes in world history took place whenever new energy paradigms coincided with new communication possibilities, argues Jeremy Rifkin. Thus, everything appears to be in place for a new, sustainable, non-polluting future.

We are approaching the sunset of the oil era in the first half of the 21st century. The price of oil on global markets continues to climb and peak global oil production is within sight in the coming decades. At the same time, the dramatic rise in carbon dioxide emissions from the burning of fossil fuels is raising the earth's temperature and threatening an unprecedented change in the chemistry of the planet and global climate, with ominous consequences for the future of human civilisation and the ecosystems of the earth.

While oil, coal, and natural gas will continue to provide a substantial portion of the world's and the European Union's energy well into the 21st century, there is a growing consensus that we are entering a twilight period where the full cost of our fossil fuel addiction is beginning to act as a drag on the world economy. During this twilight era, the 27 EU member states are making every effort to ensure that the remaining stock of fossil fuels is used more efficiently and they are experimenting with clean energy technologies to limit carbon dioxide emissions in the burning of conventional fuels. These efforts are in line with the EU mandate that member states increase energy efficiency 20 percent by 2020 and reduce their global warming emissions 20 percent (based on 1990 levels), again by 2020. But, greater efficiencies and mandated global warming gas reductions, by themselves, are not enough to adequately address the unprecedented crisis of global warming and global peak oil and gas production. Looking to the future, every government will need to explore new energy paths and establish new economic models with the goal of achieving as close to zero carbon emissions as possible.

The great revolutions

The great pivotal economic changes in world history have occurred when new energy regimes converge with new communication regimes. When that convergence happens, society is restructured in wholly new ways. In the early modern era, the coming together of coal powered steam technology and the printing press gave birth to the First Industrial Revolution. It would have been impossible to organise the dramatic increase in the pace, speed, flow, density, and connectivity of economic activity made possible by the coal fired steam engine using the older codex and oral forms of communication. In the late nineteenth century and throughout the first two thirds of the twentieth century, first generation forms of electrical communication – the telegraph, telephone, radio, television, electric typewriters, calculators, etc. – converged with the introduction of oil and the internal combustion engine, becoming the communications command and control mechanism for organising and marketing the second industrial revolution.

Similarly, today, the same design principles and smart technologies that made possible the Internet, and vast 'distributed' global communication networks, are just beginning to be used to reconfigure the world's power grids so that people can produce renewable energy and share it peer-to-peer, just like they now produce and share information, creating a new, decentralised form of energy use. We need to envision a future in which millions of individuals can collect and produce locally generated renewable energy in their homes, offices, factories, and vehicles, store that energy in the form of hydrogen, and share their power generation with each other across a Europe-wide intelligent intergrid. (Hydrogen is a universal storage medium for

intermittent renewable energies; just as digital is a universal storage mechanism for text, audio, video, data and other forms of media.)

The question is often asked whether renewable energy, in the long run, can provide enough power to run a national or global economy? Just as second generation information systems grid technologies allow businesses to connect thousands of desktop computers, creating far more distributed computing power than even the most powerful centralised computers, millions of local producers of renewable energy, with access to intelligent utility networks, can potentially produce and share far more distributed power than the older centralised forms of energy – oil, coal, natural gas and nuclear – that we currently rely on.

The creation of a renewable energy regime, loaded by buildings, partially stored in the form of hydrogen, and distributed via smart intergrids, opens the door to a Third Industrial Revolution and should have as powerful an economic multiplier effect in the 21st century as the convergence of mass print technology with coal and steam power technology in the 19th century, and the coming together of electrical forms of communication with oil and the internal combustion engine in the 20th century.

Millions of local producers of renewable energy will produce and distribute more energy than the old, centralised forms of energy creation.

Renewable energy and the building sector

Renewable forms of energy – solar, wind, hydro, geothermal, ocean waves, and biomass – make up the first of the four pillars of the Third Industrial Revolution. While these sunrise energies still account for a small percentage of the global energy mix, they are growing rapidly as governments mandate targets and benchmarks for their widespread introduction into the market, and their falling costs make them increasingly competitive. Billions of euros of public and private capital are pouring into research, development and market penetration, as businesses and homeowners seek to reduce their carbon footprint and become more energy efficient and independent.

While renewable energy is found everywhere and new technologies are allowing us to harness it more cheaply and efficiently, we need infrastructure to load it. This is where the building industry steps to the fore, to lay down the second pillar of the Third Industrial Revolution.

The construction industry is the largest industrial employer in the EU and, in 2003, represented 10 percent of the GDP and 7 percent of the employment in the EU-15. Buildings are the major contributor to human induced global warming. World-wide, buildings consume 30 to 40 percent of all the energy produced and are responsible for equal percentages of all CO_2 emissions. Now, new technological breakthroughs make it possible, for the first time, to design and construct buildings that create all of their own energy from locally available renewable energy sources,

allowing us to reconceptualise the future of buildings as "power plants". The commercial and economic implications are vast and far reaching for the real estate industry and, for that matter, for Europe and the world.

25 years from now, millions of buildings – homes, offices, shopping malls, industrial and technology parks – will be constructed to serve as both 'power plants' and habitats. These buildings will collect and generate energy locally from the sun, wind, garbage, agricultural and forestry waste, ocean waves and tides, hydro and geothermal – enough energy to provide for their own power needs as well as surplus energy that can be shared.

A new generation of commercial and residential buildings as power plants is being built now. In the United States, Frito-Lay is retooling its Casa Grande Plant, running it primarily on renewable energy and recycled water. The concept is called 'net-zero'. In France, Bouygues, the giant French construction company, is taking the process a step further by erecting a state-of-the-art commercial office complex this year in the Paris suburbs that collects enough solar energy to provide not only for all of its own needs, but generates surplus energy as well.

Walqa Technology Park in Huesca, Spain is nestled in a valley in the Pyrenees and is part of a new trend in technology parks that produce their own renewable energy on-site to power their operations. There are currently a dozen office buildings in operation at Walqa Park, and 40 more are slated for construction. The facility is run entirely on renewable forms of energy, including wind power, hydro, and solar. The park houses leading high-tech companies, including Microsoft and other IT firms, renewable energy companies, etc.

Hydrogen as universal storage medium

The introduction of the first two pillars of the Third Industrial Revolution – renewable energy and 'buildings as power plants' – requires the simultaneous introduction of the third pillar of the Third Industrial Revolution. To maximise renewable energy and to minimise cost it will be necessary to develop storage methods that facilitate the conversion of intermittent supplies of these energy sources into reliable assets. Batteries, differentiated water pumping, and other media, can provide limited storage capacity. There is, however, one storage medium that is widely available and can be relatively efficient. Hydrogen is the universal medium that "stores" all forms of renewable energy to assure that a stable and reliable supply is available for power generation and, equally important, for transport.

Hydrogen is the lightest and most abundant element in the universe and when used as an energy source, the only by-products are pure water and heat. Our spaceships have been powered by high-tech hydrogen fuel cells for more than 30 years.

Hydrogen is the lightest and most abundant element in the universe.

Here is how hydrogen works. Renewable sources of energy – solar cells, wind, hydro, geothermal, ocean waves – are used to produce electricity. This electricity in turn can be used, in a process called electrolysis, to split water into hydrogen and oxygen. Hydrogen can also be extracted directly from energy crops, animal and forestry waste, and organic garbage – so called biomass – without going through the electrolysis process.

The important point to emphasise is that a renewable energy society becomes viable to the extent that part of that energy can be stored in the form of hydrogen. That's because renewable energy is intermittent. The sun isn't always shining, the wind isn't always blowing, water isn't always flowing when there's a drought, and agricultural yields vary. When renewable energy isn't available, electricity can't be generated and economic activity grinds to a halt. But, if some of the electricity being generated when renewable energy is abundant can be used to extract hydrogen from water, and can then be stored for later use, society will have a continuous supply of power. Hydrogen can also be extracted from biomass and similarly stored.

The European Commission recognises that increasing reliance on renewable forms of energy would be greatly facilitated by the development of hydrogen fuel cell storage capacity. Therefore, in October 2007, the European Commission announced an ambitious public/private partnership to speed the commercial introduction of a hydrogen economy in the 27 member states of the European Union, with the primary focus on producing hydrogen from renewable sources of energy.

The intelligent intergrid

By benchmarking a shift to renewable energy, advancing the notion of buildings as power plants, and funding an aggressive hydrogen fuel cell technology R&D program, the EU has erected the first three pillars of the Third Industrial Revolution. The fourth pillar, the reconfiguration of the European power grid along the lines of the Internet, allowing businesses and homeowners to produce their own energy and share it with each other, is just now being tested by power companies in Europe.

The smart intergrid is made up of three critical components. Minigrids allow homeowners, small and medium size enterprises (SMEs), and large scale economic enterprises to produce renewable energy locally – through solar cells, wind, small hydro, animal and agricultural waste, garbage, etc. – and use it off-grid for their own electricity needs. Smart metering technology allows

The new network must allow companies and homeowners to produce their own energy and share it with each other.

local producers to more effectively sell their energy back to the main power grid, as well as accept electricity from the grid, making the flow of electricity bi-directional.
The next phase in smart grid technology is embedding sensing devices and chips throughout the grid system, connecting every electrical appliance. Software allows the entire power grid to know how much energy is being used, at anytime, anywhere on the grid. This interconnectivity can be used to redirect energy uses and flows during peaks and lulls, and even to adjust to the price of electricity from moment to moment.

In the future, intelligent utility networks will also be increasingly able to respond to moment-to-moment weather changes – recording wind changes, solar flux, ambient temperature, etc. – giving the power network the ability to adjust electricity flow continuously, to both external weather conditions as well as consumer demand. For example, if the power grid is experiencing peak energy use and possible overload because of too much demand, the software can direct a homeowner's washing machine to decrease by one cycle per load or reduce the air conditioning temperature by one degree. Consumers who agree to slight adjustments in their electricity use receive credits on their bills. Since the true price of electricity on the grid varies during any 24-hour period, moment-to-moment energy information opens the door to 'dynamic pricing', allowing consumers to increase or decrease their energy use automatically, depending on the price of electricity on the grid. Up-to-the-minute pricing also allows local minigrid producers of energy to either automatically sell energy back to the grid or go off the grid altogether. The smart intergrid will not only give end users more control over their energy choices, but also create significant new energy efficiencies in the distribution of electricity.

The intergrid makes possible a broad redistribution of power. Today's centralised, top-down flow of energy is becoming increasingly obsolete. In the new era, businesses, municipalities and homeowners become the producers as well as the consumers of their own energy – so-called 'distributed generation'. Even the hydrogen-powered fuel cell automobile is a 'power station on wheels' with a generating capacity of twenty or more kilowatts. Since the average car is parked most of the time, it can be plugged in during non-use hours to the home, office, or the main interactive electricity network, providing premium electricity back to the grid. Fuel cell powered vehicles thus become a way to store massive amounts of renewable energy in the form of hydrogen, that, in turn, can be converted back to electricity to fuel the main power grid. If just 25 percent of drivers used their vehicles as power plants to sell energy back to the intergrid, all of the power plants in the European Union could be eliminated.

IBM and other global IT companies are just now entering the smart power market, working with utility companies to transform the power grid to intergrids, so that building owners can produce their own energy and share it with each other. Centerpoint Utility in Houston, Texas, Xcel Utility in Boulder, Colorado, and Sempra and Southern ConEdison in California are laying down parts of the Smart Grid this year, connecting thousands of residential and commercial buildings.

The new EU energy plan is preparing the way for the intergrid, with the demand that the power grid be unbundled, or at least made increasingly independent of the power companies that also produce the power, so that new players – especially small and medium-size enterprises and homeowners – have the opportunity to produce and sell power back to the grid with the same ease and transparency as they now enjoy in producing and sharing information on the Internet. The European Commission has also established a European Smart Grid Technology Platform and prepared a long-term vision and strategy document in 2006 for reconfiguring the European power grid to make it intelligent, distributed, and interactive.

A continent-wide, fully integrated intelligent intergrid allows each EU member country to both produce its own energy and share any surpluses with the rest of Europe in a "Network" approach to assuring EU energy security. Italy can share its surplus solar energy with the United Kingdom, and the United Kingdom can share its excess wind power with Portugal, and Portugal can share its abundant hydropower with Slovenia, and Slovenia can share its culled forestry waste with Poland, and Poland can share its agricultural biomass with Norway, etc. When any given region of the European Union enjoys a temporary surge or surplus in its renewable energy, that energy can be shared with regions that are facing a temporary lull or deficit. Hydrogen – buttressed by other niche storage media – provides a universal carrier for all forms of renewable energy, for use in transport, or for conversion back to electricity when needed to feed the power grid.

Europe as leader

The key to achieving the European Union goal of integrating a single European market and becoming the worlds' most competitive economy, is to create a seamless logistics infrastructure – buildings, transport, communication, power generation – and to build a green energy regime across the continent. With its 500 million consumers, and the additional 500 million consumers that live in the surrounding countries that make up its relational partnerships, the EU is potentially the "wealthiest internal market in the world". If goods and services can move efficiently and sustainably across the 27 member countries and associated regions by constructing a Third Industrial Revolution infrastructure, Europe can become the world's first post-carbon energy economy.

Being first to market will position the European Union as a leader in the Third Industrial Revolution, giving it a commercial edge in the export of green technological know-how and equipment around the world. Producing a new generation of renewable energy technologies, transforming Europe's millions of buildings into power plants to produce renewable energy for internal consumption or distribution back to the grid, manufacturing stationary fuel cells to store renewable

The European Union is potentially the richest internal market in the world.

energy, and reconfiguring the electrical power grid as an intelligent utility network, as well as producing all of the accompanying technologies, goods and services that make up a high tech Third Industrial Revolution economy, will have an economic multiplier effect that stretches well into the middle decades of the 21st century.

For a younger generation growing up in a less hierarchical and more networked world, the ability to produce and share their own energy in an open access intergrid, like they produce and share their own information, will seem both natural and commonplace.

Impact on the Third World

The half-century transition from the second to the Third Industrial Revolution will dramatically change the globalisation process. The most significant impact is likely to be on developing nations. Incredibly, over half of the human population has never made a telephone call and a third of the human race has no access to electricity. Today, the per capita use of energy throughout the developing world is a mere one-fifteenth of the consumption enjoyed in the United States. The disparity between the connected and the unconnected is deep and threatens to become even more pronounced as the world population is expected to rise from the current 6.2 billion to 9 billion people in the next half century.

Lack of access to electricity is a key factor in perpetuating poverty around the world. Conversely, access to energy means more economic opportunity. In South Africa, for example, for every 100 households electrified, 10 to 20 new businesses are created. Electricity frees human labour from day-to-day survival tasks. It provides power to run farm equipment, operate small factories and craft shops, and light homes, schools and businesses. Making the shift to locally generated renewable energy, loaded by buildings, partially stored in the form of hydrogen, and distributed via smart intergrids holds great promise for helping to lift billions of people out of poverty.
The shift from elite fossil fuels and uranium based energies to distributed renewable energies takes the world out of the "geopolitics" that characterised the 20th century, and into the 'biosphere politics' of the 21st century. Much of the geopolitical struggles of the last century centred on gaining military and political access to coal, oil, natural gas, and uranium deposits. Wars were fought and countless lives lost, as nations vied with each other in the pursuit of fossil fuels and uranium security.

