COMPETITIVENESS OF THE CONSTRUCTION INDUSTRY

AN AGENDA FOR SUSTAINABLE CONSTRUCTION IN EUROPE

A report drawn up by the Working Group for Sustainable Construction with participants from the European Commission, Member States and Industry.

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EXECUTIVE SUMMARY

Developments in the latter part of the 20th century, both at the world level as well in Europe, have pushed issues related to the environment and sustainable development increasingly higher up governments' agenda. As industry too, has been drawn into the debate, it was only a matter of time before the construction sector, like many others, would be called to account.

In more recent years, while the European Institutions have continued to pile up plans, programmes and ever more complex and far-reaching legislation in the field of the environment, some at least, of the member states have begun developing national policies and strategies for the construction sector of their own, in the context of what has come to be known as "sustainable construction".

The Action Plan, in the context of the Commission's Communication on the competitiveness of the construction industry [COM(97)539], agreed at a tripartite meeting of representatives of the European Commission, Member States and the Construction Industry on 31st May 1999, on a consolidated list of priority actions for improving the competitiveness of the construction industry. One of these actions is entitled:

"to develop a strategy for the use and promotion of

a) environmentally friendly construction materials,
b) energy efficiency in buildings and
c) construction and demolition waste management

in order to contribute to sustainability".

The recommendations from the 3 Task Groups set up to address these 3 essential topics are included in the appendices to this report, which itself goes one step further in proposing:

"AN AGENDA FOR SUSTAINABLE CONSTRUCTION IN EUROPE".

It has as its principal objective, the review of current developments in the Member States and to promote a "European Agenda" thereby constraining the tendency that the Member States might increasingly develop disparate and un-coordinated plans on their own. Viewed from a positive standpoint, it is hoped that this report will serve as a focal point for sustainable construction policies and strategies and will encourage most, if not all Member States and Accession Countries, to develop their own national plans and strategies for a sustainable construction agenda.

This report examines the implications of Article 6 of the Treaty of Amsterdam, in particular the requirements that *"environment protection requirements must be integrated into the definition and implementation of the Community policies and activities…, in particular with a view to promoting sustainable development".*

The construction industry is Europe's largest industrial employer and this implies that social aspects are of particular importance in the sector. Moreover, the relationship between construction activities, and the built environment on the one hand, and sustainable development on the other, is both significant and complex.

This report examines these relationships, identifies the principal environmental impacts concerned and suggests strategic goals to address them.

It then goes on to propose a "programme of action" and develops a set of recommendations through which they can be addressed at both European and national levels.

The appendices to the report contain copies of the national plans for "sustainable construction", in so far as such are known exist, together with a bibliography for reference and further reading.

PREFACE

The terms of reference of this report are drawn from the European Commission's Communication to the Council and the European Parliament [COM(97) 539 final] dated 4th November 1997 and the Council conclusions of 7th May 1998. The Industry Council in its conclusions, invited the European Commission to discuss the proposed measures contained in the Annex of the Commission's Communication (list of 65 proposed actions) with representatives of Member States and Industry with the aim of developing an action plan and to present a report about the discussions to the Council within one year.

Subsequently, in a tripartite meeting organised by the Commission on 31st May 1999, a consolidated action plan containing just 13 Priority Actions was agreed. The 13th action is:

"to develop a strategy for the use and promotion of environmentally friendly construction materials and energy efficiency in buildings, and waste management in order to contribute to sustainability".

It was decided to set up 3 Task Groups (TG) designated as follows:

TG1: Environmentally friendly construction materials;
TG2: Energy efficiency in buildings;
TG3: Construction and demolition waste management.

As soon as the drafting of these three reports had been completed, work began on drafting the text of this report which in the first instance was intended as a "covering report" for the results of the TG reports. On further reflection, taking into consideration on the one hand, the conclusions of the Helsinki Summit of 10th/11th December 1999 and on the other current developments at World level, in particular in the framework of the United Nations Environment Programme (UNEP) as well as in the Member States, it was decided that this report should address the wider issues of "Sustainable Construction" in general. Consequently, this report examines the *status quo* both at Community and Member States level and develops recommendations for further action, aimed at developing European strategies for the promotion of "sustainable construction".

It is also pertinent to recall that the European Commission (DG Enterprise) re-organised its priorities with effect from the beginning of 2001 as concerns initiatives already under way in the context of the exercise known as the "Competitiveness of the Construction Industry". A decision was taken to continue the work of WG4 "Sustainable Construction".

Consequently, the terms of reference for the Working Group have been amended as follows:

"*To develop strategies and recommendations aimed at promoting more sustainable construction in a European context. In the first instance, before addressing further issues, priority will be given to developing strategies for environmentally friendly construction materials, energy efficiency in buildings and construction and demolition waste management.*"

It would be unrealistic and it is certainly not the purpose of this report to develop a comprehensive treatise on the subject of "sustainable construction".

Ever since the Earth Summit in Rio de Janeiro in 1992, much has been written and continues to be written, about the subject of "Sustainable Development", and more latterly about the concept of "Sustainable Construction".

Whilst the contents of this report draw on much of what has already been published (a list of acknowledgements and further reading is contained in appendix 2), its purpose is not to repeat *ad verbatim* what has already been written elsewhere or to develop a new treatise on sustainability issues.

As the above terms of reference indicate, the purpose of this report is rather to examine the *status quo* and to identify and draw up an agenda at the European level in the form of recommendations and to propose ways and means of coordinating and carrying forward such an agenda for "sustainable construction" in the member states.

At the time this report was drafted national strategies and/or policies had been adopted, or were in the process of being developed in Finland, Ireland, The Netherlands, Sweden and the UK. Further details giving the sources, websites, etc. of this information are listed in the appendices.

PART I: THE SCALE OF THE SUSTAINABILITY ISSUES AND CHALLENGES CONFRONTING THE CONSTRUCTION INDUSTRY

I.1. Introduction

The construction industry is Europe's largest industrial employer, accounting for 7.5% of total employment and 28,1% of industrial employment in the EU. It also accounted for 9,7% of GDP and 47,6% of gross fixed capital formation in 1999. The "cradle to grave" aspects linked to the creation, use and disposal of built facilities taken together constitute major environmental impacts. Construction activities consume more raw materials by weight (as much as 50%) than any other industrial sector. The built environment moreover, accounts for the largest share of greenhouse gas emissions (about 40%) in terms of energy end usage. Measured by weight, construction and demolition activities also produce Europe's largest waste stream, (between 40% and 50%)most of which though, is recyclable.

We are often reminded that the industrialized nations are consuming the world's natural resources at an unsustainable rate. Nowhere is this more pronounced than in the consumption of fossil fuels.

This implies that the construction industry – and the sustainability of its products: principally buildings – in order to become more sustainable in the long term, faces an environmental challenge that, in absolute terms is greater than that of any other industrial sector.

For too many years, nation states have been remarkably slow in recognising the scale of the difficulties involved in achieving sustainability in the built environment. Moreover, these are no longer simply national issues or even European ones; they are global in their extent.

The importance of employment in construction brings with it significant social and economic impacts. As economic activity and investment expands, construction activities create considerable employment opportunities. Moreover, the multiplier effect[1] is such that one job in construction gives rise to two further jobs in the economy as a whole. Not surprisingly therefore, investment in construction is sometimes used by governments to reduce unemployment in the economy.

The so-called "three pillars of sustainable development" are "economic", "social" and "environmental". "social" is sometimes referred to as "societal" covering a wider scope of social, cultural, ethical, juridical, etc. impacts. The integration of social and environmental protection into EU policies is now a requirement of the EU Treaty. Consequently, an "holistic" approach is called for in addressing these issues.

One of the aims of this report is to demonstrate the scale of the issues involved, beginning with an assessment of the environmental challenges the industry faces. It puts forward recommendations aimed at developing strategies to mitigate the environmental impacts of construction activities and of the built environment in Europe.

It is based on the premise that achieving these objectives will require a two pronged approach; firstly, a highly competitive construction industry, and secondly, carefully crafted environmentally focused strategies for the sector. The involvement of all stakeholders, particularly national governments, with the EU Institutions playing a significant coordinating role is crucial in striving for a real improvement in raising the level of sustainability.

I.2. From Rio to Amsterdam

The Earth Summit in Rio de Janeiro in 1992 constituted a turning point in man's attitude to his environment.

[1] Communication from the European Commission: "The Competitiveness of the Construction Industry" [COM (97) 539] dated 4th November 1997, chapter 2.

Already in 1987, the very broad concept for "sustainable development" that has become widely used in recent years had been defined in the Brundtland Commission report as:

"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

More particularly "sustainable development" is taken to imply:
- social progress which recognises everyone's needs;
- effective protection of the environment;
- prudent use of natural resources;
- maintenance of high and stable levels of economic growth and employment.

There is a widening gap between the requirements of sustainability and the reality of European politics. In particular, the implementation of environmental policies is recognised as being insufficient, and the policies as such are therefore perceived as being ineffective. Following the Rio Summit, sustainable development has become one of the objectives of the EC-Treaty (article 2), and in view of achieving sustainability, the integration of environmental protection requirements into the definition and implementation of the Community policies and activities has become one of the basic principles of the European Community (article 6).

Some of the most important extracts from the EU Amsterdam Treaty:

"The Community shall have as its task…to promote throughout the Community a harmonious, balanced and sustainable development of economic activities, …".

"Determined to promote economic and social progress for their peoples, taking into account the principle of sustainable development…".

"Environment protection requirements must be integrated into the definition and implementation of the Community policies and activities…, in particular with a view to promoting sustainable development".

"…the Commission undertakes to prepare environmental impact assessment studies when making proposals which may have significant environmental implications".

"The Commission, in its proposal…concerning health, safety, environmental protection and consumer protection, will take as a base a high level of protection, taking account in particular of any development based on scientific facts".

"A high level of human health protection should be ensured in the definition and implementation of all Community policies and activities".

I.3. From Amsterdam to Helsinki and the integration of environmental requirements into other EU policies

The Amsterdam Treaty of June 1997 has reinforced the principle of the integration of environmental requirements into other policies, recognising that it is key to promoting sustainable development (article 6 EC Treaty). Moreover it is clear that, in accordance with the subsidiarity principle, responsibility for achieving sustainable development must be shared at all levels and among all actors. Thus, the Community needs to promote and leave scope for measures at national, regional and local level. Governments as well as enterprises and citizens need to be fully involved.

Recognising that further action was necessary to maximise the benefits of the Single Market in preparation for the launch of the single currency, the Amsterdam European Council strongly endorsed the Action Plan for the Single Market. This sets out the priority actions needed to improve its functioning; it takes account of the many dimensions of Single Market policy and includes among its four Strategic Targets that of "Delivering a Single Market for the benefit of all citizens". This

emphasized that in delivering greater personal freedom and wider choice to consumers, the Single Market is also required to ensure a high level of protection of health, safety and the environment.

Subsequently, on 9th November 1999, the Industry Council adopted a report[3] on "integrating sustainable development and industrial policy". This report emphasizes the three pillars of sustainable development and addresses issues such as climate change, employment, enlargement, changing production and consumption patterns, eco-efficiency and integrated product policy.

In particular, the report explains the objectives of sustainable industrial development which is described as only being sustainable when all three criteria of sustainable development are met:

- production is **economically** sound, growth-oriented and safeguards the opportunities of future generations;
- employment is improved and other **social** aspects such as social security, equity, occupational health and labour market relations are taken into account;
- pollution, waste, **environmental** health risks and other pressures are minimised to the level of the carrying capacity of ecological systems while using natural resources effectively and safeguarding natural capital and its productivity.

The above-mentioned report also underlines the needs for a broadening of the range of policy instruments, development of policy and performance indicators and improved co-operation and exchange of information between relevant formations of the Council as well as with all stakeholders. The Council commits to continue its work towards the development of the integration strategy. Further work is now needed to operationalise the strategy. This should involve appropriate new actions and measures within policy areas related to business and industry, including an action plan and a timetable. It will then be necessary to establish clear policy targets on the basis of the policy performance indicators against which progress can be monitored.

The Commission in its Working Document[4] [SEC(1999)1941] dated 24th November 1999, considered that in the further development of strategies in individual areas the following general elements merit consideration:

- The development of the various strategies has been uneven and further work will be required in the coming period to develop them further including the requirement for timetables for action.
- More focus should be put on addressing the origin of problems rather than seeking to abate the effects often with end of pipe solutions.
- More reflection is needed on the role of long-term and intermediate-term sector-specific environmental targets taking account of the specific characteristics of the sector. Such sector-specific targets have already been used in some Member States and could also be useful at the Community level.
- Some Member States have good experience in environmental integration both in administration and policies as well as in the development of indicators. Exchanges on best practice already take place, but much more could be done.

Finally, the conclusions of the Helsinki Summit of 10/11th December 1999 stated that:

- The Industry Council was asked to bring all of this work concerning the integration of environmental requirements to a conclusion and to submit to the European Council in June 2001 comprehensive strategies with the possibility of including a timetable for further measures and a set of indicators for these sectors (i.e. those sectors for which European Councils exist).
- The completion of sectoral strategies (as defined in the European Council of Ministers) should be followed by their immediate implementation.
- Integrating environmental issues and sustainable development into the definition and implementation of policies is a central factor in fulfilling the Community's commitments under the Kyoto Protocol. Every effort will be made so that the Hague Conference reaches coherent and credible decisions.

[3] n° 13549/1/99
[4] From Cardiff to Helsinki and beyond – integrating environmental concerns and sustainable development into Community policies.

An essential aspect then of this report, is to provide a "construction industry response" to the decisions taken, and demands made, at Helsinki.

I.4. Responding to the Challenge from Rio

World consumption has expanded at an unprecedented pace over the 20th century, with private and public consumption expenditures reaching USD 24 trillion in 1998, twice the level of 1975 and six times that of 1950. In 1900 real consumption expenditure was barely USD 1.75 trillion. Today's consumption is undermining the environmental resource base as never before seen during the 20th century. (UN- Human Development Report, 1998) Construction activities account for a significant amount of this consumption.

Agenda 21 identified in particular the unsustainable patterns of consumption in industrialised countries as the major cause of the continued deterioration of the global environment. There is therefore a need to develop strategies that allow people to meet their needs without exceeding the Earth's carrying capacity. Any successful strategy to achieve the overall objective of the environment and social sustainability will require a de-coupling of economic development from energy and resource use.

Significant initiatives in recent years accentuate this de-coupling by defining efficiency targets more specifically. In this context, the concept and strategy of eco-efficiency and the targets of factor 4 and 10 seem to offer promising contributions to achieving sustainable development.

At the Earth Summit +5, the 19th Special Session of the General Assembly (UNGASS) in June 1997 in New York, it was the first time that the concept of eco-efficiency and factor 4 and 10 targets were included in the conclusions in the UN. At UNGASS, governments stressed that in order to make consumption and production patterns more sustainable, action should be taken to promote energy and material efficiency, if possible with timetables.

The programme for the further implementation of Agenda 21, adopted at UNGASS, particularly states that "attention should be given to studies that propose to improve the efficiency of resource use, including consideration of a ten-fold improvement in resource productivity in industrialised countries in the long run and a possible factor four increase in those countries in the next two to three decades." It was also stated that "further research is required to study the feasibility of these goals and practical measures for their implementation" and that "industrialised countries will have a special responsibility and must take the lead in this respect" (UN- Conclusions from UNGASS,1997)

In common with other industrial sectors, the construction industry faces the challenge of implementing "Agenda 21" agreed at the "Earth Summit" at Rio de Janeiro in 1992.

Whilst this challenge is not directly addressed here, this report could form the basis of the input which is expected to be presented at the "Earth Summit RIO + 10" in Johannesburg, South Africa in 2002.

I.5. Responding to the Challenge from Helsinki

The priority of the European Commission and the European Council must now be to respond to the Conclusions of the Helsinki Summit of December 1999. So far as the construction industry is concerned these conclusions may be summarised as follows:

- By June 2001(Gothenburg Summit), the various European Councils of Ministers are required to submit to the European Council under the Swedish Presidency "all the work concerning the integration of environmental requirements in the form of comprehensive strategies with the possibility of including a timetable for further measures and a set of indicators for these sectors".
- Sectoral strategies (i.e. European Councils of Industry, Agriculture, Transport, etc) are to be completed and implemented immediately.
- Achieving these objectives is perceived as being central to the EU's efforts to meet its commitments under the terms of the Kyoto Protocol.

In January 2001, the European Commission adopted the 6th Environmental Policy and Action Programme which reflects renewed pressure (article 2.5.) from various Commission Directorates General and non-governmental organisations to adequately take into account the whole question of the quality of the built environment. Moreover, a paper containing a clear statement on the importance of this issue was presented at the Council of Environment Ministers under the Portuguese Presidency in April 2000.

Other relevant points are:

- broaden the range of policy instruments
- improve cooperation and information exchange between stakeholders
- develop action plans with timetables
- establish clear policy targets on the basis of policy performance indicators
- address the origins of problems rather than seeking to abate them with “end of pipe” solutions
- improve identification and exchange of best practices.