If millions of individuals and communities around the world were to become producers of their own energy, the result would be a profound shift in the configuration of power. Local peoples would be less subject to the will of far-off centres of power. Communities would be able to produce goods and services locally and sell them globally. This is the essence of the politics of sustainable development and re-globalisation from the bottom up. The ushering in of the Third

Electricity liberates human labour from the daily tasks of survival.

Industrial Revolution will go a long way toward diffusing the growing tensions over access to ever more limited supplies of fossil fuels and uranium, and help facilitate biosphere politics based on a collective sense of responsibility for safeguarding the earth's ecosystems.

The central question that every nation needs to ask is where they want their country to be twenty five years from now: in the sunset energies and industries of the Second Industrial Revolution, or the sunrise energies and industries of the Third Industrial Revolution. The Third Industrial Revolution is the end game that will take the world out of the old carbon and uranium-based energies and into a non-polluting, sustainable future for the human race.

Europe has the potential to lead the world in energy efficiency

Philippe de Buck
Secretary General, BusinessEurope

Introduction

Philippe de Buck argues that energy efficiency is the ideal way to reduce CO_2 emissions. This after all allows for climate protection, without endangering economic growth.

Europe for that matter already scores quite high today with respect to energy efficiency. And this must also remain the case in the future. Thus, we must do everything possible to keep European industry in Europe. Too many additional costs could chase companies away from Europe.

Industry is an indispensable link in realising Europe's environmental objectives. It is then also logical that industry has a voice in policy-making. Philippe de Buck sees an example of how it ought to be in the Netherlands, where government and the business community concluded a voluntary sustainability agreement in 2007.

Europe has the potential to lead the world in energy efficiency

The world needs an efficiency revolution

Global warming is one of the biggest challenges of this century. It constitutes a serious threat to the environment, as well as to the quality of life and the welfare of the world population. To tackle this challenge, it is very important that we find an answer to the following question: how can unprecedented global growth, primarily in emerging economies, be reconciled with climate protection?

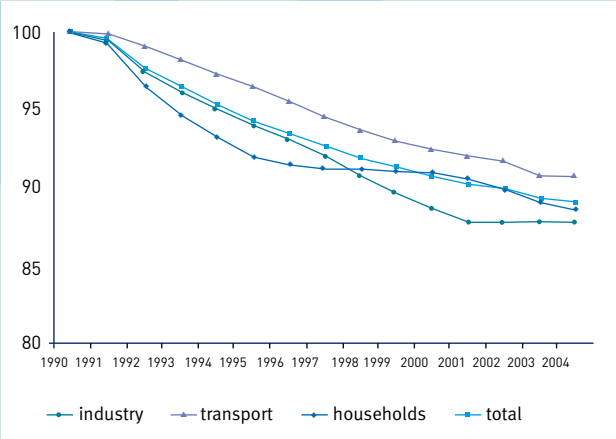
According to the International Energy Agency, world energy demand is projected to grow by more than 50% by 2030. As prosperity and urbanisation in industrialising countries rapidly increases, billions of people will demand more and better housing, cars, refrigerators, air travel, etc. Oil and gas prices have soared since the beginning of the millennium. The global race for cheap and secure energy sources has begun. Unfortunately, these energy sources are not necessarily the most environment-friendly ones: coal use is expected to expand by more than 70% between 2005 and 2030 in a business-as-usual scenario. As a result, greenhouse gas emissions are increasing; they will have increased by more than 50% in 2030. Although the US, Japan and Europe still have much higher per-capita emissions, their relative share in global greenhouse gas emissions is steadily decreasing. In 2007, China overtook the US as the world's largest greenhouse gas emitter. Climate change can only be mitigated through a global effort, and the industrialised countries must take the lead in reducing greenhouse gases emissions.

Such a scenario will continue to exert pressure on global energy prices, as well as increase the pressure to take political action to put a price on CO_2 emissions. In view of these developments, energy efficiency plays an important role. In theory, there are three ways to reduce greenhouse gas emissions: reducing economic growth, changing the energy mix to low-carbon sources, and increasing energy efficiency. But in practice, reducing growth would cause the global economy to stagnate and cannot be considered an option. Making the world energy mix less carbon-intensive is an important factor; however, apart from nuclear energy, many of the relevant technologies are not yet widely available at market conditions. Energy efficiency is therefore key to reducing greenhouse gases since it reconciles economic growth with climate protection.

The industrial sector in the EU15 already increased its energy efficiency by 13% between 1990 and 2004. In addition, industry provides products that enable other areas of the economy to increase their energy efficiency, especially in the domestic sector. Many technologies to reduce energy consumption in households and offices are already available, such as energy-saving light bulbs, improved insulation for houses, more efficient household appliances, etc. An overall change in mindset must take place throughout society to encourage the use of energy-efficient solutions, and policymakers can help by providing the right framework and positive incentives.

Compared to other regions, the European Union is already very energy efficient.

ODEX Energy efficiency index for EU-15 final energy users (1990=100)

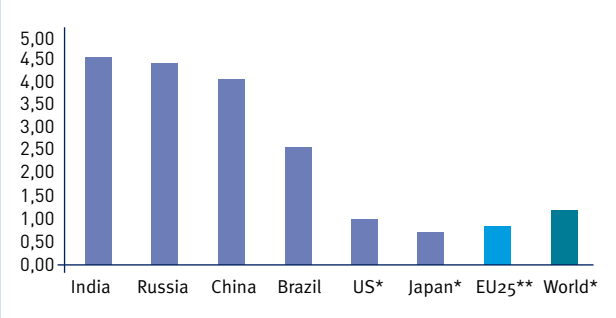


ODEX is a weighted average of 26 sectors (7 transport, 9 household, 9 industry, 1 services)

Source: ODYSSEE energy efficiency project 2007. The actual energy efficiency of many industry sectors is even higher when taking into account not only the production phase but the whole life cycle of their products.

Although much remains to be done in Europe, compared with other world regions the EU is very energy-efficient. If all the countries in the world had the EU's energy productivity rate, the world's energy consumption would be instantly reduced by more than a quarter. Energy productivity in the industrial sector is several times higher in the EU than in the large emerging economies.

Energy consumption/value added (ktoe/billion PPP International $) – Industrial Sector



**2000 value added*
***with EMU sectoral value added shares*

Source: BUSINESSEUROPE calculations based on World Bank 2007, IEA 2005

Energy efficiency solutions also present an enormous global business opportunity. According to the International Energy Agency, 22 trillion Euros will need to be invested in new energy technologies throughout the world over the next 25 years. These opportunities can and must be seized through more effective deployment of financial instruments such as CDM (Clean Development Mechanism) and JI (Joint Implementation.) These instruments, which were devised under the Kyoto Protocol, must be improved and reinforced to enable the export of clean technologies to the regions of the world that are experiencing the strongest increases in energy demand and greenhouse gas emissions.

Many energy efficiency solutions are in fact already available, and European companies are leaders. For example, the Danish coal power plant Nordjyllandsværket has the highest electrical efficiency of a coal-fired installation to date. The plant can achieve 47% thermal efficiency, which is much higher than the thermal efficiency of the many coal power plants currently built in China, estimated at about 36% on average. These new inefficient power plants in China have a lifetime of 50 to 70 years.

Another example is car tyres, which consume 20% of the energy used to move a car. Tyre rubber compounds transform energy into heat when the tyres are in motion. The company Michelin has been working for more than 80 years to reduce this so-called tyre rolling resistance, and the introduction of silica in 1993 was a major breakthrough. Low rolling resistance tyres now represent about 50% of passenger car tyres sold in Europe on the replacement market. In view of the expected exploding demand for passenger cars in countries like India and China, this presents a huge global potential to save energy.
Finding the most efficient and effective solutions for reducing greenhouse gas emissions also means keeping all technology options open and using them. The time has come in energy strategy discussions to give nuclear energy the attention it has lacked for a long time. Nuclear energy is an energy technology with zero CO_2 emissions. It represents 32% of the electricity generated in the EU. The EU should focus on eliminating the obstacles that unnecessarily hold back development of nuclear energy. It is also important to maintain Europe's technological lead in nuclear technologies as global markets develop.

The EU must put the right policy framework in place

European business is increasingly worried that the current mix of EU policies to meet the climate and energy challenges will not trigger further innovation in and deployment of energy-efficient solutions. Industry in Europe is already very energy-efficient, whereas industry in many other regions of the world is not. This trend must be continued. Industrial activity must therefore be kept in Europe in order for European technology to be exported outside the EU rather than forced to leave Europe through a further increase in the domestic production costs through energy and climate policies.

The political commitment to increase energy efficiency in the EU must be given the same weight in the definition of policy measures as the commitment to increase the share of renewable energy and to reduce greenhouse gases. The EU target of increasing energy efficiency by 20% by 2020, which was proclaimed

in 2007, must not be merely regarded as an indicative target. Indeed, reaching the energy efficiency goal should be a precondition for reaching the targets on greenhouse gas reduction and on increasing the share of renewable energy to 20% by 2020.

Even though European companies acknowledge the role of renewable energy sources in tackling the climate challenge, it will be very costly to achieve the 20% renewable energy target defined by the European Community. And the review of the *EU Emission Trading Scheme* directive has exacerbated the cost issue. The cost imposed by the EU-ETS is a serious threat to competitiveness, especially for energy-intensive industries.

The EU has made a unilateral commitment to reduce greenhouse gases by 20% by 2020, even without an international agreement on climate change mitigation. EU leadership in setting a price on carbon is important, but the EU needs to make sure that the other major emitters follow. Otherwise the European economy and the world's environment would suffer from carbon leakage, since emissions would decrease in the EU but increase in the rest of the world.

Emission trading also leads to a higher cost for power from fossil-fuelled plants, but will not affect power generation from renewable, hydropower, nuclear or biomass. However, power prices are set based on marginal cost. Therefore, prices in general will rise even if generated from non-CO_2 or a CO_2 neutral source. This generates windfall profits for electricity producers and further increases costs for electricity consumers.
The energy and climate policies of the EU have already resulted in a rise in the electricity price. In Europe, prices have climbed excessively compared to other continents. Indeed in only three years (2002-2005), the sales price offered to large industrial consumers in Europe increased from 20-30$/MWh to more than 40$/MWh. In the same period, prices in China have decreased from 30-40$/MWh to 20-30$/MWh, and in India, Russia and South Africa, prices have remained at an average of 20$/MWh. This is partly due to the passing on of CO_2 prices.

Consequently, European industries are urging policy makers to create a framework in which energy-intensive industrial consumers can fulfil their energy needs in the medium and long-term at reliable, internationally competitive prices. Long-term contracts between producers and users can play an important part in solving the issue while guaranteeing planning stability for the electricity and gas industries.

The risk of European industry leaving Europe as a consequence of these additional costs could be alleviated by introducing the possibility of allocating ETS emission rights to industrial installations according to criteria such as energy-efficient benchmarks rather than auctioning. Thereby, companies that increase their efficiency will be rewarded and encouraged to innovate further rather than be forced to relocate their emissions outside the EU.
As long as there is no global agreement and equivalent commitments by the large emitters, auctioning of ETS emission rights can be an incentive for carbon leakage, since energy-intensive industry outside the EU becomes more profitable. And where auctions do take place, it is vital that revenue is recycled for supporting research and the development of mitigation and adaption technologies and for protecting the international competitiveness of EU business.

Europe has the potential to lead the world in energy efficiency

Ensure continued innovation in clean products – the SET-Plan

In order to foster solutions to reduce energy and greenhouse gas emissions, it is necessary to keep the industrial base in Europe. This is a condition sine qua non for the invention and development of cost-effective and environmentally friendly technologies.

Smart promotion of energy efficiency aims at curbing emissions relative to production, and at fostering innovation and competitiveness without resorting to disproportionate and costly regulation or to a unilateral and unreasonable increase in the carbon price.

The EU Strategic Energy Technologies (SET) Plan, proposed by the European Commission in November 2007, can make an important contribution to achieving Europe's energy goals if it adequately involves industry as an indispensable part of the solution. It needs to contain the following key elements:

- Develop the right framework to enable the market to drive technological development and deployment of renewable and other low-carbon technologies as well as with respect to energy-efficient technologies.
- Significantly increase public funding for research, development and demonstration projects (RD&D) as well as for the commercialisation of new energy-efficient and low-carbon technologies.
- Improve the coordination between EU and member states' RD&D efforts to ensure coherence, focus and integration of the RD&D efforts. Possible synergies should be identified to optimise the output of EU and member states' efforts.
- Strengthen the focus on technology-push instruments, with funding decisions for RD&D being science-led, with an independent evaluation of technological potential, allowing technologies to compete for public funding on fair and transparent terms.
- Particularly focus on the deployment of energy-efficient technologies within all sectors, since this is the most cost-effective way of meeting targets with respect to climate change as well as security of supply.
- Use instruments to promote entrepreneurship and enable technologies with a market potential. Initiatives to improve entrepreneurs' skills in search of risk capital are one way to bridge the gap between the RD&D phase and the commercial phase.
- Apply funding schemes that do not damage the competitiveness of energy-intensive industries competing in a global market.
- Use market-friendly demand-pull initiatives such as public procurement and technical product standards.

A voluntary agreement is preferable to regulations.