PART II: PROPOSALS FOR A RESPONSE TO THE CHALLENGES

II.1. Framework for a response

This report, in drawing up a response to this challenge so far as it concerns the construction sector, addresses the following aspects:

a) It identifies strategies and discusses the meaning of the term "sustainable construction";
b) It identifies the principal sustainability issues affecting the construction industry;
c) It puts forward a programme for action containing recommendations that can be used as a basis for establishing clear policy targets with proposals for indicators and the exchange of best practice.

II.2. Strategies for raising the level of "sustainable construction" in Europe

This report proposes that the strategies for raising the level of sustainability in construction be implemented through developing policies for the construction sector that will:

1. Contribute to the proposed European long-term framework dovetailing policies for sustainable development.
2. Facilitate a progressive change in lifestyles and in patterns of consumption and production that will decouple economic growth from resources use and pollution.
3. Reduce environmental impacts and resource depletion caused by the construction, operation and demolition of built facilities, whilst increasing quality of life and health and safety in the built environment.
4. Raise environmental awareness in the sector taking into account all indoor and outdoor environmental aspects.
5. Promote quality in construction both in aesthetic and fitness for purpose terms.
6. Place increased emphasis on and measure life cycle costs in terms of environmental and technological competitiveness factors of existing projects such that they may be converted into performance indicators and be fed back and used in the design and development of new construction products and processes.
7. Promote renovation, re-use and re-habilitation of existing buildings.
8. Promote environmental expertise and technology so that they become increasingly competitive factors.
9. Establish mechanisms for regular review of progress achieved.

Various attempts have been made to define the term "sustainable construction". In reality it would appear to mean different things to different people in different parts of the world depending on local circumstances. Consequently, there may never be a consensus view on its exact meaning and it is probably futile to suggest an exact definition.

"Sustainable construction" can be approached starting from the approved generic objectives and definitions as follows:

"Sustainable development is a matter of satisfying the needs of present generations without compromising the ability of future generations to fulfill their own needs" [Brundtland report, "Our Common Future", 1987].

Sustainable development means sustainability not only "*ecologically"* and "*economically"* but also "*socially"* and "*culturally"*. Whereas "Sustainable construction" has been defined as: "*The creation and responsible management of a healthy built environment based on resource efficient and ecological principles*" [5]

[5] Charles Kibert: First International Conference on Sustainable Construction, Tampa 1994

It has been suggested that "sustainable construction" is the set of processes by which a profitable and competitive industry delivers built assets (buildings, structures, supporting infrastructure and their immediate surroundings) which in turn:

- enhance the quality of life and offer customer satisfaction
- offer flexibility and the potential to cater for user changes in the future
- provide and support desirable natural and social environments
- increase investment in people and equipment for a competitive economy
- achieve higher growth whilst reducing pollution and maximising the efficient use of resources
- share the benefits of growth more widely and more fairly
- improve our towns and protecting the quality of the countryside
- contribute to sustainable development internationally.

In Finland for example, the principles of sustainable development are considered to include securing people's well-being without endangering the environment. According to the Finnish National Commission on sustainable development, there are three practical dimensions to sustainable development: the ecological, municipal and cultural dimensions.

II.3. Principal sustainability issues affecting the construction sector

The ways in which built structures are procured and erected, used and operated, maintained and repaired, modernised and rehabilitated, and finally dismantled (and reused) or demolished (and recycled), constitute the complete cycle of sustainable construction activities. Building products should, as far as possible, be reusable and materials recyclable. Design for long service life (and durability) is superior to design for reusability. Reusability is superior to recycling, and recycling is superior to waste disposal. In sustainable construction, reusability and ease of changeability are necessary product properties, in particular for modular products and systems with different service lives.

It is unrealistic to suppose that it is even possible to draw up an exhaustive list of all issues[6] which impact, one way or another, the sustainability of construction activities and the built environment. There are quite simply too many variables in an environment that is in a state of continuous change and evolution. Moreover, it seems superfluous at this stage to identify issues that have only a marginal impact on sustainability or indeed those that cannot realistically be addressed at the European level.
In the first instance, the following issues have already been addressed by the Working Group as described in the terms of reference for this report and have formed the basis of discussions through the three Task Groups recommendations, copies of which are included in PART IV of this report:

ISSUE	BRIEF RATIONALE
Environmentally friendly construction materials	As much as 50% of all materials extracted from the earth's crust are transformed into construction materials and products. Including energy in use, when installed in a building, they account for as much as 40% of all energy use. Moreover, these same materials when they enter the waste stream, account for some 50% of all waste generated prior to recovery.
Energy efficiency in buildings	The construction, operation and subsequent demolition of built facilities accounts for about 40% of all energy end use and a similar percentage of greenhouse gas emissions. Moreover, the potential for reducing greenhouse gas emissions in existing and new buildings, is greater than that of any other sector and consequently represents the most significant target for reducing emissions in order to reach the targets laid down in the Kyoto Protocol.
Construction and demolition waste management	Construction and demolition waste constitutes the largest waste stream by weight in the European Union. Disposing of these waste materials is presenting increased difficulties in many parts of Europe. Increased emphasis needs to be placed on waste minimization and

[6] For a more exhaustive list refer to BRE Digest 446 dated May 2000 ISBN 186081 398 4

	recycling.

In addition to the above, the following issues (not an exhaustive list) account for significant environmental impacts and could be the subject of further studies and/or initiatives at European level or indeed in the Member States:

ISSUE	BRIEF RATIONALE
Water conservation	The operation of buildings places a strain on raw water reserves whilst waste water and sewage needs to be treated before being returned to water courses. Ways of conserving water and more efficient and effective means of treating waste water need to be developed taking better account of land use planning for such facilities.
Health in buildings	The quality of the internal environment of buildings is an essential element to the health of its occupants. Problems caused by damp and mould can be avoided through good building practices. Bio-climatic considerations and good ventilation can also reduce or even eliminate the need for air conditioning in the summer months whilst reducing the amount of energy required for heating in the winter.
Building related transport aspects	Studies[8] have demonstrated that relatively compact towns and cities well served by public transport systems are appreciably more energy efficient than cities that have a relatively low urban density (often referred to as "urban sprawl"). For as long as modern civilization continues to rely on the combustion of fossil fuels as its principal source of transport energy, there will be an on-going environmental imperative to construct buildings to relatively high densities, served by efficient public transport systems.
Urban Sustainability	Whilst construction activities and the operation of built facilities are only one of many aspects linked to urban sustainability, the quality and efficient operation of buildings and infrastructure are of fundamental importance.
Sustainable architecture	As demonstrated in for example, the reports of the Task Groups on Environmentally Friendly Construction Materials, Energy Efficiency in Buildings, and Construction and Demolition Waste, there is a lot that can be done to improve the overall performance of buildings, by implementing principles and measures in the design process, leading to Sustainable Architecture[9]. Sustainable Architecture relies on the continuous dialogue and close co-operation among all actors involved in the design and construction process, in order to improve the sustainable quality of every building. Moreover, Sustainable Architecture must be considered in the context of a holistic and integrated approach to the overall quality of the built environment, in particular in the urban context.[10]
Societal impacts arising from construction activities and the built environment	How more sustainable construction can improve the living context and the relationship between citizens and their environment whether rural or urban and contribute effectively towards social cohesion and job creation, the promotion of cultural tourism and regional economic development.

[8] "Transport and Buildings; the environmental impact", ISBN 1 86081 322 4

[9] A Green Vitruvius, Principles and Practice of Sustainable Architecture Design, 1999, James & James Ltd., London, ISBN N). I-873936-94-X

[10] Resolution of the Council of the European Union, 12 February 2001, JOCE (2001/C 73/04)

II.4. A programme for action

II.4.1. Implementing the recommendations of the Task Groups

It is essential that the recommendations of the Task Groups are treated seriously and are taken into account by both Member States and the European institutions in measures developed for furthering sustainability in construction.

The emphasis placed by the Task Group Environmentally Friendly Construction Materials on industry providing systematic, transparent and verifiable environmental information on their products and on the use of such information in product standards, is fully substantiated by statements made in the European Commission's recent Communication on the 6th Environmental Action Programme (COM(2001)31)[11] and in its Green Paper on Integrated Product Policy (COM(2001)68)[12].

"The general philosophy of increasing the amount of product information on the market calls for flexible and cost-effective solutions. For example, the criteria of environmental performance developed for product groups, based on a transparent examination of life cycle considerations, could be more extensively used." "The Commission intends to co-operate with the standardisation bodies and relevant stakeholders to develop mechanisms to integrate systematically environmental characteristics into product standards."

Ongoing actions to achieve these goals include a Conference held by industry in May 2001 to examine current national initiatives on environmental information on construction products and to gauge the potential for their harmonisation at a European level.