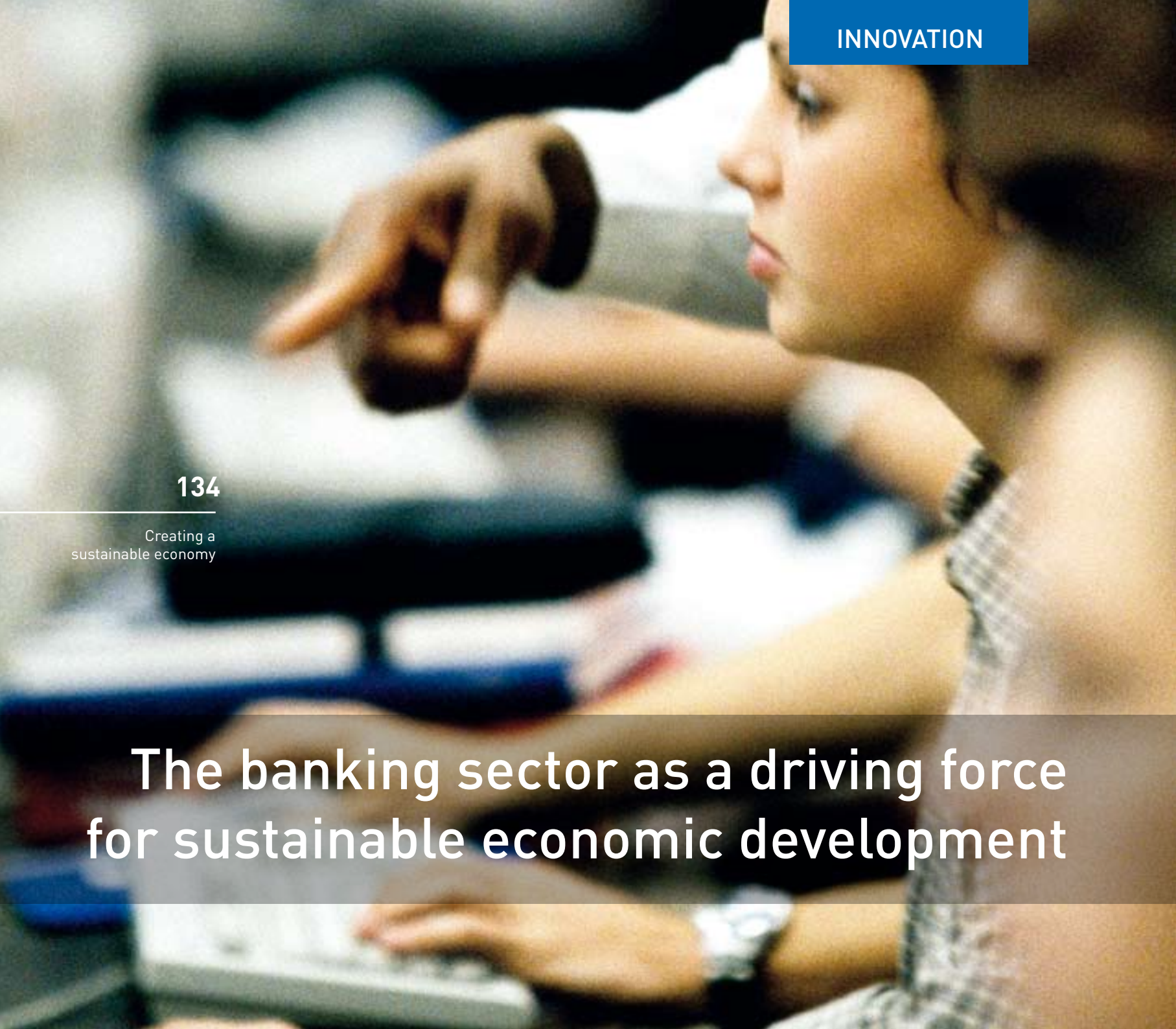
An example of a good policy practice: the agreement struck between Dutch industry and the Dutch government on climate change

In 2007, the Dutch business community and the Dutch government concluded a sustainability agreement. It was the first time that a government and the business community agreed to such an extent on energy conservation and an approach to climate change. The private sector promised to do its utmost to achieve greater energy efficiency, more sustainable energy and reduce the emission of greenhouse gases. In return, the business community expects that the government authorities "will do their utmost" to ensure that Dutch businesses do not suffer any competitive disadvantage relative to foreign competitors.

As it is a "voluntary" agreement, it has advantages over legislation, mainly because it leads to quick action: "as soon as a voluntary agreement has been concluded, businesses can get to work". This voluntary agreement will be evaluated in 2010. The sustainability agreement makes it possible to combine both climate and economy. "Economic growth ensures that we have the means for technological innovation, which is necessary for a new 'industrial revolution', as alluded to in the sustainability agreement."

This agreement is a real contribution to the global climate issue and Europe's ambitions, as it focuses as much as possible on an innovation and transition strategy that makes use of modern energy technology. Indeed, VNO-NCW, MKB-Nederland and LTO Nederland will make great efforts to ensure through sector agreements that their members invest in the use of biomass and biofuels. They will also make efforts through the sector agreements to ensure that the private sector invests in pilot projects in developing countries to encourage the sustainable production of biomass. The use of cogeneration *(Combined Heat and Power)* is important for efficient energy use in industry, greenhouse horticulture and elsewhere. Other environmental criteria must also be met in this context, e.g. new development of cogeneration at the micro-level of homes and buildings to replace the high-efficiency Combined Boiler and Water heater. Electricity generated in this way is much more efficient than electricity generated from centralised power stations.

Ideally, the modern technology they are developing and using should be also suitable for use outside Europe. Such an approach offers new opportunities for trade and industry to increase their competitive strength through cost reduction and the opening of new markets for efficient and sustainable technologies.



The banking sector as a driving force for sustainable economic development

Eric Bouwmeester & Wouter Scheepens
General Manager CSR, Fortis
Partner, Triple Value

Introduction

Financial institutions are also evolving in our globalising world, which is recognising the importance of sustainability. More and more banks are taking their responsibilities. They are naturally doing this because it is in their interest, but also out of conviction. The conviction that care of the environment and humanity, besides making profit, is becoming the new standard. It is clear that that will not always be easy. However, Eric Bouwmeester and Wouter Scheepens fully support Larry Page's call for "a healthy disrespect for the impossible".
Their article zooms in on the opportunities and the limitations of a financial institution in the field of sustainable business. On the basis of many examples which illustrate the Fortis case study, the article offers concrete examples of a possible approach, both at regional level and international level. Just like any other business, financial institutions also seem to be driven, on the one hand, by market demand, but also seem to be a source of innovation from their own vision and mission, on the other hand.

Introduction

That our economy has to become more sustainable is inevitable. The pressure that the world population is putting on the basic resources for life and well-being is worrying. The growing scarcity of fossil fuels, fresh air, and clean water is becoming more acute. For many people, rising food costs, globalisation, migration, and climate change signal doom and gloom.
As a financial institution, we believe in the ability of mankind to bounce back and in mankind's power of innovation. The challenges facing mankind are a source of inspiration and renewal, contributing to a transition towards a more sustainable and inclusive economy. Financial institutions can play a major role in this process, in which there are differences between the position of insurance companies and banks. We have dedicated a completely separate paragraph to sustainable insurance.
This article highlights the manner in which banks can contribute to a more sustainable economy. We will be particularly focusing on Fortis's vision, activities, and initiatives in this field. We will also be mentioning some of the financial sector restrictions; limits to opportunities and responsibilities. Business and profit-driven organisations cannot always equally meet all of the needs and wishes of all of the players in society.
Today's challenges are making the role of the banker even more interesting. Larry Page, one of the founders of Google, expressed an inspiring statement for when things get difficult. What you then need, according to him, is to have "a healthy disrespect for the impossible". We will always go in search again for new opportunities to promote economic growth, with respect for the interests of humanity and the environment.

Banks in the economic traffic

Banks play a pivotal role in economic traffic. They are an indispensable intermediary for managing savings, granting loans, and taking care of payment movements. Fortis offers business, individual and institutional customers a wide range of financial products. This means that we have a diverse customer-base, ranging from the multinational to the corner shop, from wealthy private individuals to John Bloggs, and from pension funds to charity organisations.

A bank cannot operate without the confidence of its stakeholders.

The stability of the financial sector is of prime importance, not only for the customers of a particular bank, but also for society in the broader sense. That is why the sector is heavily regulated by legislation and inspected by supervisory bodies. However, compliance with legislation and rules and regulations is only the tip of the iceberg. In addition, every bank first has to earn and then retain the trust of customers and other interested parties. Any banker will confirm that trust is vital for the existence of the organisation. Without the stakeholders' trust – the customers, the

staff, the shareholders, society, the authorities and the supervisory bodies –a bank cannot operate in economic and social traffic.
Firstly, that trust has to be earned on the basis of the quality of the products and the advice, and the way in which these services are provided. Is the bank accessible, are agreements met in a timely fashion, are their products of good quality, and is their risk management robust? In the course of the recent credit crisis, it has been demonstrated once again that when that trust is dented, the short-term results come under pressure, which can threaten the bank's future existence.
However, trust is not only determined on the basis of a bank's services, but also by the stakeholders' perception of the institution's activities. This is why banks always have to keep a close eye on social developments.

Banks in society

But what in fact is "the society" in which a bank actually operates? Globalisation, such as Thomas Friedman described it in his book *The World Is Flat*, has had an enormous impact on the banking sector. As a result of developments in the field of ICT, economies and value chains have become closely intertwined to form a world market. Furthermore, financial flows have grown accordingly, and have become globalised. Banks are doing business in all of the four corners of the world, they have connections with many countries, companies, and citizens. Magnification of scale, mergers, and take-overs have contributed to the development of a large number of world-spanning companies, and financial institutions themselves are also mainly operating at global level and have become multinational companies. Banks are still fulfilling the role of 'driving force of the economy'. Whereas in the past, they played this role primarily at local or national level, with the players knowing each other well, now we see a multitude of agencies, interactions, and a much greater dynamic. The economy is working at such a high speed that legislation is having difficulty keeping up with the pace. Moreover, national legislation stops at borders, and these are less relevant to the multinationals.

Banks have to be able to respond to these social developments in a flexible and appropriate manner. As a result of globalisation, society has become an amorphous concept; a listing of different countries, contexts, and interests all over the world.
Considering this dynamic, banks simply cannot operate 'value-free'. Not only (national) legislation and supervisory bodies are making demands on the banks, but also public opinion, the media, action groups, customers and staff are insisting on having a say in the debate. The banks also face contradictions and dilemmas.
In order to deal with these intelligently, policy principles are laid down, which provide bank staff with back-up whenever they are faced with dilemmas. In 2002, Fortis introduced its

In a globalising society, a bank cannot operate value-free.

General Code of Conduct. They inform the staff of what is expected of them in terms of behaviour and attitude, both at and outside of work. They are practical guidelines, something to rely on when dealing with shareholders, customers, colleagues and society. The General Code of Conduct also stipulates the main responsibilities with regard to the environment, society, and human rights. In this way we aim to do business responsibly and achieve sustainable economic growth, without losing sight of the legitimate interests of our stakeholders. We are convinced that correct compliance with this General Code of Conduct strengthens our reputation.

Dealing with stakeholders and protecting its own reputation can sometimes be viewed as defensive starting point for companies to embrace sustainable business. This has also played a part for us. However, focusing on sustainable business does not mean that there are no more dilemmas. On the contrary, the wishes and interests of our stakeholders can sometimes be in conflict.

For example, it may happen that a customer wants to invest in building a factory. This investment benefits the local economy and employment, but the environmental lobby is of the opinion that this will have a negative impact on the environment and is therefore making its feelings known. This is just a small example of the dilemmas which we often face. By adhering to our General Code of Conduct, by applying *sector-specific policies*, by entering into a dialogue with stakeholders and by weighing up the interests, we always try to achieve defensible decision-making with integrity. This is explored in greater depth in paragraph 5.

These ethical and defensive arguments are only part of what is referred to as sustainable business. Fortis has added more pro-active and innovative elements quite some years ago. Now that society has really taken sustainability on board, this is being enhanced even further. However, even before Al Gore impressed the general public with his film An Inconvenient Truth, we were already noticing a shift in the market. Customers have become increasingly aware of their personal impact on the environment, and ask questions about sustainability. These questions also translate into market developments and product opportunities for financial institutions. In the following paragraph, we highlight some of Fortis's activities in this area.

Anno 2008: Fortis as an example of sustainable banking

Sustainable business is sometimes referred to by some as *soft*. We have already indicated that, as far as we are concerned, this is certainly not a soft topic, but vital to our success. Our focus on sustainability helps us to respond to social developments and strengthens our reputation. In order to stay in tune with society as much as

possible, and in order to learn about the latest insights of renowned thinkers, we have founded an international advisory board, the Fortis Advisory Board for Corporate Social Responsibility. This board consists of representatives from the world of science, non-governmental organisations (NGOs), CSR research, and the business world. The board, which convenes twice a year, advises the Group Executive Committee and the top management of Fortis about sustainability policy and its implementation in our daily operations. The wide-ranging skills and backgrounds of these experts will assist Fortis in becoming a forerunner in sustainable business among the financial service providers.
Finally, this pioneering position will have to prove itself in the market, and it is exactly there where we can see many opportunities to develop products in order to achieve those win-win propositions. These are products which meet our customers' particular needs and requirements, but which also have a positive effect on sustainability in a broader sense. Here we should particularly like to emphasise a few examples: carbon banking, energy financing, shipping finance, sustainable asset management, and last but not least, sustainability through credit lending.

Carbon banking

In order to combat the danger of greenhouse gas emissions, the European Union launched an emissions trading system (EU Emissions Trading Scheme – EU ETS) in 2005. This system, which is now in its fourth year, is making individual companies responsible for part of the national contribution to be made by each member state in reducing CO_2 emissions. At Fortis, we were quick to recognise the business opportunities that the EU ETS had to offer. In the meantime, we have grown into the market leader and pioneer in European emissions trading. We have the expertise available to provide added value and we therefore do not just restrict ourselves to trading in emission rights. We offer our customers a range of CO_2 solutions, such as trust, trade, financing, fund, clearing, and escrow services. Fortis Carbon Banking currently has more than three hundred customers from various sectors, from oil and gas companies, cement factories, potteries, iron and steel companies, to refineries, pulp and paper factories, and utility companies. A special interdisciplinary team constantly responds to the needs and requirements of customers in a world with increasingly diminishing possibilities for CO_2 emissions. Fortis aims to promote the reduction of greenhouse gases by offering innovative solutions, thus enabling companies from all over the world to reduce their emissions in a cost-efficient way. With its branches in Europe, the United States, Hong Kong and Singapore, Fortis is the first to offer carbon banking services 24 hours a day.
Our international position has been confirmed by the United Nations Development Programme (UNDP), which has recently appointed Fortis as the unique financial service provider for the first series of compliance projects arising from the Millennium Development Goals (MDG) Carbon Facility. This strategic joint venture arrangement with the UNDP demonstrates that effective and efficient CO_2 reduction, as required by the EU ETS, can be used to promote progress in developing countries at social, economic and environmental level. As an established leader in

The emissions trading system offers business opportunities.

the field of technical support for environmental projects, the UNDP will use its extensive network of offices and strong local connections to develop projects which generate high-quality CO_2 credits and contribute to achieving the Millennium Development Goals (MDG's). The two main objectives of the MDG Carbon Facility are:

- To achieve wider access to the world-wide CO_2 trade and CO_2 finance, and by opening these up to a wider group of developing countries, for example, countries which are currently underrepresented.
- To support CO_2 projects which contribute to the MDG's, and which achieve extra advantages with regard to sustainable development and combating poverty, and which increase the quality and the credibility of CO_2 credits.

Energy financing

Fortis is active over the entire energy value chain. We finance companies operating in oil and gas production, energy infrastructure, energy generation and distribution, and water and waste. The two main challenges which the energy market currently faces are climate change and security of supply. In this context, conventional energy remains of vital importance, whilst sustainable energy sources will experience exponential growth. That is why we continue to focus on both conventional as well as sustainable energy. Nuclear energy can also offer part of the solution to the aforementioned challenges, but then with strong focus on safety and protection.
Fortis has already been a financial pioneer in the field of sustainable energy for ten years, and we are determined to strengthen this position. Sustainable energy is gaining ground in our growing energy portfolio. In 2007, we concluded sixteen new transactions for a total amount of 468 million euros in new production – a considerable rise compared to 399 million euros in 2006 and 253 million euros in 2005. Most of these transactions still relate to wind energy, but the contribution from other technologies is increasing.