Some progress is also being made with regard to energy efficiency in buildings. A proposal for an EU Directive on the energy performance of buildings[13] in the residential and tertiary sectors was adopted in May 2001. This looks to create a common framework for improving energy efficiency through the application of minimum standards and certification for both new and existing buildings. It is paramount that once the Directive is adopted, the measures listed are implemented rapidly and effectively by Member States.

With regard to construction and demolition waste, the European Commission's Communication on the 6th Environmental Action Programme has confirmed the publication of a Recommendation as a priority area for action[14]. With the Commission having been fully involved in its work, the Task Group expects the Recommendation will take full account of its conclusions, particularly with regard to the emphasis on measures for waste minimization and measures to minimize the amount of waste going to landfills and to illegal dumping sites.

II.4.2. "Whole life costs" of construction works

Until recently, most buildings have been conceived and built on the basis of very simple criteria:
- fitness for purpose, corresponding to the
- lowest possible construction cost.

Considerations such as running and maintenance costs and the overall environmental impact of a built facility have nearly always been a lesser consideration, if indeed a consideration at all. Moreover, in many countries, fiscal systems of taxation tend to favour low capital costs over high running and maintenance costs.

In most cases, the costs involved in servicing and running built facilities during their lifetime far exceed the initial costs of construction. For most clients therefore, there should be a genuine interest in procuring built assets with low running and maintenance costs.

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[11] "Member States and companies should aim at introducing product information schemes for all types of products in the years to come."

[13] COM(2001)226 final

[14] See article 7, item 4

In reality, theory and practice are often very different. For many public authorities, finding budgets for construction works is usually far more difficult than meeting recurring, running and maintenance costs that are included in annual budgets as a matter of course. Trying to reverse this "unfortunate" lack of balance in what should be "simple economics" is likely to remain difficult with construction clients continuing to procure on the basis of lowest price only, rather than on the basis of lowest cost taking account of whole life costs.

With regard to construction materials and products, it is important that life cycle approaches to improving environmental performances are adopted not only for products but for construction works as well. Construction products cannot be assessed on a stand-alone basis since construction works with the highest "green" credentials may use products which might have relatively high environmental loads but which will significantly contribute to reducing a building's environmental impact throughout its lifetime. Construction products need to be viewed in terms of functional units, how they perform throughout the life-time of a built facility and what happens to them when deconstruction or demolition takes place.

Recommendation: Review work already undertaken and published and carry out further studies and R&D actions establishing guidelines that will lead to LCA and LCC becoming normal standard procedures aiming for convergence in methods and metrics at the European level. Assessment of environmental impacts over the lifetime of built facilities as well as estimates of life cycle costs should be made available to clients before construction works begin. This would facilitate benchmarking alternative development solutions.

II.4.3. Sustainable procurement

National governments and public bodies ("contracting authorities" in the meaning of the public procurement directives) together constitute the construction industry's largest client. It is they who must take a lead in promoting sustainability in construction so that it becomes a process driven in the best interests of the client.

Both European and national procurement policies require that all public procurement is carried out on the basis of best value for money[15]. If the term "best value for money" is simply a matter of price, such policies are relatively straight forward in their implementation. If tenders are invited on the basis of various other criteria, such as quality, performance specifications, design requirements, time for completion, etc, then the evaluation of such tenders becomes much more complex, if not subjective.

The Luxembourg, Cardiff and Vienna Councils have adopted their conclusions indicating that both Commission and Council should work out strategies of integration of environmental aspects into the other policies; in case of possible contradictions between the objectives of public procurement and environmental policies these objectives should be reconciled.

Therefore, the interpretation of public procurement legislation[16] should respect its primary objective, which is economical in nature and at the same time it should integrate the environmental aspects, without, however, these environmental aspects replacing the primary objectives of public procurement. Nevertheless, if more sustainable construction is to be encouraged, procurement cannot remain a purely economic exercise – nor does it have to.

In day to day practice, conscious of their responsibility regarding the realisation of sustainable development, more and more public purchasers wish to, and actually do, integrate environmental considerations into their procurement policy.

If the European Commission and the Member States are determined to press ahead with the "greening" of public procurement, then a number of solutions need to be considered:

[15] Refer to results of WG1 on "abnormally low tenders".

[16] Refer to Commission's Communication (n° not available yet) on the interpretation of Community Public Procurement law and the possibilities for integrating environmental considerations into public procurement.

a) Clients should be encouraged to assess tenders on the basis of the economically most advantageous tender (EMAT)[17], balancing price, quality and life cycle costs, for which the quality assessment criteria should include sustainability factors.
b) Client, architects and consulting engineers will in future need to take much more detailed account of environmental aspects in their designs, especially LCA and LCC considerations. Tools for these must be developed and integrated with each other in order to simplify evaluations;
c) The award of contracts on the basis of "concessions" linked to solutions on the basis of "facilities management" taking increased account of life cycle costs, thus implying increased integration of the design and construction functions may have its advantages.
d) Tenderers may be encouraged to put forward alternative technical solutions ("Variants" – Article 25 of the public procurement directive) that take account of environmental aspects.

Note: for reasons of clarity the term **"Facilities Management"** means the activity of running, maintaining and managing a built facility (provision of power, water, heating, cleaning, rubbish collection, maintenance, repairs, etc.). The term **"concession"** is linked to this in the sense that a contractor is able to enter into a contract for a **"concession"** which would include construction and subsequently the **"facilities management"** of the built facility. This could also be done in the framework of a **"public-private partnership"**.

Whichever approach is adopted, as far as public procurement is concerned, certain principles will remain essential:

a) As far as possible, a maximum number of environmental considerations based on identified priorities should be included in the tender documents before tendering procedures are started;
b) The client's requirements must be clear and unambiguous with clearly defined priorities; and
c) The rules that will apply to the evaluation of tenders must be fair and transparent and be clearly stated in the tender documents.

Recommendations:

1. Clients, especially public clients, must measure and report their progress in promoting sustainability in construction and the built environment.
2. Sustainability impacts and their mitigation should be addressed as far as possible in the planning and design process (or even as part of the granting of planning permission) prior to commencing tendering procedures.
3. Carry out a study to assess the advantages and disadvantages of awarding construction contracts on the basis of "concessions" and "facilities management" in order to determine procedures that produce built facilities with reduced environmental impacts. This could be done on the basis of a benchmarking exercise.

II.4.4. Sustainability performance indicators

In the first instance, reference needs to be made to the unsustainable patterns of consumption in industrialised countries identified in the text of "Agenda 21". The construction industry needs to try and determine to what extent it could raise its eco-efficiency over given periods of time, perhaps a factor of "four over 20 years" or "ten over 50 years"? This needs to be studied and addressed as a pre-requisite before beginning further actions.

The conclusions of the Helsinki Summit in December 1999 called for the establishment of clear policy targets on the basis of policy performance indicators.

Several initiatives have already been taken to identify and develop indicators for the construction sector. In the United Kingdom for instance, on 10th July 2000, a conference[20] on sustainable construction put forward the following suggestions for indicators:

[17] Refer to results of WG1 on "abnormally low tenders".
[18] Construction Confederation and the Movement for Innovation (Working Group 18/07/2000)

- operational energy,
- embodied energy,
- transport energy,
- waste,
- water,
- biodiversity.

These indicators could form the basis of a set of LCA-based indicators for the construction industry in general.

Another initiative is known as CRISP – Construction and City Related Sustainability Indicators[21]. CRISP concerns the setting up of a Thematic Network which aims at coordinating research works dealing with defining and validating such indicators, implementing these indicators to measure the sustainability of cities, construction projects (buildings and built environment) in cities and the progress of activities dealing with creating and maintaining them at the national level, implementing the indicators to compare the sustainability of individual buildings, large groups of buildings at the urban and suburban level, urban areas and construction activities at the scale of a city, region or a country.

Through the range of indicators which will be dealt with, the project will contribute to improving the quality of life in urban communities and to promote sustainable development assessed in economic, architectural, environmental, social and cultural terms. Challenges that will be considered using the indicators are for instance linked to the preservation of natural resources, air quality, noise, health and safety, waste, economic competitiveness, employment, deterioration of infrastructure, urban sustainability, environmental loads of construction, social-cultural aspects, etc.

Recommendations:

1. In the context of responding to the challenges contained in "Agenda 21" carry out a feasibility study to examine the extent to which eco-efficiency can be increased in the sector with the perspective of raising it by a factor of 4 or, over a much longer time frame, by 10.
2. That a set of common indicators be agreed for the construction sector and that the results of CRISP be considered and adopted for use throughout the EU. These indicators will need to be reconciled with the "urban sustainability indicators" [22] issued by DG Environment in November 2000 which municipalities are expected to adopt on a voluntary basis and use them as the basis for environmental reporting.
3. Develop a system of life cycle costs performance indicators in order to facilitate comparisons of performance on a European basis and use these indicators to benchmark construction sustainability across Europe.

II.4.5. National Plans and European Programmes for "Sustainable Construction"

Certain member states have drawn up national plans and programmes for sustainable and ecological construction. Copies of these documents in respect of the following countries are appended to this report:

- Finland,
- Netherlands,
- Sweden,
- United Kingdom.

[21] EC Proposal No. EVK4 – 1999 – 00078/Contract No: EVK4 – CT – 1999 2002
website: http://crisp.cstb.fr/

[22] Towards a local sustainability profile – European Common Indicators", EC DG Environment (ISBN 92-828-9493-2), 2000.

It is pertinent to mention PRESCO[24], the "European Thematic Network on Practical Recommendations for Sustainable Construction". It is an active project funded by the EC. It has as main objective the definition of a European Code of Practice for Sustainable Construction. This Code will contain recommendations on how to put sustainable construction into practice. Existing (national) recommendations will be integrated through the whole life cycle of a building, going from inception and feasibility study to design, construction, refurbishment and finally decommissioning with dismantling and disposal.

Recommendations:

1. All member states and accession countries should be encouraged to draw up and publish plans and programmes for "sustainable construction".
2. The European Commission should draw up and issue guidelines - based perhaps on the work undertaken in PRESCO – explaining in general terms what these national plans and programmes should contain. Furthermore, the Commission should establish a website where all the documents can be easily found.

II.4.6. Software tools

Software tools already exist, and new ones continue to be developed which can help designers and owners of buildings in reducing environmental impacts. Possibilities include for instance:

- optimising for least environmental impact
- informing on choice of main construction materials
- enabling the environmental impacts of both construction and operation to be balanced over the life of the building
- giving comparisons for different buildings and specifications
- graphically illustrating the environmental credentials of a design to clients
- calculating the environmental book values of property
- calculating environmental burdens and costs
- estimating the extent of environmental damage by using life-cycle analysis (LCA); hence
- environmental repair costs can be estimated and included in total construction costs
- allowing environmental investments to be depreciated over the technical lifetime of a building.

Software tools known to be available and in use at the time this report was published include:

Name of software	Producer/publisher	Brief description of application
BREEAM	BRE (UK)	Environmental assessment of new and existing buildings
ENVEST	BRE (UK)	Measures embodied and operational energy
ECOQUANTUM	NL	
GREENCALQ	NL	
ECO-PRO	DE	
EQUER	FR	
LEED	US	
ATHENA	CA	
GBC 2000	(24 X NN)	

Recommendation: ECCREDI[25] (through E-CORE) and PRESCO should be asked to review the various software tools available and advise industry on any shortcomings or improvements that could be made. If feasible this should include a market survey in order to determine which software tools are the most useful and appreciated by users.

In doing this, ECCREDI should note that one of the main objectives of PRESCO, the "European Thematic Network on Practical Recommendations for Sustainable Construction" is an inter-

[24] See also: http://jbase208.eunet.be/

[25] European Council for Construction Research, Development and Innovation

comparison and benchmarking of LCA-bases Environmental Assessment and Design Tools. The different tool developers will execute environmental performance assessments on reference buildings, selected in Europe. The results of these assessments will be compared and discussed in order to define a common baseline offering a harmonized approach for assessment and design methodologies.

II.4.7. Education and awareness raising

The whole topic of "sustainable construction" as well as its scope, has already become a major issue for the industry and these tendencies are expected to continue. There is a growing need therefore to raise the awareness of sustainability issues both among the actors in the entire construction process, as well as the general public which is the principal beneficiary of built facilities. The following recommendations are included here even although raising the awareness of the general public in particular, is inherently difficult to achieve.

Recommendations:

1. Employers and professional bodies should phase out recognition of training and educational courses which do not take adequate account of the topic of "sustainable construction" in all member states and accession countries.
2. The actors in the industry should raise the awareness of the general public, especially clients, in their daily activities. This could be promoted through the increased use of environmental labelling of products and buildings including energy and environmental quality labelling.
3. The European Commission, through a dedicated website, should disseminate national plans and programmes and other related and relevant material.
4. One or other European body (perhaps ECCREDI) should organise annual competitions for "flagship sustainable construction projects" in the member states and the accession countries. A jury would adjudicate the proposals submitted and a distinguished European personality would present the awards at an annual event in Brussels.
5. Consideration could also be given to setting up a "European Best Practice Programme" for sustainable construction, which would act as a learning network and coordinator of national best practices. It should include a scheme for "European Awards".

II.4.8. Research and Development (RTD)

ECCREDI, was set up in 1995 as a new European Body to coordinate Construction R&D efforts at the European level. The following year, ECCREDI secured European funding for a "Thematic Network" entitled "Targeted Research Action for Environmentally Friendly Construction Technologies " (TRA-EFCT).

The TRA-EFCT has been instrumental in linking about 120 on-going EC funded RTD projects from different programmes in an alliance to disseminate research findings, including findings that embrace environmental aspects of RTD.

The TRA-EFCT will come to an end in 2001 and is expected to be followed by a new "thematic network" known as "E-CORE" (European Construction Research Network). E-CORE will specifically contribute towards establishing a European Research Area as defined in the Communication of Commissioner Busquin on behalf of the construction industry.

More particularly, E-CORE will act as an "umbrella network" for other thematic networks in the construction sector. Some of these have already been set up and others are expected to follow. Moreover, the following thematic networks specifically address environmental and sustainability issues:

Acronym	Activity
ETN Recy.net	The use of recycled materials as aggregates in the construction industry.
PRESCO	Practical recommendations for Sustainable Construction
DURANET	Network for supporting the development and application of performance based durability design and assessment of concrete structures.

TENSINET	Upgrading the built environment in Europe through tensile structures.
ENERBUILD	Energy in the built environment.
CRISP	Construction and city related sustainability indicators.

Proposals to be confirmed:

Acronym	**Activity**
PeBBu[26]	Performance based building
LIFETIME	Lifetime Engineering of Buildings and Civil Infrastructures.

Other actions:

Most of the respective RTD work is, however, performed elsewhere at global, European, national and company levels. Good examples for these actions are the underlisted three European RTD projects just started under the GROWTH programme:

Acronym	**Activity**
EUROLIFEFORM	Probability approach for predicting LCC and performance of buildings.
LIFECON	Life cycle management of concrete infrastructure for improved sustainability.
INVESTIMMO	A decision making tool for long-term efficient investment strategies in housing maintenance and refurbishment.

As an example about national actions, two large national programmes from Finland can be mentioned:
"Environmental Technology in Construction" 1994-1999 (23 MEUR) and "Healthy Building" 1998-2002 (21 MEUR).

Recommendation:

1. That ECCREDI through its responsibility in managing E-CORE, acts as a focal point for European RTD actions in the field of "sustainable construction". The results of these thematic networks should be further developed and used in order to carry forward the agenda for sustainable construction as described in this report.

2. E-CORE should develop further actions, policies and strategies aimed at promoting more "Sustainable Construction" including giving consideration to requesting the European Commission to mandate CEN to draw up European Standards defining performance criteria which could be used as an alternative to prescriptive requirements in public procurement.

[26] Refer to CIB website: www.cibworld.nl/pges/begin/pebbu.html

PART III: RECOMMENDATIONS

Issue	Recommendation
Whole life costs	Review work already undertaken and published and carry out further studies and R&D actions establishing guidelines that will lead to LCA and LCC becoming normal standard procedures aiming for convergence in methods and metric at the European level. Assessment of environmental impacts over the lifetime of built facilities as well as estimates of life cycle costs should be made available to clients before construction works begin. Consideration should be given to making such assessments mandatory for public works valued above a given threshold. This would facilitate benchmarking alternative development solutions.
Sustainable procurement	Clients, especially public clients, must take the lead in promoting sustainability in construction and the built environment.
	Sustainability impacts and their mitigation should, be addressed as far as possible in the planning and design (or even as part of the granting of planning permission) prior to commencing tendering procedures.
	Carry out a study to assess the advantages and disadvantages of awarding construction contracts on the basis of "concessions" and "facilities management" in order to determine procedures that produce built facilities with reduced environmental impacts. This could be done on the basis of a benchmarking exercise.
Sustainability performance indicators	That a set of shared indicators be agreed for the construction sector and that the results of CRISP be considered and adopted for use throughout the EU. These indicators will need to be reconciled with the "urban sustainability indicators" [28] issued by DG Environment in November 2000 which municipalities are expected to adopt on a voluntary basis and use them as the basis for environmental reporting.
	Develop a system of life cycle costs performance indicators in order to facilitate comparisons of performance on a European basis and use these indicators to benchmark construction sustainability across Europe.
National plans and European programmes	All member states and accession countries should be encouraged to draw up and publish plans and programmes for "sustainable construction".
	The European Commission should draw up and issue guidelines – based perhaps on the work undertaken in PRESCO - explaining in general terms what these national plans and programmes should contain. Furthermore, the Commission should establish a website where all the documents can be easily found.
Software tools	ECCREDI (through E-CORE) and PRESCO should be asked to review the various software tools available and advise industry on any shortcomings or improvements that could be made. If feasible this should include a market survey in order to determine which software tools are the most useful and appreciated by users.