Shipping finance

Fortis is a trendsetting financial services provider in the international shipping sector. We have a world-wide network of offices for this sector with branches in Rotterdam, Athens, Oslo, London, New York, Singapore, and Hong Kong.
This position means that Fortis plays a highly visible role in global shipping, an industry that plays a major role in the international economy. More than 90 percent of international commodities are transported by ship, and for numerous types of cargo there is simply no alternative.
However, shipping also generates high CO_2 emissions. The industry is responsible for almost 4 percent of world-wide emissions; approximately double the emissions caused by aeroplanes.
Given our position, we want to play a pro-active role in making the industry more sustainable. As a starting point, we developed a tool for this purpose in order to enable us to measure the

The Green Award is becoming increasingly valued and is gaining recognition.

sustainability level of our own portfolio, of potential customers, and of transactions, based on social aspects and environmental criteria. After liaising with a number of customers, experts and NGOs, we developed a prototype of this tool, which we use to map out all of our customers' sustainability aspects.
We also actively support our customers through our involvement in the *Green Award Incentive Programme*. We offer our shipping customers a discount on their subscription costs. The organisation of this programme is in the hands of an independent foundation, which was set up in 1994 by the City of Rotterdam port company and the Dutch Ministry for Traffic and Waterways. The *Green Award* Flag is awarded to ships which demonstrate high standards of quality, safety, and environment. Ports and service providers to the shipping industry are increasingly recognising the Awards' intrinsic value, and are prepared to apply special tariffs and grant additional benefits to *Green Award* vessels. The latter are offered a significant discount on port duties in the ports of Belgium, Lithuania, the Netherlands, New-Zealand, Portugal, South-Africa, and Spain. Private companies also appreciate the extra quality guaranteed by the *Green Award*. The *Green Award* is valid for three years, but inspections take place on a yearly basis.
At Fortis, in accordance with our recent agreement, we reimburse our shipping customers with 25 percent of the annual *Green Award* tariffs for ships financed by us, and the same percentage of the *Green Award* office audit. We actively promote the programme among our customers, we explore opportunities to combine the Sustainable Shipping Assessment Tool with the *Green Award* screening method, and we recommend laying down sustainability criteria in the finance models.

Sustainable asset management

Sustainability principles constitute an important topic in an investment process. Customers are increasingly demanding sustainable and ethically sound investment opportunities. Investment is clearly an area which we can influence considerably, both by incorporating sustainability criteria into our investment activities and by offering products in the field of sustainable investment.
Sustainable investment is key for our asset manager Fortis Investments and our private bank Fortis MeesPierson. Fortis Investments has long-standing experience in Socially Responsible Investment (SRI), which is sometimes also referred to as sustainable and responsible investment. We operate a centre of expertise for SRI investments in Frankfurt. The SRI Investment Centre employs ten specialists from seven different countries, each one having an average of ten years' experience in sustainability and finance. The Centre assists private and institutional investors in fine-tuning their financial objectives to their core values, by taking responsibility for what their money does in the world around them. At the same time, investors are becoming increasingly aware of the major impact which environmental, social, and management issues can have on a company's balance-sheet. They want to take these aspects into account when investing. The SRI Investment Centre aims to generate excellent long-term share returns by investing in 'sustainability leaders' in a broad spectrum of various industries and in companies offering sustainable products and services and showing strong growth.
Fortis Investments offers twelve SRI products in various categories (shares, balanced products, bonds, and money market) in order to meet the needs of the sustainable investor. In 2007, the product range was extended by the first investment fund aimed at sustainable climate change, with various capital protection

Investors are becoming aware of the impact of environmental issues on a company's balance-sheet.

structures and the first SRI money market product for institutional investors with AAA ratings of Standard & Poor. At the end of 2007, sustainable managed investments amounted to 2.2 billion euros – an increase of more than 140 percent per annum. In addition, there is approximately 700 million euros in sustainable managed assets or private banking.
As regards private banking, the joint venture set up with Triodos Bank represents major business. Triodos MeesPierson Sustainable Investment Management wants to offer investors the best combination of financial and sustainability criteria. Fortis Private Banking (Fortis MeesPierson in the Netherlands) offers investment knowledge and the systems, whilst Triodos Bank brings many years of experience and expertise in the field of sustainable investment. The partners also make use of the sustainability reports from Dutch Sustainability Research (DSR). Triodos MeesPierson does not invest in companies which operate in non-sustainable commercial activities and actively strives towards creating a portfolio with companies which make a positive contribution to sustainable development.

Increased sustainability through credit lending

In the above, we have given a few examples of sustainable products and niches in response to market demand. A core process which is not so much driven by the market, but which is essential for making banking more sustainable, are our risk management procedures.
On the basis of our policy and our guidelines, the bank weighs up whether or not we can grant credit to (potential) customers' projects. Besides a customer's credit-worthiness, sustainability aspects are also a criterion. In our policy documents, we always endeavour to specify those sustainability aspects as accurately as possible. Thus, we conduct a policy for financing agri-commodities, shipping, the defence industry, and the energy sector.
International banks are increasingly integrating sustainability aspects into their risk management processes. In this respect, there already exist a number of international guidelines, such as the Equator Principles, which Fortis also adheres to. These guidelines ensure the technologically environmentally friendly and socially responsible implementation of infrastructure projects, primarily aimed at up-and-coming markets. These guidelines are of major importance, especially in up-and-coming markets and countries with unsound legal frameworks. In our annual sustainability report, we report the number of projects that we have judged on the basis of these guidelines; in 2007 there were 73. We also indicate how many of of these projects were rejected or approved on the basis of these conditions. We believe that this type of transparency also contributes significantly to making our activities more sustainable.
Furthermore, compliance with sustainability principles in the credit lending industry does not necessarily mean that no further discussion can take place on specific projects. We discuss this aspect in more detail hereafter.

Sustainability is also a criterion when granting credit.

Sustainable insurance

With regard to the aspect of sustainability and the role of insurers as investors, we primarily refer to what we have previously mentioned under the heading Fortis Investments. Generally speaking, the same mechanisms apply. For the insurance activity we have laid down a sustainability policy which will apply to all investment portfolios. That policy combines a positive examination of the best practices and the ruling out of specific controversial issues. The policy is in the process of being finalised and will be implemented in 2008.

The topic of sustainability in insurance is primarily aimed at responsibly offering products to consumers and to clearly represent the risks and costs associated with these insurance products. These are also important issues for us. Naturally, the quality of our products and services is a top priority. In order to not just deal with this in the throes of a hectic market, but also to give this due reflection, we operate an *Insurance Transparency Working Group*.

In recent times, there has been a great deal of debate about insurers' transparency and product information. We endeavour to supply accurate information, in order to enable customers to determine whether particular products are or are not appropriate for them. Where we see opportunities in the market, we will also launch specific sustainable insurance products. Thus we are promoting more environmentally friendly driving in the Netherlands and Belgium. In both countries, we are offering a 10 percent discount on the insurance premium for environmentally friendly cars, such as hybrid cars and cars running on bio-fuels. But in Asia, for example, we are trying to implement our insurance know-how in a socially relevant way. With local joint venture partners of Fortis Insurance, we are examining the opportunities to develop micro-insurance. These are insurance products for the very poor, to ensure that risks are covered, just as it is common practice in developed Western markets.

Dilemmas in practice: there are limits to the banks' responsibilities

In previous paragraphs, we have already discussed how sustainability principles are reflected in our General Code of Conduct, our product range, our market approach, and our risk management procedures. Sustainable business is also sometimes described as a process of continuous improvement. In its search for appropriate solutions, Fortis holds frequent and intensive discussions with its stakeholders. In our sustainability report, we explore the way in which, and the frequency with which, we exchange ideas with a wide range of interested parties.

The banking sector as a driving force for sustainable economic development

The search for solutions takes place in liaison with the stakeholders.

Within the framework of this article, the special dynamic of our dialogue with NGOs is important. NGOs usually do not involve banks in their direct activities, but they do in their indirect activities, in other words: Those of their customers. By exerting pressure on the banking sector, an NGO wishes to bring about important changes. This approach virtually always goes hand in hand with media pressure. Thus, a bank is used as a lever for a necessary development.
Fortis recognises the role of NGOs and the positive influence which they can have on the sustainable development of the economy. We usually enter into a dialogue with parties who want to have serious discussions with us on the topic of possible dilemmas. Finally, however, the bank is asked to carefully weigh up the interests which take into account the three P's: People, Planet and Profit. Entering into an open dialogue on this subject is essential, as is respect for the possible irreconcilability of viewpoints and demands. Sometimes we simply do not agree. We always strive to explain our point of view. We also emphasise the limits of our responsibility. NGOs simply cannot approach us with everything they would like to change in the world. For some aspects of their agenda, for example, it is the authorities that lay down the legal frameworks, and that have to supervise their correct implementation. From a democratic viewpoint, it is also not a good thing for banks to hold a key position in the decision-making process on controversial and complex issues.
A current example in which the limits of responsibility are being explored is industry's CO_2 emissions. Our indirect impact is a complex and fundamental issue. On the basis of many discussions with NGOs, but also with customers, fellow banks, authorities and advisers, we have drawn up an in-depth analysis which is being debated within Fortis. The concept that is presenting itself is that of 'sphere of influence', in which we identify various levels of influence and responsibility with respect to various stakeholders. With customers, this influence can vary greatly, from industry to industry, but also at individual customer level. The scale ranges from a position of detached financier, and from one among many, to that of preferred partner and adviser. In the latter position, a dialogue and a common approach to combat climate change therefore constitutes more of a topic, compared to when acting as a detached finance organisation. Banks are not expected to solve the complex issues of climate change by the opening or closing of the credit tap. However, we do remain actively involved in the dialogue on this important case study and take our responsibilities seriously. That is why, at the beginning of 2007, Fortis has also implemented a Climate Neutral Programme, which provides for, for example, the purchase of green energy, the reduction of energy use by 10 percent by 2010, and compensating for CO_2 emissions by purchasing valuable emission rights.

A few future expectations

To conclude this article, we still want to discuss a few expectations on the topic of sustainable business within the financial sector and at Fortis.

Firstly, we emphasise that sustainability is irreversible. That is why we will also continue to play an active role, within our means. Our credit policy in the field of sustainability will gradually be tightened up. Moreover, our product range will grow considerably, to respond to increased and broader market demand. As far as our private customers are concerned, consumers are demanding a greater choice of sustainability products. In the business market, besides the international companies, the SME's will also become increasingly sensitive to sustainability in their banking matters. Furthermore, it is unlikely that these customers are prepared to make major financial concessions for sustainability purposes. They are searching for more sustainability, but they are not prepared to pay a higher price. This in itself is a challenge, for which we are designing innovative solutions.

We also expect that more forms of collaboration will constantly be created around the topics of sustainable business. The obvious ones are joint ventures between financial institutions for the development of international frameworks, based on the example of the Equator Principles and the United Nations Principles for Responsible Investment (PRI). In addition, there are specific types of partnerships between, for example, banks and NGOs. Thus, at Fortis Foundation we are already collaborating with diverse organisations. NGOs have specific knowledge and competencies available, which can be relevant to our work. In up-and-coming markets, there are spectacular examples of collaboration in the field of micro-finance. Micro-finance has caught the attention of developed markets, such as Belgium and the Netherlands, and there such types of collaboration will probably take place in the future.

Furthermore, we expect that sustainability will mainly succeed in cases where financial and social returns go hand in hand. Measuring the impact and success will become increasingly relevant when making a choice between specific projects. Sustainable business is coming of age, is less dependent on the idealism of the individual, and reaches the masses because results are becoming easier to measure. This is not self-evident; it requires effort, innovation, competitiveness and scalability.

Achieving a more sustainable economy is an absolute necessity. Care for the environment and humanity, besides achieving financial added value, will become the norm. And those who allow themselves to be primarily motivated by business arguments will also end up with sustainability. After all, the market is already offering enormous opportunities. May they become more sustainable, according to the motto of the legendary designer Raymond Loewy: "The most beautiful form is that of a rising sales curve".

N.B. The Fortis sustainability report provides a broader and more detailed picture of our sustainability activities. This report is available to you on www.fortis.com/sustainability.

Care for the environment and humanity, besides achieving financial added value, will become the norm.

Innovation as driver of sustainable growth

Gerard Kleisterlee
President and Chief Executive Officer, Koninklijke Philips Electronics plc

Introduction

In his speech to the China Central Party School (4 December 2007), Gerard Kleisterlee from Philips linked sustainability to innovation. It is only by playing the innovation card to the full, that China will manage to combine economic growth with balanced social development, responsible use of energy and environmentally conscious policy in the years to come.

Innovation therefore has to be encouraged. The needs and wishes of the consumer are key. In order to meet these requirements in a flexible way, companies have to focus on their core activities. Where necessary, they must re-organise themselves and collaborate through networks and partnerships. Government can assist in creating a suitable climate, for example, by ensuring clear legislation on intellectual property protection.

Gerard Kleisterlee illustrates his presentation with a whole host of examples of developments from the field of sustainability and innovation at Philips, both in China and elsewhere in the world.

It is a great honor for me to address such a distinguished audience here today on the important topic of innovation. The Chinese government has rightly made innovation one of China's top priorities. At the Party's 17th National Congress, President Hu Jintao explained the importance of transforming China's model of economic development, stressing the necessity to increase both the quality and efficiency of economic growth.

I fully agree with President Hu and it is precisely this need for better and more efficient economic growth that makes innovation so important. Innovation will help China to combine economic growth with harmonious social development, with a rational use of energy resources and with a reduction of environmental pollution. Philips and various Chinese partners have already engaged in many mutually beneficial relationships to foster innovation. For example, Philips and Shanghai Institutes of Biological Sciences (SIBS) have recently established a joint research laboratory for research in the area of molecular medicine.

Philips has thirteen Chinese R&D Centres, including one of our company's global Research Centres as well as Centres for patient monitoring, lighting electronics and digital technology for consumer lifestyle. We are also very proud that, over the last three years, both prime minister Wen Jiabao and vice prime minister Hui Liangyu have visited Philips' headquarters in Amsterdam to obtain first-hand knowledge of our innovative products and solutions!

Innovative in the world

Innovation has been part of Philips' DNA since our foundation as a manufacturer of light bulbs in 1891. Over the last 115 years, we have reinvented ourselves many times, but we have always stayed true to our mission: "Improve the quality of people's lives through timely introduction of meaningful innovations".

Today we are a global company with almost 27 billion euros of sales in 2006, and a workforce of over 128,000 employees. We have manufacturing sites and sales operations in all continents, focusing on the areas of healthcare, lighting and consumer lifestyle. Philips has always been an innovation power house. Our many inventions include the CD and the rotary shaver. Currently, we invest 6 percent of our sales in R&D and we have a portfolio of 80,000 patents. According to Business Week and the Boston Consulting Group, we are among the world's 50 most innovative companies.

Philips' most recent great transformation has taken place over the last decade. Ten years ago, we were basically a technology-driven conglomerate with strong positions in high-volume, low-added-value electronics. Now, we are a market-driven company focusing on high-growth, high-added-value activities in healthcare, lighting and consumer lifestyle. Not only did we radically change, we also adopted a more consumer-focused approach and a new brand message – *Sense and Simplicity*. At the same time, we now endeavor to extract value from synergies between our different product divisions and business units.

Market leader in China

In the long term, economic growth without social justice and a responsible environmental policy is impossible.

Philips has a long history in China. We have grown with the Chinese market from a very early start: Philips' products have been sold in China since the 1920's. Nowadays, we are one of the largest multinationals in this country with a total activity of 12 billion US dollar in 2006 and 14,000 employees. In China, Philips is market leader in lighting and domestic appliances; we are among the top three in Medical Systems and LCD TV. We are proud of our excellent relationships with the Chinese government, industry, universities and consumers.

In China as well as in the rest of the world, innovation will help us all to make economic growth sustainable. In the long run, economic growth without social justice and environmental responsibility is not possible. Therefore, sustainability and corporate social responsibility are very important to Philips. When our managers take decisions, we try to balance economic, social and environmental interests. I am sure many of you will have to perform the same balancing act in government or business; it is not always easy, but it is the right way.

Economic opportunities

Sustainable business is sound business; sustainability is not only an ethical imperative, but also a business opportunity. In the 21st century, sustainable growth requires innovative solutions and the need for innovation provides business opportunities. Philips is especially active in two areas where there is a great social need for innovation: healthcare and energy management.

The area of healthcare is, of course, of essential importance. Every human being should have access to affordable healthcare of decent quality. To achieve this goal will require a huge effort. As a result, healthcare will be a very important driver of economic development over the coming decades. Business, government, insurers and healthcare institutions will have to work together to find innovative solutions. For example, we need a shift from costly treatment at a late stage of a disease to prevention and early detection. Prevention can be increased by healthier lifestyles and a cleaner environment. Remote patient management can help us to bring healthcare to areas where traditional healthcare is not available. We need innovative insurance and financing models for healthcare, so that healthcare becomes not only available, but also affordable for all. As a provider of products and solutions to healthcare institutions, Philips is doing its best to improve healthcare, working together with many partners.

As for energy management, climate change is one of the most pressing issues of our time. At the same time, we all know that energy resources, so necessary for development, are scarce.

Energy efficiency helps to address both challenges. As the number one lighting company in the world, Philips is taking the lead in the promotion of innovative, energy efficient lighting solutions in houses, streets, offices, shops and cars.

Promoting innovation

It is vital for innovation to be based on consumers' needs and wishes. So the need for innovative solutions is clear, not only in healthcare and energy management, but in many other sectors as well. The question is: how can we foster innovation? How can we ensure that we get the maximum result from our efforts to stimulate innovation? I would like to share my ideas with you on this topic from Philips' perspective.

First of all, we should understand that 'innovation' is not the same as 'invention'. Of course, inventions in laboratories are important, but an invention only becomes an innovation if it is transformed into a product or service that is successfully introduced into the market. For a product or service to be successful, it needs to answer a real need felt by its users. What good is a smart, technically ingenious invention if nobody is really interested in its application? It is extremely important to make the needs and aspirations of consumers the starting point of innovation. The more you understand consumers, the better you can direct your research and development efforts. Technology is important, but insight in user needs is the starting point.

That is why in our company the people involved in R&D talk regularly with the people involved in marketing. The marketing people have a lot of information about the changing aspirations and needs of consumers. It is also important to involve users in the early stages of any research project, to get their feed-back, to see if we are on the right track. At Philips, we do this with our so-called Experience Labs, where ordinary people can experience applications of our latest R&D efforts in the natural setting of a home or a shop.

Original applications

It is vital for innovation to be based on consumers' needs and wishes.

Not every invention becomes innovation. At the same time, you do not always need an invention to be innovative. Sure, a new invention that meets a clear user need is great news for a company such as Philips, especially if it creates not only a new product but a whole new market. But innovation is not limited to inventions brought about by basic research. A lot of economic prog-

ress and growth is driven by the development of original applications of technologies that already exist. At Philips we create a lot of innovations that we can categorize as “experience enhancement”. Examples are our Flat TVs with Ambilight (creating a richer, more immersive infotainment experience), City beautification (lighting architecture solutions, improving the safety, comfort and atmosphere of urban spaces) and Ambient Experience (creating a more patient-friendly experience, while increasing the throughput of MRI scans).

But innovation can also be found in new business models. In recent years, we have introduced several innovative products developed in close cooperation with partners in the consumables industry. An agreed shared revenue model ensures a recurring stream of income and allows reducing the purchase barrier for the hardware product.

A collective process

Successful innovation is a collective process. An open and cooperative mindset is nowadays absolutely necessary if you want to be an innovator. The number of companies and public or semi-public institutions conducting high quality research has increased dramatically. So has the number of locations where this research takes place. From Shanghai to The Netherlands, from Silicon Valley to Germany, new knowledge is blossoming everywhere. In this era of ‘Open Innovation’, companies, universities and research institutes are increasingly sharing costs and opportunities by working together in R&D and by looking outside their own laboratories for useful inventions from outsiders.

A good example of Open Innovation is offered by the High Tech Campus in Eindhoven, the town in The Netherlands were Philips started off more than a century ago and that has always been an important research location for our company. A few years ago, we decided to open up our High Tech Campus in the city. Nowadays, it is an open environment, where researchers from Philips mingle with colleagues from other companies and research institutes, both public and private. The High Tech Campus is buzzing with networks and partnerships! With more than 6,000 people, the Campus has become the center point of a new regional ecosystem of innovation.

Open Innovation allows companies to concentrate on that area of R&D where they are most efficient and have the strongest competitive advantage. Joining efforts means faster time-to-market, lower costs and better adoption of new products and services.

A good example of open innovation is offered at the High Tech Campus in Eindhoven.

Here in China, Philips has various partnerships with Chinese companies and universities. We are proud to build 'Brain Bridges' between China and Europe. We are an integral part of partnerships between two Dutch universities (Eindhoven Technical University and Erasmus University Rotterdam) and various Chinese universities including the Northeastern University in Shenyang, the University of Zhe Jiang in Hang Zhou and the Fudan University in Shanghai.

Company organisation

To foster innovation, we have also drastically transformed the way we organize our business. On the one hand, we have eliminated vertical integration. For a company such as Philips, it doesn't make sense anymore to own the whole production chain from components to sales. In the era of globalization and Open Innovation, we have chosen to concentrate on our competitive advantages in innovative applications, marketing and brand building.

That's why we have divested our components and semiconductor operations and outsourced large parts of our manufacturing operations, also here in China. We concentrate our growth investment on growing and reshaping our businesses in the application areas of healthcare, lighting and consumer lifestyle.

On the other hand, we actively look for synergies between these three focus areas, now even more so than in the past. For example, we apply our lighting expertise in our *Intelligent UV Water Purifier*. As you know, water-related diseases are responsible for millions of deaths every year. Therefore, clean drinking water should be a priority in any integrated healthcare program. Philips' UV lamps kill bacteria and viruses, and can be built into more traditional water purification systems. As for lighting and consumer lifestyle, in our Aurea and Ambilight televisions, we use light effects to enhance the viewing experience.

Moving boundaries

We have also learned that we have to be flexible if we want to maximize the value from our innovative efforts. Not every promising idea can be nurtured within the environment of our established businesses – sometimes because the idea is too much of a break-away, sometimes because the expected returns or scale-up are too slow for our global businesses. We would

be destroying value if we just left those technologies on the shelf. That's why we have set up three incubators, to develop these technologies in a separate, entrepreneurial environment. An environment that measures performance in terms of growth, not earnings; an environment where risk is tolerated and people are stimulated to push the boundaries.

After nurturing and developing these ideas for a few years, successful incubator initiatives make it into new businesses, often within Philips, but we have also spun out some of them as independent companies. The incubators create a win-win solution. Society at large profits, because promising technologies do not rust on the shelves and can be developed into new business. Philips profits, because the incubators allow us to extract more value from our R&D efforts.

Intellectual property

Innovation thrives when ideas and technologies are pooled, shared and exchanged. In order to share technology in a commercially sustainable way, companies and research institutes need protection of their intellectual property rights. That is why innovative companies favor clear laws on the protection of intellectual property and a resolute implementation of those laws. Without IP protection, innovation suffers.

This is not only true for companies such as Philips. A good system of intellectual property rights is extremely important for innovation in countries such as China, too. It stimulates investments and R&D by the most innovative Chinese companies themselves. It also fosters direct investments by foreign companies in China; it enables transfer of technology and cooperation between Chinese and foreign partners, both inside and outside China.

As a result, the transfer of foreign technologies and related intellectual property rights to China receives a boost, which in turn stimulates the generation of local technology and intellectual property rights. In other words, a real virtuous circle of innovation that will strengthen China's international competitiveness, moving from low-cost to high-value. The Chinese government has put a lot of efforts in the past years to improve IP protection and to support the Chinese government in enhancing the knowledge-base in China regarding intellectual property rights, Philips has set up various intellectual property academies in China, in cooperation with universities such as Renmin, Tsinghua and Fudan.

Innovation is also stimulated by clear standards that allow for the combination and communication of technologies and products from different sources. Philips clearly understands that in

Innovative companies support clear legislation on intellectual property protection and its effective implementation.

some areas, China currently prefers its own standards to ensure that local technologies are included. In fact, Philips cooperates with China in the development of some local standards, such as digital TV and TD-SCDMA. On the other hand, Chinese industries and research institutes can also actively participate in the creation of global standard through joint development programs with the multinational companies. The combined local and global market potential provides China a clear advantage of faster returns if a global standard perspective is taken into consideration at an early stage.

The Role of Government

Innovation has to come from companies, universities and research institutes. Public authorities, however, can play an essential role in the development of an innovative economy. They can ensure that there is an attractive climate for investment in innovation. For example, it is vital for China to continue investing in the improvement of its physical infrastructure. Just as important is an attractive business environment with financial incentives for investment in innovation and with legal certainty: clear rules, strong enforcement. Education is, of course, vital, too. Creativity, inventions, innovation: it has to be produced by smart, original, enthusiastic people. Last but not least, China needs to have a social value system which encourages, recognizes and values a longer term way of thinking and a step-by-step attitude of people, companies who commit to their efforts in innovation. We are very happy to see that how to establish an appropriate core value system is high on the agenda of the recent National Congress.

Ready for the Future

Innovation is about flexibility. It is about concentrating on your main areas of expertise. It is about really understanding the needs and aspirations of consumers and finding original, creative solutions for their demands. Innovation is also about protecting your ideas and technologies in order to share them, pool them and exchange them. Innovation is about putting the right conditions in place for innovative business to thrive.

I am sure that after the phenomenal, peaceful rise of China over the last three decades we will see another miracle over the next thirty years: the transition of China to an economy based on innovation, creativity and knowledge. This will allow China to achieve economic development, social harmony and a cleaner environment. Philips has participated whole-heartedly in China's exciting journey of the last two decades. We are ready and eager to continue with China on this new voyage!

In the next thirty years, China will be evolving towards an economy based on innovation, creativity and knowledge.

Green zealots help industry

Introduction

The story of The Bellona Foundation is remarkable and unique. It all began in Norway, a good twenty years ago. A group of green-minded youths wanted to bring about change. However, they quickly realised that to push through fundamental change they would need the help and co-operation of the industry. And if business was not brought on-side, they would not be inclined to rush to join the green movement.

Bellona therefore worked out a new strategy whereby environmentally friendly solutions were sought together with business that were economically feasible and indeed profitable. And successful.

Today, Bellona does not operate only in Norway, but throughout Europe. The organisation has had a lobbying office in Brussels for several years, from which Bellona seeks to exert an influence on European law.

"The best way to do environmental good, is to make money on it! We need to make the sustainable solutions, technologies, products and services the winners. Companies can go green by *black* numbers on the bottom line – not red numbers. Energy, transport and activity are not the problem, it is the emissions we need to put out of play!" says Arnt-Gøran Hartvig, head of co-operation with industry at The Bellona Foundation.

Bellona was set up in 1986 by a group of young Norwegian green "hotheads" who simply wanted to "get on with things" and felt constrained within existing environmental organisations. That meant at first digging up barrels of toxic waste and other civil disobedience actions against polluting companies in Norway. Bellona's revelations made the headlines, and the organisation gained respect in industry.
At the same time, Bellona began to realise that environmental solutions had to be profitable in order to be implemented. This acknowledgement was key to setting up Bellona's co-operation programme with industry in the late 1990s. The organisation had grown and was about to structure its work according to a strategic plan. It soon became clear that the work would be expensive and that many of the objectives in the plan would require a great deal of innovative thinking and changes in industry. The plan, called B7, thus also became a plan for co-operating with industry.

Lovers of industry

Even though Bellona has created a lot of trouble for industry with criticism and direct actions, the organisation has never opposed industry or market forces as such. Chairman of Bellona, Olaf Brastad, puts it this way: "In reality, we like industry. Stuff has to be produced somewhere. But we are dogmatic opponents of emissions and pollution. Our focus on the Norwegian process industry has contributed to making it one of the most energy-efficient and low emission industries in the world."
The co-operation between Bellona and companies varies according to challenges and needs. Sometimes it concerns increasing a company's environmental competence and showing which opportunities and constraints exist. In other situations, the co-operation may focus on identifying more environmentally friendly technology. Dialogue is always the keyword.

Proponents of industry, opponents of pollution.

Things that make a difference

Bellona appreciates solutions that make a difference. It is crucial to scale environmental solutions up to industrial volumes. Norway's largest road constructor, Mesta, has more than 16,000

vehicles and consumes 13-14 million litres of diesel every year. After Mesta began co-operating with Bellona, the state-owned company set itself an ambitious target: by the end of 2012, all CO_2 emissions would be halved and in 2025, the company would not be responsible for any emissions at all!

"I think we are obliged to take responsibility for the environment. We just have to be environmentally friendly, if we are to do things properly. There is no conflict between that and a good bottom line," says Mesta's CEO, Kyrre Olaf Johansen. Mesta recently replaced much of its vehicle fleet and required its suppliers to respect strict emission standards. Mr. Johansen believes the company's green profile may give it a competitive advantage.

Politicians should in fact impose stricter environmental regulations on companies.

Company seeks stricter regulations

In 2005, Bellona lent its hydrogen car to Mesta, thereby becoming Norway's first hydrogen car in commercial use. The car is currently propelled by a combustion engine, but with fuel cells it will be able to drive fully emission-free – one of Bellona's greatest goals. Until infrastructure and regulations for hydrogen are in place, Bellona recommends another option: biodiesel. In the last few years, Mesta has switched to biodiesel for many of its vehicles, and the environmental benefit has been substantial. "In addition, biodiesel is good business for us! It is profitable both for the company and for society. Norwegian politicians really should impose even stricter environmental requirements on companies," says Mr. Johansen. He appreciates the expertise and the challenges that Bellona has brought to Mesta, and he seeks even closer collaboration in the future.

Bringing people together

Bellona has more than 30 strategic co-operation partners and another 40 companies from a variety of value chains in its *B7* programme. In 2005, Yara, the world's largest manufacturer of artificial fertilisers, joined the programme.
One of its products is urea, a by-product of fertiliser production which, when added to diesel, eliminates nitrous oxide (NOx) emissions. The product was initially made only for vehicles. But as a result of their co-operation, Bellona saw that Yara's urea product would be very suited to the diesel-driven shipping industry. Indeed, another Bellona partner, Wilh. Wilhelmsen, is a large Norwegian ship owner and maritime service supplier dedicated to reducing the

Cooperating with Bellona is no guarantee against critique. Bellona has prosecuted several of its collaborating partners for environmental infringements.

environmental impact of shipping. That is why Bellona facilitated a dialogue between the two companies, which in 2007 resulted in the creation of Yarwil – a joint venture to commercialise the urea-based fuel blend to cut NOx emissions from shipping.

Met with criticism

At first Bellona was met with scepticism for its co-operation with industry, to which Mr. Hartvig retorts: "We are here to identify solutions and do our best to promote and implement them in society. A company's environmental footprint must be regarded as part of its core business, and we need to be given a chance at the drawing table *before* industrial activity becomes a problem. The best strategy is to prevent pollution from happening!"