[28] Towards a local sustainability profile – European Common Indicators", EC DG Environment (ISBN 92-828-9493-2), 2000.

Education and awareness raising	Employers and professional bodies should phase out recognition of training and educational courses which do not take adequate account of the topic of "sustainable construction" in all member states and accession countries.
	The actors in the industry should raise the awareness of the general public, especially clients, in their daily activities. This could be promoted through the increased use of environmental labelling of products and buildings including energy and environmental quality labelling.
	The European Commission, through a dedicated website, should disseminate national plans and programmes and other related and relevant material.
	One or other European body (perhaps ECCREDI) should organise annual competitions for "flagship sustainable construction projects" in the member states and the accession countries. A jury would adjudicate the proposals submitted and a distinguished European personality would present the awards at an annual event in Brussels.
	Consideration could also be given to setting up a "European Best Practice Programme" for sustainable construction, which would act as a learning network and coordinator of national best practices. It should include a scheme for "European Awards".
	The actors in the industry should raise the awareness of the general public, especially clients, in their daily activities.
Research and Development	That ECCREDI through its responsibility in managing E-CORE, should act as a focal point for European RTD actions in the field of Sustainable Construction. The results of these thematic networks should be further developed and used in order to carry forward the agenda for sustainable construction as described in this report.
	E-CORE should develop further actions, policies and strategies aimed at promoting more sustainable construction including giving consideration to requesting the European Standards defining performance criteria which could be used as an alternative to prescriptive requirements in public procurement.

PART IV: RESULTS OF THE TASK GROUPS

Note: These results should be read in conjunction with the full texts of the related reports.

It is essential that the recommendations of the Task Forces are treated seriously and are taken into account by both Member States and the European institutions in measures developed for furthering sustainability in construction.

IV.1. Task Group 1 "Environmentally Friendly Construction Materials" recommendations

With regard to construction materials and products, it is important that life cycle approaches to improving environmental performances are adopted not only for products but for construction works as well. Construction products cannot be assessed on a stand-alone basis since construction works with the highest "green" credentials may use products which might have relatively high environmental loads but which will significantly contribute to reducing a building's environmental impact throughout its lifetime. Construction products need to be viewed in terms of functional units, how they perform throughout the life-time of the construction works in which they are installed and what happens to them when deconstruction or demolition takes place.

The emphasis placed by the Task Group "Environmentally Friendly Construction Materials" on industry providing systematic, transparent and verifiable environmental information on their products and on the use of such information in product standards, is fully substantiated by statements made in the European Commission's recent Communication on the 6th Environmental Action Programme (COM(2001)31)[29] and in its Green Paper on Integrated Product Policy (COM(2001)68)[30].

Ongoing actions to achieve these goals include a Conference held by industry in May 2001 to examine current national initiatives on environmental information on construction products and to gauge the potential for their harmonisation at the European level.

The Task Group recommends that :

- the construction materials industry adopts a life-cycle approach to improving the environmental performance of its products. This can best be achieved through, where feasible, a non-regulatory IPP approach which is flexible, pragmatic and based on industry initiatives and voluntary agreements.
- life-cycle inventory based environmental data schemes (LEDCM) should become general practice for the construction materials industry.
- national LEDCM schemes are harmonised (preferably through CEN) on an EU basis. Separate national schemes will mean increased costs and indirect barriers to trade for the construction materials industry, particularly for SMEs.
- both public authorities and industry support the development and use of models which assist architects and specifiers to take into account environmental impacts when designing new construction works. LEDCM is indispensable to the functioning of such models.
- despite the delay in incorporating environmental aspects into construction product standards, the CEN Construction Sector Environment Project Group continues to work closely with the relevant CEN Technical Committees to develop appropriate guidelines for the inclusion of such aspects.
- the EC, CEN and industry consider the feasibility of using pan-European LEDCM schemes, when developed, as a complement or as an annex to harmonised product standards.

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[29] "Member States and companies should aim at introducing product information schemes for all types of products in the years to come."

[30] "The general philosophy of increasing the amount of product information on the market calls for flexible and cost-effective solutions. For example, the criteria of environmental performance developed for product groups, based on a transparent examination of life cycle considerations, could be more extensively used."

"The Commission intends to co-operate with the standardisation bodies and relevant stakeholders to develop mechanisms to integrate systematically environmental characteristics into product standards."

- construction materials industry associations at both national and European levels actively promote the adoption of environmental audit schemes i.e. ISO 14001 and EMAS and environmental management systems in general. Member States should also be involved in such promotional work and provide funding for such action.
- industry initiatives based on such voluntary approaches as environmental agreements and codes of conduct should be given priority over regulatory measures in implementing policies for improving the environmental performance of construction products.
- both public authorities and industry fully support efforts made to promote the use of recovered materials, materials made from renewable resources and materials where innovation has succeeded in substantially reducing their environmental impact.

IV.2. Task Group 2 “Energy Efficiency in Buildings” Action Plan

Some progress is also being made with regard to energy efficiency in buildings. A proposal for an EU Directive on the energy performance of buildings in the residential and tertiary sectors is due for publication in mid-2001. This looks to create a common framework for improving energy efficiency through the application of minimum standards and certification for both new and existing buildings. It is paramount that once the Directive is adopted, the measures listed are implemented rapidly and effectively by Member States.

IV.2.1. MONITORING AND BENCHMARKING

Develop new indicators, including consumption per square metre occupied which would demonstrate energy performance improvements; and in the tertiary sector, consumption relating to value added or per employee.

Develop through appropriate RTD mechanisms ways of establishing both the appropriate means of measuring progress, and Best Practice in doing so.

Establish and disseminate Best Practice in terms of regulation, fiscal and financial incentives

Establish a system for monitoring progress against targets in each Member State, more specifically on buildings.

Establish benchmarks and publish results on a high profile basis annually, accompanied by unambiguous explanations why some Member States are succeeding while others are failing.

Information programmes will be of vital importance. A concerted effort must be made to expand these to motivate building occupiers to adopt new energy saving measures.

Steps must be taken to capitalise on the enthusiasm of multiple interested parties by helping to form constructive partnerships to take action upon the ground on a local basis. Such steps would obviously need to be taken with the full knowledge of the relevant Member States.

A system should be developed for certifying specialist firms possessing the relevant skills and knowledge to carry out energy efficiency works.

Give particular attention paid to improving the awareness of energy efficiency at all stages of the conventional educational process

IV.2.2. STIMULATION MECHANISMS

Place an obligation on landlords(or initially via a voluntary code) at time of granting new lease or at rent review, to undertake an energy survey of properties, providing details of results to tenants. Use experiences of Australian and US building ratings.

Encourage owners of buildings above a certain size (to begin with, 1000 sq. metres) to publish consumption figures and targets per building. Subsequently publish comparison between companies. If insufficient voluntary response is obtained, consider legislation.

Target certain property letting companies on either a flagship, or a ‘name and shame’ basis. Emphasise potential to reduce service costs to themselves via investment in energy efficiency, whilst maintaining existing charges to tenants. Require landlords to publish the percentage of square metrage owned by them with individual gas and electricity meters. Require publication of future targets for installation of individual meters.

Oblige building owners to upgrade the energy efficiency of an existing building, when more than 25% of the building is being refurbished. Similarly, when 25% of the glazing is altered, the glazing of the entire building should be upgraded.

Seek to amend national legislation to enable tenants to undertake energy efficiency works at their own volition, and/or when necessary, with landlord required to object in writing and with reasons within a given period of application in order to halt activity.

IV.2.3. FISCAL MEASURES

The single best means of encouraging investment is to offer specific financial inducements to consumers. These can be by way of cash-back schemes, grants, tax breaks and accelerated capital allowances. These tax breaks are directly required in order to compensate for the substantial numbers of barriers which exist in the marketplace currently, which distort optimum levels of investment.

Grants repayable through energy bills would have many attractions - made conditional on a prescribed energy rating on completion, indicating a high level of energy efficiency, an energy rating certificate could be attached to the title of the property and become part of the normal pre-purchase and valuation procedures.

Given the failure to reflect external environmental impacts of fuel usage within consumer prices, alternative policies to stimulate investments in renewable energy sources and in energy efficiency are required in compensation.