Co-operation with Bellona is no guarantee against naming and shaming. Bellona has sued several co-operation partners for breaching environmental regulations. The Oslo airport received a 250,000 euro fine after Bellona sued it in 1999 for emitting de-icing liquid. "Bellona would never have survived if companies could buy themselves free from criticism," says Stein Lier-Hansen, director of Norwegian Industry, the main employers' federation of manufacturing industries. "Many in the private sector are surprised by the tough criticism they can receive as partners of Bellona. I have dealt with Bellona in different contexts since it started and I know they don't compromise on their environmental objectives. They are *not* for sale," he says.

Cleaner and cheaper

Because many environmentally friendly solutions are energy-efficient and thereby cost-efficient, industry and environmentalists often have a common interest in promoting environmental technologies.

A proud partner of Bellona and the pacesetter for low and zero-emission shipping solutions is Eidesvik Offshore, a Norwegian ship owner. It has put together the FellowSHIP project, with Bellona as sparring partner and clearing house. The purpose is to develop and apply fuel cell technology to shipping. This technology eliminates air pollutants (NOx, SOx and particles from ships), one of the main environmental challenges of shipping. At first, natural gas will be used as fuel, which will reduce CO_2 emissions by 50 percent compared to the diesel used today. The green potential of fuel cells will be even greater when hydrogen becomes commercially avail-

able, because hydrogen-powered fuel cells emit only clean water. "This groundbreaking technology represents a milestone for Eidesvik Offshore," says Jan Fredrik Meling, CEO of Eidesvik Offshore ASA.

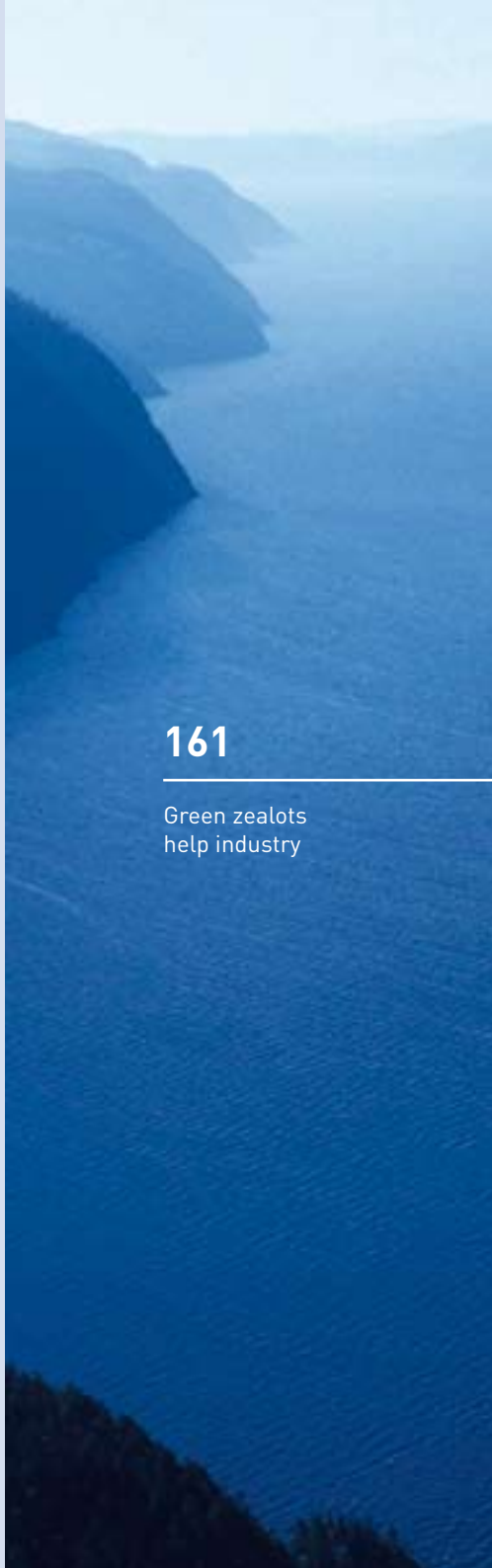
The FellowSHIP project brings together ship owners, ship builders, technology and service providers in order to demonstrate fuel cell technology in large ships. As a first step, a 330 kW fuel cell system will power parts of a new supply ship (serving platforms in the North Sea) of Bellona partner Eidesvik Offshore. The ship is to be delivered in 2008. Fuel cells are still far more expensive than diesel engines, but forward-looking industry actors see a great potential in them, due to their lower emissions and higher energy efficiency: "Stricter regulations coupled with policies favouring green solutions will in future years more than compensate for the higher initial investment costs of fuel cells," says Tomas Tronstad, who heads the FellowSHIP project for Norwegian ship classifier Det Norske Veritas (DNV).

Mr. Lier-Hansen refers to gas-fired power plants as another example of win-win collaboration: "We have a shortage of power generation in Norway. Bellona has contributed to making gas-fired power plants environmentally acceptable thanks to successful lobbying for CO_2 capture and storage. Bellona is happy because CO_2 capture and storage at gas-fired power plants in Norway will demonstrate a technology that is needed globally to curb greenhouse gas emissions, while we in industry are happy because we need more electricity. So it's a win-win situation for both parties!"

Shaping policy

Since 1992, Bellona has been pushing for CO_2 capture and storage at fossil-fuel power plants. Back then, few believed in it. Today, it is seen as a key technology for mitigating climate change. "Bellona has played an important role in shaping environmental policy, and has contributed with important information about the framework conditions necessary for CO_2 capture and storage," says Geir Vollsæter, special advisor at Alston & Bird, a US law firm, and previously in charge of CO_2 capture and storage at Shell International.

Bellona has been co-operating with Aker Kværner, a large Norwegian industrial company heavily involved in equipment supply, since 1998. It was therefore a huge victory for Bellona when in January 2008 the industrial group committed to financing on their



The collection and storage of CO_2 is an enormous market opportunity.

own the construction of a test centre for CO_2 capture at the gas-fired power plant at Kårstø in western Norway. Aker Kværner has established a new company, Aker Clean Carbon, to develop and test the CO_2 capture technology. The test centre will capture 100,000 tonnes of CO_2 every year from 2009. It will cost more than 100 million euro, but Aker Clean Carbon is prepared to accept the cost because it wants to position itself as a pioneer in what it sees as a tremendous future market.

"We have been acting as environmental quality managers, and have given industrialists confidence that CO_2 capture and storage technology makes environmental sense and that it provides a huge market opportunity for those willing to risk being a pioneer," Mr. Hartvig says.

Going European

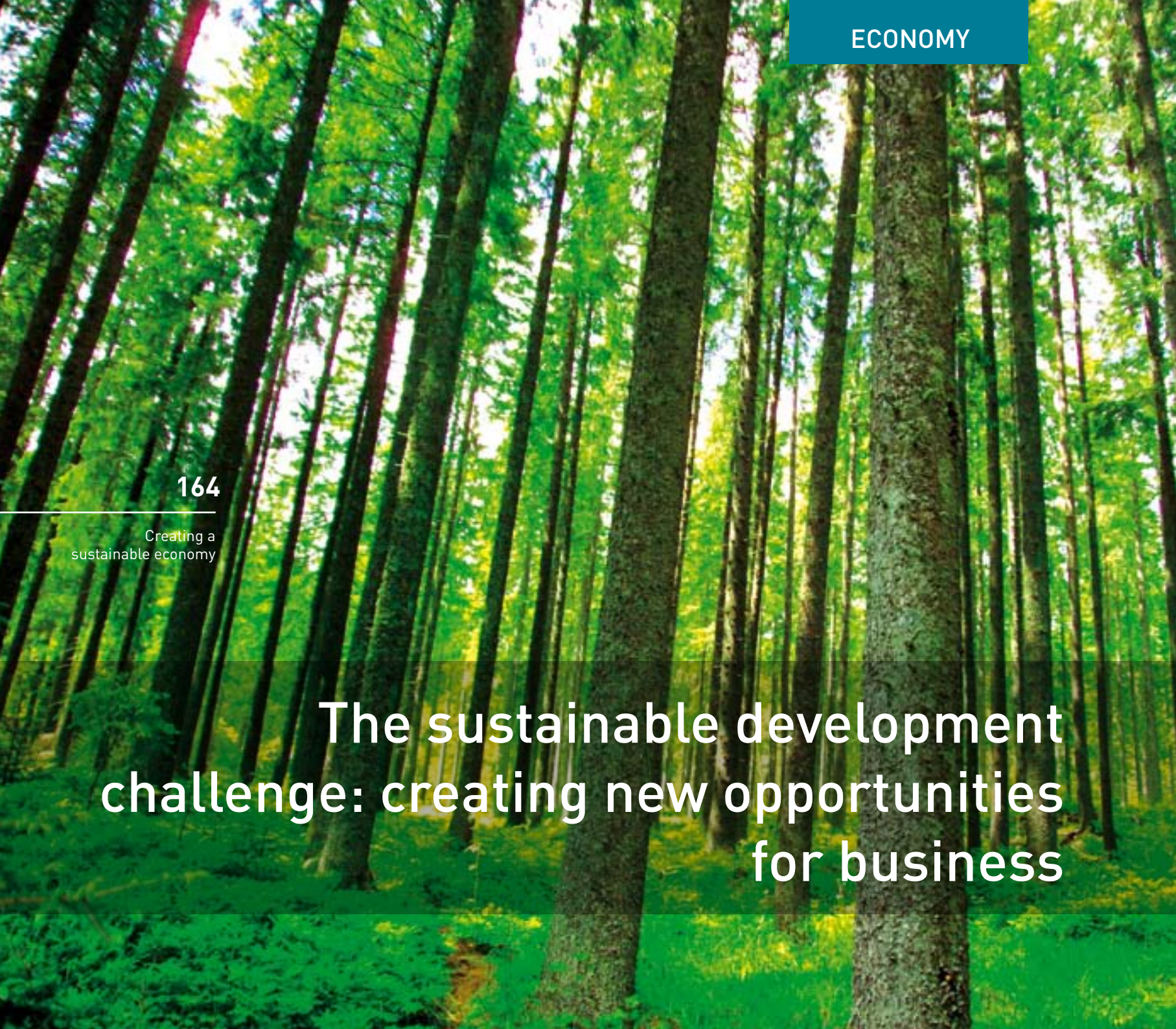
Policies for CO_2 capture and storage are also a major topic in Bellona's extensive work at the European level. Most Norwegian environmental regulations originate in Brussels through the country's membership of the European Economic Area. For this reason, the organisation set up a lobby office in Brussels already in 1994. It brought with it a constructive approach to finding solutions that work both for environment and businesses. An example is the EU directive on waste electrical and electronic equipment (WEEE). When the directive was negotiated between 2000 and 2003, Bellona was instrumental in pulling together an alliance of environmental NGOs and progressive companies for so-called individual producer responsibility.

"The directive established an obligation for companies to pay for the recycling of their products in order to prevent mercury and other highly dangerous substances from leaking into the environment and our bodies. The question was how should companies pay for this? We formed an alliance with some of the best-in-class companies to argue for their right to pay less for recycling if they put less toxic substances in their products," says Paal Frisvold, chairman of Bellona Europe. In that way, companies were given an incentive to reduce the size of the original problem – namely hazardous waste.

In the last few years, the emphasis of Bellona's work in Brussels has shifted to CO_2 capture and storage. Having won the battle over CO_2 capture and storage in Norway is certainly a good thing, but the technology must first and foremost be disseminated in countries more reliant on fossil fuels for power generation. As a result, Bellona is involved in a number of working groups of the European Technology Platform for Zero-Emission Fossil Fuel Power Plants (commonly known as ZEP), which gathers companies, NGOs and academics to advise the European Commission

on how to advance CO_2 capture and storage. Bellona's president Frederic Hauge is the vice-chair of the ZEP Advisory Council.

"Bellona has succeeded several times in setting an agenda that later results in political decisions. Bellona is currently doing a great job in ZEP, so the foundation will strengthen its position in Europe as a competent and very energetic environmental organisation," says Mr. Vollsæter.



The sustainable development challenge: creating new opportunities for business

Bjorn Stigson
President, World Business Council for Sustainable Development

Introduction

Governments, large companies and NGOs working together closely for a more sustainable economy appeared almost unthinkable approximately twenty years ago. Times have changed, however, says Bjorn Stigson. A number of companies have come together in the World Business Council for Sustainable Development (WBCSD). They are taking the lead in the propagating the idea of sustainable development.

The WBCSD is active primarily in three areas: energy & climate, development, and sustainable ecosystems. In each of these three areas, the organisation takes initiatives to actively involve companies in the evolution to sustainable development. "The time for talking is past, action must urgently be taken", postulates Bjorn Stigson. And the good news is: the business community is ready.

Sustainable entrepreneurs are ready to meet the challenges.

The world is changing

The world we inhabit has changed radically in the last two decades. Over the last 20 years, the attention of the scientific community, governments, civil society and business has focused increasingly on the rapid growth of developing world economies, and raising awareness of sustainability issues and their impact. The world is faced with the seemingly conflicting imperatives of meeting the demands of rapid population growth – most of it in so-called developing countries – while at the same time reducing the negative impacts on society and the environment. If we do not get this right, the results could be devastating. .

The current global population of 6.5 billion is predicted to grow by half again by 2050 and to reach a staggering 9.2 billion, 85 percent of whom will be in so-called developing countries. Energy demand to meet the needs of this growing number of people and help them out of poverty is forecast to grow by as much as 50 percent between now and 2030, requiring investments and infrastructure development worth some US$ 20.2 trillion over the same period. Then there is demand for food and non-food crops which is also rising. At the same time, the world faces very real problems of resource depletion, water scarcity, ecosystem destruction and climate change.

If populations in rapidly emerging economies are to achieve the levels of development and standards of living to which they aspire, and if we are to slow and reverse resource destruction and limit climate change impact, we will need, by some estimates, to cut our carbon emissions by as much as 50 percent by 2050. This assessment is now widely accepted.

Another change that has taken place is a newfound awareness that far-sighted business is part of the solution and is ready to collaborate with concerned stakeholders to tackle these challenges. Members of the WBCSD were some of the most influential pioneers of this change.

Twenty years ago, the idea that large corporations, governments and civil society could actually seek to work together on challenging issues was largely unheard of. Multinational corporations were viewed in a less-than-positive light and largely believed to shun regulation in the quest for profits. Governments were seen as commercially uninformed and determined to stymie business efforts. Finally, NGOs campaigned against both. The relationships were of course much more complex, but in many quarters this was the enduring perception.

Then things began to change. In 1987, the Brundtland Report first coined the term "sustainable development". The report went further and proposed that business, governments and civil society work together to try to tackle global issues, notably environmental degradation and poverty alleviation. In 1992, the idea was taken a step further when business, led by the fledgling forerunner of the WBCSD, was invited to participate in the Earth Summit in Rio.

Twenty years down the road, sustainable development is at a tipping point; the time for talk is over and there is urgent need for action. Business is ready to step up to the plate. This commitment comes with new responsibilities and new expectations on the part of business. But, while this creates new challenges for business, it also stimulates new and exciting business opportunities.

The role of business is to provide goods and services that people want at prices that are affordable while reducing the negative impact on the environment and not hastening resource depletion.

The WBCSD member companies have understood this. A key *raison d'être* of the WBCSD is to make the business case for sustainable development. It seeks to interpret the challenges and implications that sustainability presents for business and to work with companies, governments and civil society to manage these impacts. It provides a forum within which members can share their knowledge and the lessons learned from their experiences, create consensus around sustainability issues and develop strategies to "implement" sustainable development. Such strategies can first be implemented within individual business operations and then scaled up company-wide, and eventually taken to a wider audience both within and beyond the business community. Underlying all this is an important advocacy function.

The importance that the WBCSD and its member companies attach to sustainable development issues is reflected in the Focus Areas on which they have chosen to work. These are Energy & Climate, Development, and Sustainable Ecosystems. The key themes are all underpinned by the Business Role, which helps the Focus Areas coordinate their advocacy messages and better articulate, in an integrated way, common points between them.

Energy & climate: the next industrial revolution

The key to creating a sustainable global economy is the transition to a low-carbon economy. Traditional sources of energy such as fossil fuels like coal and oil, whose increased use helped to trigger Europe's industrial revolution in the 1800s, will not be sustainable in the long-term unless they can be made cleaner and their energy output more efficient. Similarly, patterns of energy consumption and use that historically have powered development are likely to lose sustainability in the light of current demographic trends, particularly in emerging economies. However, this analysis risks being too simplistic when viewed against the backdrop of the energy development conundrum.

Although there is some debate about whether peak oil production has been reached – with some arguing that we have now already started the downward trend towards depletion – it is widely acknowledged that fossil fuels, particularly coal, will be the primary source of energy for the foreseeable future. This is especially true in the rapidly emerging BRICS economies (Brazil, Russia, India, China, and South Africa) where coal is in cheap and abundant supply. At present, some 40 percent of electricity generation is coal-fired. Yet, burning of fossil fuels is responsible for greenhouse gas emissions and pollution, and a major contributor to climate change. So, the big question is how can we meet the energy needs of a growing developing global population while not further exacerbating climate change with all of its attendant implications?

The answer will lie in developing alternative, renewable, non-polluting sources of energy (wind, wave, solar, nuclear) on the one hand, and on the other hand making existing sources of energy cleaner and more efficient (clean coal technologies, carbon capture and storage (CCS)). This will require the participation of both developed and developing nations.

As purveyors of technology and technological development, WBCSD members of the Energy & Climate Focus Area have been investigating and developing innovative technologies to make this possible. However, business will not be able to do this in isolation. In order to make this happen, business requires comprehensive policy frameworks to guide its research and development activities and set goalposts for the objectives it is seeking to achieve. This will require the articulation of firm pathways to emissions reductions, and increased commitment and greater financial investment on the part of governments.

These imperatives have now taken on an increased urgency with the agreement in Bali to negotiate a new climate change treaty by December 2009 to come into effect once the Kyoto Protocol ends in 2012. For the first time, this event included a Business Day – coordinated by the WBCSD – as part of the official program in which business leaders were given an opportunity to engage firsthand with government representatives, articulate their needs and provide input to shape a future policy framework.

For WBCSD members, the next industrial revolution has now begun in earnest. Over the next two years, the WBCSD's Energy and Climate Focus Area will concentrate on advocacy to establish a post-2012 framework. Specifically, the Focus Area will work closely with Japan, the 2008 G8 President, concentrate on input to international energy and climate policymaking and develop content – and technology – to support these.

Development: doing business with the world

While energy is key to economic development and poverty alleviation, alone it will not be enough to solve the challenges of the 3 billion members of the global population that currently subsist on less than US$ 2 per day. The importance of poverty alleviation hardly needs an introduction. It is not simply an issue of philanthropy underpinned by moral considerations, but the long-term security and prosperity of the planet ride on it.

Members of the WBCSD's Development Focus Area are trying to help poorer nations develop through more inclusive business models that are both profitable for business and good for poorer people and poorer nations. Within these same models, they are trying to integrate development challenges – poverty, ill-health, lack of infrastructure, poor housing and sanitation, unequal access to education, poor mobility, etc. – with wider energy and climate solutions. This concern is clearly articulated in a recent report of the Focus Area, *Doing Business with the World: The new role of corporate leadership in global development*. This report offers an overview of some of the most pressing societal needs in developing nations, and provides a business perspective on – and actual successful examples of – possible solutions that could benefit the poor.

A key strategy that the Focus Area is keen to adopt focuses on collaborative action and partnerships. Development efforts of the past have often been accused – sometimes justifiably – of inappropriateness or of serving donor self-interest. Members of the Focus Area are anxious to avoid falling into such a trap. In Latin America, the WBCSD has entered into an alliance with the Dutch development organisation, SNV. This partnership seeks to broker inclusive business ventures among WBCSD member companies, the WBCSD Regional Network, micro, small and medium enterprises, producers and local governments. In this same vein, the Focus Area has also signed an MoU with the Inter-American Development Bank (IDB) to promote market-based solutions for low-income communities in Latin America.

One area that is ripe for partnership, and where large corporations can make a difference to sustainable development objectives, is engaging with small and medium enterprises (SMEs). These organisations, which range in size from a single entrepreneur to 250 people, form the backbone of the global economy. In OECD countries, they account for 95 percent of companies, while in developing countries this proportion is in the region of 90 percent. They are responsible for generating a considerable chunk of the world's GDP. Despite this, SMEs in developing countries are frequently overlooked by investors and by government legislation that could help make them stronger players in the economy. Yet, on balance, the experience of those who have engaged with SMEs in low-income countries has been positive. Members of the Focus Area are

SME's are responsible for a sizeable part of the Gross World Product.

seeking to scale up their engagement with this sector. To this end, they published a short report in 2007, *Promoting Small and Medium Enterprises for Sustainable Development*, which outlines ways in which governments can help alleviate poverty by focusing on SMEs and encouraging larger corporations to include them in their value chains.

Looking to the future, in 2008 the Focus Area will launch a 'Framework for Measuring Impact'. This will be a practical tool to help large corporations with operations in developing nations to assess the impact of their actions on development. It will underpin the business licence to operate in emerging economies and identify ways to improve the business contribution to the societies in which they operate. The primary objective of the tool is to inform future operational and long-term investment decisions by companies. But the tool also aims to improve stakeholder engagement by including external stakeholders in a progressive manner.

Sowing the seeds of a sustainable future: ecosystems

An area that offers considerable opportunity for WBCSD members is the sustainable management of the world's ecosystems and the biodiversity that underpins them. Ecosystems are still poorly understood by the business sector, except for corporations that rely on them directly as part of their core activities such as the forestry sector. Yet, ecosystems and the services they provide underpin life itself.

Ecosystem services can be broadly separated into four categories: supporting (nutrient cycling, soil formation), provisioning (food, freshwater, wood, fibre), regulating (climate regulation, flood control, water purification), and cultural (aesthetic, spiritual, educational).

Despite their importance, the 2005 Millennium Ecosystem Assessment (MA) report, the largest and most comprehensive multi-stakeholder review of its kind conducted to date, concluded that two-thirds of the ecosystems reviewed and their services were being degraded or used unsustainably.

Life itself depends on the functioning of the ecosystem and the services it provides.

Given their importance, the loss of ecosystems and their services represents a considerable threat to all sectors of society, and not least to business. Ecosystem degradation and the associated loss of ecosystem services seriously threaten the business license to operate. Companies, their suppliers, customers and investors are faced with operational risks such as increased scarcity and cost of raw materials as well as higher insurance costs caused by natural disasters

such as flooding. Similarly, the emergence of new government policies like higher taxation or moratoria on extractive activities, pose regulatory risks. Furthermore, changing customer preferences, shareholder resolutions, or media and NGO campaigns can cause reputational damage, while the adoption of more rigorous lending and investment policies by the financial community can result in restrictions in capital access.

However, members of the WBCSD Ecosystems Focus Area have found that responding to ecosystem challenges such as water scarcity, climate change, habitat change, biodiversity loss and invasive species, overexploitation of oceans, and nutrient overloading can also create new business opportunities. Companies, for example, might benefit from developing new technologies and products that will serve as substitutes, reduce degradation, restore ecosystems or increase efficiency.

The creation of markets and payments for ecosystems and ecosystem services can also lead to new revenue streams and cost savings. For example, direct payments can be a cost-effective way to secure the continued provision of a valuable service, certification and eco-labelling a way of capturing positive externalities, and tradable permits a mechanism for managing environmental liabilities.

Although they may sound unusual, in reality some of these markets have existed for a long time. Ecotourism is one obvious example. A number of new markets, however, are also emerging for watershed services, carbon and biodiversity. The burgeoning trade in carbon credits was worth more than US$ 33 billion in 2006 alone, and grew a staggering 80 percent during 2007 to about US$ 60 billion.

Using market mechanisms offers new business opportunities and the chance to use ecosystems and their services to tap into previously unrealised assets. However, these mechanisms are not without their limitations. Weak institutions and poor governance in some – often biodiversity-rich areas – can make it difficult to exploit market mechanisms equitably and sustainably. Similarly, a lack of experience with market-based approaches to ecosystem management may result in further harm to ecosystems and their services. Finally, some of the most vital ecosystem services, such as regulating and supporting services are actually the most difficult to 'bring to market'.

Looking to the future, this realisation has inspired the WBCSD and the World Resources Institute (WRI) in collaboration with the Meridien Institute to develop the *Ecosystem Services Review* (ESR) tool. Over the next few months, the WBCSD's Ecosystems Focus Area will give priority to using all available tools and mechanisms to promote a robust case for the sustainable use of ecosystems and their biodiversity to ensure that they continue to deliver their services in a way that meets the needs of the present without compromising those of future generations.

Looking to the future we want to move further faster in advocating solutions.

Looking forward

In addition to its Focus Areas, WBCSD members are also involved in a series of projects and initiatives. These include a water project through which the WBSCD encourages its members and a wider audience to give serious consideration to mapping and managing an increasingly scarce resource. The organisation is also looking at various individual sectors including energy efficiency in buildings, or how to create sustainability in the cement industry: one of the most important and yet energy-intensive sectors. Similarly, the organisation is exploring how to manage the sustainable procurement of forest products; how to make tyres safer and healthier; or how to ensure sustainability throughout a value chain. All these sectors present significant challenges not simply for business, but also for society at large. At the same time, they represent a business opportunity.

Looking to the future, our members have told us that they want to move "further faster" in advocating solutions. Our collective response to that message will be to ratchet up our advocacy efforts in a response dubbed "Mach 2" and to set up a "Vision 2050" in which we imagine what our world will look like and the scenarios we need to develop and implement to make that vision a reality.

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The sustainable development challenge: creating new opportunities for business

A zero waste & zero carbon Flanders: strategy or mirage?

Raoul Weiler
Chairman Brussels EU Chapter, Club of Rome

Introduction

While the situation could be called dramatic, it appears to be very difficult to quickly take the appropriate actions at world scale. This means that the agreements reached will come too late to have the desired effect. Prof. Weiler thus argues for switching to a higher gear. Thus, it makes little sense today to search for new sources of fossil-fuel energy. Investing in new technologies makes much more sense and is much more urgent.

Flanders can play an important role in this. Still more, the *Flanders in Action* project provides an excellent framework in this regard. "Why not take on the challenge of making Flanders the first waste and carbon-free society?" proposes Prof. Weiler. He is convinced that this is a viable proposition. What's more, the benefits this would provide Flanders are considerable.

There are limits to the earth's capacity to sustain human life, yet this trivial observation appears difficult for industrial societies to understand and accept. Almost forty years ago, the report *The Limits to Growth*[1] (1972) was published. It applied a mathematical model using the system dynamics methodology to look for complex correlations between a large number of parameters, in the hope of achieving a better understanding of the impact of industrial production on the planet.

In fact, the initial motivation consisted in the fear that the planet would be unable to provide sufficient natural resources for feeding an increasing population and mineral stock for its increasing industrial output. The fear was that eventually the environment would be unable to digest the waste these processes produce. Three decades later, the situation could better be defined in terms of *The Limits to Waste.*

The report received mixed reviews by the public. Very recently, the *Wall Street Journal*[2,3] paid new attention to the planetary situation by accepting the correctness of the trends the early report proposed. Unfortunately, the reference to Maltus is confusing. It is not the number of people that determines resource demand, but their way of living. Technology can help address the existing and the growing footprint[4] generated by industrial societies, but their environmental impact is determinative for the implementation. As an example, the present hype around and market-driven investments in bio-fuel production plants, relying on resources that are in direct competition with food availability and land use, clearly demonstrate erroneous judgement in the choice of technological solutions and the system behind it.

It has become clear after several decades that the planet indeed has a limited *carrying capacity*, in particular with respect to the industrial and economic activities of humankind. The depletion of forests, oceans and other natural resources, the approaching or already reached oil availability peak, are all facts accepted by political and business leaders as well as by scientists and civil society groups. Scientific knowledge and understanding of the behaviour of the global ecosphere and biosphere has made considerable progress, especially in the domains of climate change, the impact of the melting polar icecaps and mountain glaciers, the dynamics of the oceans, in particular the Gulf Stream and many others.

Two major discoveries have modified the picture we have of the planet since 1972: depletion of the Ozone Layer and Global Warming resulting from the increased concentration of greenhouse gases (GHG) in the atmosphere. Both phenomena were unknown in the 1960s and could not be incorporated in the model used in the report to the Club of Rome.

With respect to the Ozone Layer, international agreements, – the *Vienna Convention*[5] (1985) and the *Montreal Protocol*[6] (1987) – were concluded to stop the production and use of chlorofluorocarbons (CFCs), halons, methyl chloroform, methyl bromide, carbon tetrachloride and several other chemicals at the origin of the depletion of the stratospheric ozone layer.

Global Warming and Climate Change[7] have finally gained the highest priority on the world political agenda, and public opinion is increasingly sensitive to these phenomena. Indeed the capacity of the atmosphere to absorb the amounts of the GHG emitted via industrial activity and a modern lifestyle appears to be inadequate. The increase in the world population over the next decades represents an additional challenge for developing workable solutions for limiting, and eventually reducing, GHG concentrations.

The melting of the glaciers at the poles and in Greenland is an additional parameter affecting our climate. Especially the seasonal disappearance of mountain glaciers radically changes the biosphere of the large river basins, with as dramatic consequence a threat to providing food to entire populations[8].

The reckless deforestation, destruction and exploitation of tropical forests, and overfishing of the oceans[9] are well known problems, but appropriate political action or responsible action by local authorities and industries has not been taken, at least not at a level able to counterbalance the effects of many years of such activity.

Accelerating effects of global warming: non-linearity

The preparation of the first Kyoto Protocol on Climate Change and the successive gatherings of experts, scientists and official representatives since 1979 (the Conferences of the Parties, COP), has been accompanied by a considerable effort in the area of research into a holistic understanding of the complexity of global warming. Cost estimates for controlling GHG emissions and concentrations in the atmosphere have led to a much better perception of the magnitude of the phenomenon. In a recent report, Nicolas Stern[10] evaluated the cost of mitigating global warming. His conclusion is that the longer humankind waits to take action, the costlier this mitigation will become. This economic analysis once again underlines the urgent need for immediate action.