Existing tax distortions should be removed. In no less than four Member State countries, VAT is levied on energy consumption at a lower rate than on energy conservation. This means that for those who bear the final burden of VAT – the domestic sector, much of the financial and public sector – there is a strong counter signal from the tax system against investing in energy efficiency.

IV.2.4. REGULATORY MEASURES – Promotion of Best Practice in Individual Member State

Documented success of individual programmes should enable the promotion of the best regulatory practice.

Implementing the SAVE Directive (97/76) where powers currently exist – for instance, under Articles 2 and 5 – would undoubtedly assist progress.

Member States should be encouraged to introduce systems of energy rating or energy performance certification for buildings.

The adoption and introduction of energy rating and certification should be accompanied by measures for training and accrediting professional energy efficiency installers, together with accredited assessors and certifiers.

IV.2.5. PUBLIC PROCUREMENT POLICY

It must be a key element of all public procurement policy, both at European, national and local government level, to ensure that all buildings occupied become exemplars on energy efficiency.

Present a proposal for a Directive on energy management, in which EU institutions and Member States agree to follow guidelines for constructing, repairing or furnishing buildings owned or leased by them. It must examine all the running costs of utilising buildings, on a lifetime basis. It should be incorporated within the new, definitive, public procurement criteria.

Making competitive tendering for energy management the norm amongst public bodies within the EU. This is particularly pertinent to usage of structural funds.

IV.2.6. ROLE OF ENERGY SUPPLY UTILITIES

The role of the electricity and gas providers must be shifted from their traditional orientation of selling more units of fuel, into becoming providers of energy services (ESCOs) intended to help customers reduce demand by arranging funding for investments in their buildings. This will probably require the

implementation of the current draft Directive on integrated resource planning (rational planning techniques).

In the Commission working document reporting to the European Council on integrating environmental concerns and sustainable development into Community policies, November 24 SEC (1999) 941 it is stated that the first main action should be “enhancing energy efficiency and savings to which the liberalisation of the internal market and increased competition of the energy industries should contribute”. This involves encouraging (or supporting) the installation of energy efficient technologies and energy management systems.

IV.2.8. MOTIVATING THE STAKEHOLDERS

Due to their technical qualifications, plus their personal contacts with clients during the installation and maintenance phase, technical building contractors have a vital part to play. Their traditional role must be extended beyond installation works into the provision of more complex customer-oriented services and advice in the field of energy efficiency. This should include the development of tailor-made solutions on how to increase energy efficiency in new and established buildings. Technical building contractors should also develop their capacity to offer "contracting" skills.

The key to success in the building sector is to ensure that all the relevant professionals are fully engaged. Strenuous efforts must be made to provide appropriate incentives for all of these players, to ensure that their interests are served by expanding investment in energy efficiency. Above all, incorrect market signals which encourage over specification of energy consumption must be eradicated.

Providing suitable guidance for owners and developers of buildings by training and accrediting professionals, by providing status for those who are demonstrably involved with the best energy efficiency practice, the enormous potential identified can be realised.

IV.3. Task Group 3 "Construction and Demolition Waste Management" recommendations

With regard to construction and demolition waste, the European Commission's Communication on the 6th Environmental Action Programme has confirmed the publication of a Recommendation as a priority area for action[31]. With the Commission having been fully involved in its work, the Task Group expects the Recommendation will take full account of its conclusions, particularly with regard to the emphasis on measures for waste minimization and measures to minimize the amount of waste going to landfills and to illegal dumping sites.

IV.3.1. Industry

- Designers and producers should develop policies with regard to prevention, e.g.:
  - waste prevention oriented planning and design
  - recovery oriented construction
  - qualitative prevention
  - design for multiple uses
- Manufacturers and suppliers should supply designers, specifiers, contractors and others with environmental assessments of their materials and products.
- Contractors and all members of the supply chain have to implement education and training within their organisation, addressing such issues as: waste prevention oriented planning and design and recovery oriented construction.
- Promoters, contractors and sub-contractors should develop codes of practice and ensure they are accepted at national level. These codes should include:
  - selective demolition and/or waste segregation
  - no mixing of hazardous/non-hazardous waste, including separate storage and collection
  - avoidance of contamination
- Construction specifications should give preference to:
  - recyclable primary materials and products
  - C+DW-derived materials meeting all relevant technical requirements.
- Promoters and contractors should be encouraged to prepare EMPs leading to ISO-14001 certification.
- A project EMP should take LCA into account and the eventual disposal of the construction works. The project EMP should pass through the entire construction process, being added to at each level–by the design team, the demolition contractor, the main contractor etc.
- Where specifications permit, the designer and contractor should be encouraged to favour the use of reused/recycled materials.
- The industry should agree to adopt acceptable Key Performance Indicators (KPIs) against which performance should be benchmarked.
- C+DW-derived materials suppliers should:
  - adopt recognised product standards on a national or European (CEN) level;
  - seek certification under existing widely recognised quality assurance schemes (this can also apply to users of the materials).
- The industry, together with the European Commission, should set up a C+DW Working Group. The role of this group, which should meet annually, would be, among other things, to:
  - disseminate and promote the strategy and aims of the recommendations
  - disseminate information regarding good practice in C+DW management
  - maintain liaison between all participants
  - monitor the progress made in the implementation of the strategy and recommendations
  - identify the need for further actions
  - report on its findings

IV.3.2. Member States and their public authorities

- Governments are recommended to draw up a national Waste Management Plan (WMP) on C+DW. This WMP must include:
  - setting targets with regard to prevention and recycling

[31] See article 7, item 4

- collect data on waste amounts recycled and land filled
- monitoring measures for land filling
- All Member States should report annually on:
- targets
- collection of data on waste arisings, prevention, recovery, incineration and land filling
- current and required processing and land filling facilities
- actions undertaken to achieve targets
- constraints presented by national standards
- All Member States should implement the Landfill Directive as soon as possible.
- Member States should implement measures to minimize the amounts and the hazardousness of waste going to landfills. These measures may be a mix of voluntary agreements and regulations.
- Public authorities in Member States should include the following in permit requirements for on-site waste management:
- site organisation and management relating to C+DW
- information on the volumes of wastes arising
- planning of demolition activities, separation and storage
- information on off-site disposal
- an EMP concerning the project.
- Member States and their authorities should set up proper acceptance criteria for recycling facilities.
- Member States should be encouraged to use funds collected from landfill taxation or levies on the disposal of C+DW to promote recovery.

IV.3.3. European Commission

- should start a project to develop a proper and common methodology regarding C+DW statistics. This includes:
- use of the classifications from the European Waste Catalogue
- methods of data collection
- accounting methods
- should fund research projects on C+DW.
- should encourage Member States to implement the recommendations formulated by the Task Group.
- C+DW derived materials produced for use must be considered as products, not waste. The Commission should give priority to a case study on this stream aiming at a clearer interpretation of the definition of waste.
- should fund a C+DW multi-stakeholder Working Group, i.e.:
- the preparation, management and reporting of the meetings
- the venue

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PART V: APPENDICES

V.1. Appendix 1: LIST OF PARTICIPANTS

The Working Group met twice in 1999, on 28th September and 7th December and four times in 2000 on 6th March, 19th June, 19th September and 17th November 2000.

First Name	Last Name	Organisation
Dave	Baker	UEPC - Union Européenne des Promoteurs-Constructeurs
Erich	Bayerl	BMVBW – Bundesministerium
Philip	Bennett	CEPMC - Council of European Producers of Materials for Construction
Horst	Biedermann	EURIMA - European Insulation Manufacturers Association
Barry	Blackwell	DETR – Department of the Environment, Transport and Regions
Jan	Boone	FIR – Fédération Internationale du Recyclage
Luc	Bourdeau	CSTB – Centre Scientifique et Technique du Bâtiment
Juan Antonio	Campos	EC DG ENTR – European Commission DG Enterprise
Renato	Caronna	EC DG ENTR– European Commission DG Enterprise
Jean-Luc	Chevalier	CSTB - Centre Scientifique et Technique du Bâtiment
Stefano	Conte	EC - DG TREN– European Commission DG Enterprise
Abel	Cucurella Ripoll	GERD – Gremio de Entitades del Reciclaje de Derribos
Geert	Cuperus	Tauw
Lars	Vedsmand	FETBB - Fédération Européenne des Travailleurs du Bâtiment et du Bois
Aurora	de Bustos	Eurometaux
Jan	Desmyter	CSTC – Centre Scientifique et Technique de la Construction
Patrizia	Di Mauro	EBC – European Builders Confederation
Martina	Dielhof	AVBB – Algemeen Verbond Bouwbedrijf
Harro	Draheim	GERD – Gremio de Entitades del Reciclaje de Derribos
Suzy	Edwards	BRE – Building Research Establishment
Alberto	Garralon	EC - DG ENTR– European Commission DG Enterprise
Rolf	Gehring	FETBB - Fédération Européenne des Travailleurs du Bâtiment et du Bois
Thierry	Gerschel	Eurometaux
Nicolas	Gomez	Rehva – Representatives of European Heating and Ventilating Association
John	Goodall	FIEC – European Construction Industry Federation
Tania	Goutoudis	CEMBUREAU – European Cement Association
Herman	Haarman	Min Vrom – Dutch Ministry of Environment
Nigel	Howard	BRE – Building Research Establishment
Pasquale	Ialongo	ANCE – Associazione Nazionale Costruttori Edili
Christine	Jarvis	DETR – Department of the Environment, Transport and Regions
Axel	Jung	FIR – Fédération Internationale du Recyclage
Josef	Karner	BMWA – Bundesministerium für Wirtschaft und Arbeit
Ted	King	DETR – Department of the Environment, Transport and Regions
Christopher	Laing	ECBP – European Council of Building Professionals
J.-F.	Le Teno	CSTB – Centre Scientifique et Technique du Bâtiment
Vicente	Leoz Argüelles	EC DG ENTR– European Commission DG Enterprise
Darrell	Locke	ECA – Electrical Contracting Association (UK)