The recognition that the earlier extrapolations on a linear time scale no long apply, mean that the process of global warming and its effects are happening much faster than envisioned a few years ago. In general, we are faced with *non-linear phenomena* evolving much quicker than expected. This leads to the conclusion that the present and future situations are dramatic. Negotiations at world level for imposing appropriate measures are occurring at an extremely slow pace, meaning that the agreements obtained will be much too late to have the desired effects on climate change. The urgency pointed out by scientists, researchers, experts and by civil society action groups must be taken seriously.

Fortunately, some political leaders, e.g. in New Zealand, are committed to taking immediate action to substantially reduce GHG output – and even aspire to becoming a carbon-neutral nation and zero-waste country, with timelines established for the realisation of objectives extending from now to 2025 and 2040.

Throughout the world, individual entrepreneurial initiatives have for some years pledged to set up zero-waste production processes, and certainly many more such initiatives are underway.
The non-linear character of the consequences of global warming will increase its direct effects

The longer humanity waits to take action, the greater the cost.

It is difficult to arrive at good decisions using the wrong parameters.

on food production for a ever-increasing world population. Thus, the urgency is not only related to safeguarding the ecosphere, but is also directly related to the survival of hundreds of millions of people.

Internalisation of environmental costs: beyond GDP at the European Parliament

In 2007, a major conference on *Beyond GDP*[11] was organised at the European Parliament. The almost universal use of GDP as a measure of a country's economic activity and especially for indicating its economic growth has been questioned for several decades. At this conference, it was stated that a similar event was organised some twelve years ago and that no progress had been achieved with respect to a better indicator of economic activity! Wrong quantifications can scarcely result in good decisions.

The major point in the discussion was how to make environmental costs more transparent when evaluating the real economic progress of a country or society and the well-being of the citizens over given periods of time. In order to gain a realistic picture of economic progress, all costs related to environmental impact must be 'internalised' into the cost structure. The statement by Øystein Dahle, former vice-president of Exxon for Norway and the North Sea, remains applicable, though the context is somewhat different: "Socialism collapsed because it did not allow the market to tell the economic truth. Capitalism may collapse because it does not allow the market to tell the ecological truth."

It was concluded that the GDP problem would be further analysed within the European Institutions, and better indicators would be proposed. It is hoped that another decade will not be lost on these proposals and their subsequent debate.

The potential of technology for coping with planetary problems

Sustainable societies and a sustainable planet belong to the desires of all. The question is who will be able to participate. Poverty, illiteracy, digital and technology divides, food and healthcare problems are well known phenomena that have been quantified in numerous reports. The costs have been estimated more than once, the required resources – financial and other – seem to be available. Foreign direct investment (FDI) and official development aid (ODA) to developing

countries have so far not demonstrated significant improvement; instead, in several cases the situation of millions of people has worsened.

The effects of global warming will continue, and their scope covers entire regions and threatens the survival of the populations who live there. Overall, the entire ecosphere of which humankind is part is under stress. Some authors speak of a threat to the survival of our civilisation, a very strong statement indeed. To avoid catastrophic surprises in the future, a number of the premises on which industrial societies have been built for more than two centuries will be the subject of radical changes in the decades to come. Science and technology have considerably changed the lifestyle of industrial societies and created well-being in the form of material comfort, healthcare, longer lifetimes etc. There are major disadvantages, however, to these technological solutions. Consumer driven economies require resources, leaving behind an ecological footprint in those places where the resources have been acquired.

The concept of *ecological footprint*[12] indicates a society's behaviour with respect to satisfying its needs, and above all its wants. Several footprints have been defined: environmental/ecological, fresh water, carbon. The footprint expresses the resource voracity of industrial societies, resulting in the destruction of the natural capital that humankind has inherited.

Humankind will need to reduce its footprint in general and return to a new 'equilibrium', so that the earth's carrying capacity is not exceeded by industrial activities. One might ask whether the present economic system can manage such a turnaround to reverse the trends of today[13]. Some economists[14] have expressed severe doubts about such a capacity. Of course, it will take some time to try, and in fact, there is no alternative.

The mission of future technology could be expressed as follows: existing and new technologies and skills must systematically reduce at an accelerated pace (by a factor of five to ten) the use of mineral material, the use of fossil energy sources, pollution via chemicals in households and agriculture, and destruction of the ecosphere. This means essentially that our throwaway lifestyle must be abandoned: that appliances of all sorts must have dramatically increased lifetimes and become repair friendly instead of being replaced, transportation of goods and patterns of physical mobility in cities and urban areas must be redesigned, etc.

Large-scale applications of available technological solutions

According to several authors, the technologies for accomplishing such drastic change are available today. In many cases, not much needs to be invented in order to get started. In their report to the Club of Rome, Ernst von Weizsäcker et al in *Factor Four*[15] described the fields in which a reduction

The question is whether the present economic system will succeed in changing the current trends and steering them in the right direction.

of material resources by a factor of four could be achieved using existing technologies. The concept focuses on a *productivity increase* and treats three action domains: energy, material and transport productivity. Fifty existing examples are described, ranging from building renovation instead of demolishing and rebuilding, to urbanisation and public transport, to food production, etc. An updated version, to be called *Factor Five*, is being prepared. The major point is that these examples demonstrate that the technologies do exist and no additional developments are required to make substantial progress in productivity and thus sustainability.

Similarly, *The Factor Ten Institute*[16] has proposed the feasibility of a reduction by a factor of ten. Japan has shown a high level of interest in this approach and it has been part of its industrial policy for a long time. Today China appears to have a similar interest. The basic philosophy consists of a dramatic reduction of material use in all types of goods, thus leading to substantial energy savings.

The *Rocky Mountain Institute*[17] has been designing equipment for many years that contributes to considerably increased resource efficiency in buildings, the well-known hyper car and the efficient manufacture of goods. Making consumer goods maintenance-friendly instead of throwaway is a feasible manufacturing possibility.

Additionally, the methodological approach to products and equipment of *Life Cycle Analysis (LCA)* provides a criterion for sustainability and has been defined for a long time. Its introduction requires the systematic compilation of product data with respect to their 'recycle-ability'. Raw materials like steel, glass, paper and plastics are making good progress in a large-scale recycling effort. Steel, for example, is mainly used in three industries: automobile, household and construction. In the US, virtually all cars are recycled as are about 90 percent of household appliances. Yet a large amount is still discarded.

The transportation of goods and persons is expected to increase world-wide in the coming decades. The concept of *just in time* is a common, but unsustainable, practice. The internalisation of environmental costs will dramatically change the present logistic business. The introduction of massive *public transportation systems* is already being implemented in larger cities. A review of urbanisation policies is underway, but will require much more investment over long periods of time. The suburbs as we know them today are largely the result of unlimited and cheap oil, and thus are unsustainable.

Housing is responsible for a major share of electricity consumption. *Buildings* are a major source of saving energy in several ways. The Green Building initiative known for its certification and rating programme has increased attention in the US for new buildings as well as for existing ones. Zero-carbon buildings are a fact. The production of carpets for offices has enjoyed remarkable success in the process implemented under the leadership of Ray Anderson, founder of Interface[18].

The *Foundation for the Future* produced a report on a high-level workshop dealing with the distant future of the planet's energy[19] situation. The focus in the workshop proceedings was on renewable energy provided by space solar energy technology, called *Space Solar Power (SSP).* By far the most important conclusion is that the planet will not run out of energy, and the reason for this is indeed the sun. Of course, technological innovation must take place in order to supply solar energy in 'stable' quantities with space as the reliable source. Based on these findings, one might question whether the present policy of searching for additional fossil fuel sources (essentially oil and gas), clearly due to the threat presented by present peak oil use, makes sense. GHG concentrations in the atmosphere are already high, resulting in a significant temperature increase of approximately 2° C. The less fossil based energy used, the better. Investment in new technologies like SSP makes much more sense and is much more urgent.

The technologies exist to make a substantial improvement in productivity and thus in sustainability.

Flanders in Action: how to cope with urgency: zero waste & zero carbon

The urgent need for sustainable development has been pointed out by scientists and many civil society activists. James Lovelock[20] even speaks of *sustainable retreat* in order to save the planet from disastrous and irreversible changes. The quick melting of glaciers and icecaps – the non-linear behaviour of the eco-system – argues for strong and quick action.

Today the *business as usual – BAU* – model continues to be the dominant political and economic framework, and has been so for about half a century. Industrial activities coupled with the market-driven consumer economy requires stable frameworks for the market. BAU is indeed an easy model to apply, and in a sense it is the *laissez faire* model of the nineteenth century. Politicians remain convinced that economic growth is the best way to manage our societies. With economic growth, material well-being increases constantly, along with other social benefits. At present, Western democracies, including Flanders, relies on economic growth to maintain the lifestyle of its citizens, to combat unemployment and to finance other activities to which our societies have become accustomed. Similar to James Lovelock's sustainable retreat, we need to start thinking in terms of *economic de-growth.*

Flanders in Action. A socio-economic action program for Flanders[21,22] is an excellent proposal for the future and provides an innovative perspective for maintaining and developing socio-economic progress. The four challenges: education, creative and innovative entrepreneurship, sustainable society, governmental accountability and stimulating action are all excellent objectives for sustaining and consolidating the performance and the position of the Flanders' economy in the coming decades. The following quote expresses it well: *'...Flanders must increasingly transform itself into an innovation-driven economy'.*

Idealistic daydream or a viable proposition?

Sustainable economies will be innovation-driven economies, and rely on technologies and industries able to offer solutions to the challenges of sustaining the ecosphere and biosphere. This means that the limits of waste production and carbon output must be mastered in a structural way.

Why not pose the challenge of Flanders becoming a zero waste and carbon society by the middle of this century? The project would involve *a large-scale mobilisation of ideas and strong motivation on the part of all for Flanders to become a zero waste & zero carbon output region in the European Union.* It could be called something like a *'Flemish Environmental Master's Programme or even a Flemish Apollo Programme'.* The timeframe should be reasonable, but not too short – say 2030-2040. It would be important to maintain the political and industrial efforts over a period longer than one generation. The pre-requisites for successful implementation are considerable: investment in new industrial production processes; developing, designing and installing renewable energy facilities; eventually creating adapted public-private capital institutions for supporting financial efforts for local investment in research and in new developments; motivating the young generation as well as the entire population to become acquainted with new ways of thinking.

This proposal may sound like an idealistic dream, but it is not! The main argument to move ahead lies in the urgent necessity for action. Politicians here have a unique opportunity to push for an innovation-driven society, with the guarantee of belonging to the top regions of Europe.

Indeed some examples do already exist. As mentioned by Lester Brown in his latest book, *Plan B 3.0* (2008), which he presented some days ago to the European parliament, New Zealand under Prime Minister Helen Clarke has announced a series of measures ranging from increasing electricity production from renewable energy sources to 90 percent by 2025, cutting carbon emissions from transport in half by 2040, expanding forest areas for carbon sequestration, etc. She expressed the objective in the following words: 'to dare to aspire to be carbon neutral'[23]. Of course a simple extrapolation to Flanders would be inappropriate, but the inspiration is there to pursue similar goals.

Many examples of redesigned industrial processes are well known. *Denmark* has a strong commitment to low waste and reduced GHG output. Today it obtains 20 percent of its electricity from wind farms and it plans to increase this to 50 percent. Danish planners have turned energy policy upside down, namely using wind as the mainstay of their electrical generating system and fossil fuel-generated power to fill in when the wind ebbs. According to the newspaper *De Tijd*[24], Denmark has also started installation of a network for recharging electric car batteries, and a basic electrical network should be in place by 2010. In several Northern European countries, broad-scale installation of voltaic panels on the roofs of private houses, public buildings, schools, warehouses and factories are under consideration. The installation of wind energy facilities in industrial zones, along highways, etc. are other possibilities that for now are still difficult to accept for parts of the population.

For *Europe*, today some 60 million Europeans obtain their residential electricity from wind farms. A proposal for an off-shore super grid stretching from the Baltic to the North Sea and southward to the coast of Spain is under consideration. This grid would link the national grids, facilitating more efficient electricity use throughout the continent. In *Europe* again, the European Solar Thermal Industry Federation[25] (ESTIF) has set ambitious goals for every European by 2020. ESTIF estimates that the European Union has a long-term potential of developing 1,200 m^2 thermal gigawatts of solar water and space heating, which means that the sun could meet most of Europe's low-temperature heating needs.

In other parts of the world, e.g. *China*, some 40 million rooftop solar water heaters have already been installed. This low-cost and simple technology is progressing extraordinary quickly in China, even in the countryside where no electricity grid is yet available. Beijing is planning to increase installed capacity by a factor of about 2.5 by 2020.

Unexpected manufacturing sectors are already in the process of zero waste production processes, including the well-known example of the carpet manufacturer for office carpets in the *US*, Interface.

A zero waste & zero carbon Flanders requires long term planning and perfect synchronisation between public authorities, the business communities, civil society groups, education in professional skills and much more. Flanders has not yet experimented with such long term political and societal objectives, yet there is no reason to think that our society could not succeed.

The long term benefits are considerable and some are critical: an industrial complex acquainted with sustainable solutions in the renewable energy sector; the geo-political independence of Flanders with respect to fossil fuel energy, with its expected price increases in the future and the political instabilities of the supplying regions; the considerable budgetary benefit for the non-supply of fossil energy; the benefit of the more labour intensive activity of large scale implementation of renewable energies compared to classical sources. Obviously the objectives of 'Full Talent' formulated in *Challenge I* of *Flanders in Action*, is fully applicable here.

Conclusion

Climate change and global warming are evolving much faster than expected a few years ago. The need for immediate and strong action is required to safeguard humankind from world-wide disasters. Existing technologies and those already in an experimental phase have demonstrated a reduction in the use of material resources by a factor of 4 to 10; new technologies are expected to enhance this performance. *A zero waste & zero carbon Flanders* by mid century is proposed and presented as feasible. Countries such as New Zealand have already announced such objectives.

In Europe, no other regions or countries have proclaimed such an ambitious vision. Flanders Zero Waste & Zero Carbon fits well in the revisited programme *Flanders in Action*; in a away, the present proposal is its long term expression. The benefits for Flanders are many. Some of these benefits are of geopolitical and critical importance. There are no reasons to assume the programme cannot be accomplished or be successful.

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Creating a sustainable economy

The challenges of the 21st century are enormous. Climate change, an increasing world population and diminishing fossil fuels remind us how fragile we are.

If we wish to secure our common future, we have to reshape our economy. We do not need any further doom-mongering or tentative discussions; we need to take distinctive action. Creativity, innovation, partnership and a long-term vision are the key concepts. Companies, governments and research institutions join forces. The good news is: it works. Better yet, it pays off!

Pioneering companies at home and abroad have shown that investing in sustainability goes hand in hand with developing a healthy, profitable business. Sustainability poses certain challenges, but it also creates a lot of opportunities. Hence, companies need to develop a vision and set up a good business case in order to enhance sustainable economic growth.

The book *Creating a sustainable economy*, contains a number of cases revealing how diverse prominent figures from the business community deal with the challenges and the opportunities of a sustainable economy. It shows contributions from and about Flanders in Action (VIA), Umicore, Agoria, Volvo Europe Truck, IMEC, Photovoltech, ACP, Voka, the West Flanders Environmental Charter, Alpro, Evelop Belgium, Capricorn Venture Partners, the International Polar Foundation, Business Europe, Fortis, Philips, Bellona, the World Business Council for Sustainable Development, the Foundation on Economic Trends and the Club of Rome.

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