Oliver	Loebel	UEAPME - Union Européenne de l'Artisanat et des Petites et Moyennes Entreprises
Adele	Lydon	EC DG RTD - European Commission DG Research
Asa	Malmstrom	EC DG ENTR– European Commission DG Enterprise
Herman	Haarman	Dutch Ministry of Housing, Spatial Planning and the Environment
Paul	Meinders	Dutch Ministry of Environment
Werner	Mellacher	STMK – Land Steiermark
Pat	Minogue	Irish Ministry of Environment
Tariq	Nawaz	DETR – Department of the Environment, Transport and Regions
Ernst-Rainer	Niederhausen	BMWI – Bundesministerium für Wirtschaft und Technologie
Brendall	O'Neill	Irish Ministry of Environment
Alexandre	Paquot	EC DG ENVI - European Commission DG Environment
Mark	Polman	EDA - European Demolition Association
Pereira	Pontes	ANEOP – Portuguese Environment Minister
B,	Rivain	UCF - Union Climatique de France
Jean	Rougnon	CEETB – Comité Européen des Entreprises Techniques du Bâtiment
Alain	Sagne	ACE – Architects Council of Europe
Rafael	Salgado de la Torre	Ministerio de Fomento – Spanish Ministry of Environment
John	Sangster	EAA - European Aluminium Association
Ingo	Schulz	FIR – Fédération Internationale du Recyclage
Bruce	Sharpe	DETR – Department of the Environment, Transport and Regions (UK)
Hans	Stielstra	EC DG ENV.E.4 - European Commission DG Environment
Gerhard	Stimmeder	ECDGXI - European Commission
Helen	Sutcliffe	EC DG Entr - European Commission DG Entreprise
Roland	Talon	FFEE - Fédération Française de L'Equipement Electrique
Reinhard	Tatzl	FIR – Fédération Internationale du Recyclage
Jan	Te Bos	EAA - European Aluminium Association
Olavi	Tupamäki	Villa Real Ltd / FutureConstruct®
Joseph	Twomey	Irish Ministry of Environment
Johan	Van Dessel	CSTC – Centre Scientifique et Technique de la Construction (B)
Matti	Virtanen	Min. Environment of Finland
Andrew	Warren	Ass. Cons. Energy in the UK
Kerstin	Wennerstrand	Swedish Min. Environment
Rick	Wilberforce	EUROACE – European Alliance of Companies for Energy Efficiency in Buildings
Udo	Wirges	ZVSHK – Zentralverband Sanitär Heizung Klima
Karlheinz	Zachmann	EC DG ENTR– European Commission DG Enterprise
Edwin	Zoontjes	FIR – Fédération Internationale du Recyclage

The following persons acted as convenors of the Working Group and Task Groups:
Task Group I: Philip Bennett – CEPMC
Task Group II: Andrew Warren – EuroACE
Task Group III: Jan Boone – FIR
Working Group: John Goodall – FIEC

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V3. Appendices 3 and seq: NATIONAL PLANS AND PROGRAMMES FOR SUSTAINABLE CONSTRUCTION

These appendices contain the text of national plans and programmes for more sustainable construction of which the Working Group is aware. The texts relating to just four countries are included here but the list is probably not exclusive:

Country	Source	Date of publication
United Kingdom	Department of the Environment, Transport and the Regions (DETR), London	April 2000
The Netherlands	Ministry of the Environment	?
Finland	Ministry of the Environment	10 December 1998
Sweden	Ministry of the Environment	?

V.3.1. BRITAIN - Building a better quality of life - A strategy for more sustainable construction

Building a better quality of life was launched in April 2000 by the UK government. Developed in partnership with industry bodies, it is a strategy for changing how Britain's buildings and their supporting infrastructure are created. It will lead to more socially and environmentally responsible construction, contributing to national and international sustainable development.

Building a better quality of life is an action plan to create a UK construction industry which:

- Is profitable and competitive
- Produces buildings and structures which provide value
- Respects people
- Enhances and protects the natural environment
- Has minimum impact on the consumption of carbon-based energy and natural resources

Building a better quality of life applies to investors, clients, (including the government, which has already prepared an action plan for procurement and is leading by example), designers, suppliers, constructors and occupiers. Actions to achieve the objectives include:

- Re-using existing built assets
- Designing for minimum waste
- Minimising energy use throughout the life cycle
- Avoiding pollution
- Adding to bio-diversity
- Conserving water resources
- Respecting people and communities

Actions must be supported by measurement against indicators – now being tested – which will be used to set targets for continuous improvement. Government and construction (at the levels of businesses, sectors and the whole industry) will be making public reports on progress.

Building a better quality of life is available on the Internet at
www.property.gov.uk/services/construction/gccp/100700.pdf

For more information, contact:
Sustainable Construction Team, DETR, Eland House, Bressenden Place, London, SW1E 5DV, UK
Tel: +44(0)20 7944 3000

The strategy set out in *Building a better quality of life* has already provoked responses from the industry and its clients.

Achieving sustainability in construction procurement – A response by public sector clients

The Office of Government Commerce, a part of the Treasury, has adopted an action plan for sustainability prepared by the Government Construction Clients Panel. This was published in July 2000 under the title *Achieving Sustainability in construction procurement*. Every UK government department and agency has agreed to implement this action plan in full by March 2003. As government procurement accounts for 40% by value of the UK construction market, this plan will make a big difference quickly to the impact of UK construction to the objectives of sustainable development.

The requirements of *Achieving Sustainability in construction procurement* are based on ten themes. These are:

Re-use existing built assets – *Consider the need for new build. Refurbishment/Re-use may work better. Think brownfield wherever possible for new construction*.

Assessing the case for refurbishment/re-use or new build should be based on a careful and objective technical appraisal (e.g. through a 'Whole Life Cost' assessment') to evaluate the long-term potential of an existing asset against that of a decision to build new.

Design for minimum waste – *Design out waste both during construction and from the useful life – and afterlife – of the building or structure. Think whole life costs. Involve the supply chain. Specify performance requirements with care to encourage more efficient use of resources. Think about using recycled materials.*

Design is fundamental to sustainable construction. In this context it is more than a matter of converting client briefs for individual buildings or structures. Sustainability in design requires a broad, and long-term, view of the environmental, economic and social impacts of particular decisions. A particular priority is designing out waste, both from the construction process and during the useful life of the building or structure.

Waste does not imply just unwanted physical material. It includes unnecessary consumption of land, time, lower than planned economic return and unrealised potential from built assets during their lives. Minimising waste through design means avoiding over-specification of materials and services in favour of simplicity (build ability), bearing in mind operation and maintenance (maintainability), and considering flexibility and future re-use (adaptability), so as to minimise construction costs.

Aim for lean construction – *Work on continuous improvement, waste elimination, strong user focus, value for money, high quality management of projects and supply chains, improved communications.*

Minimise energy in construction – *Be aware of the energy consumed in the production and transport of construction products. Adopt "green" travel policies.*

Minimise energy in use – *Consider more energy efficient solutions in design including passive systems using natural light, air movement and thermal mass, as well as solutions involving energy produced from renewable sources*.

Buildings consume large quantities of energy during their life-spans. A significant proportion of all energy consumption is used in the production and transport of construction products and materials. Selecting where practicable materials whose production and distribution are less energy intensive will be of benefit. Both in new-build, and in the refurbishment of existing buildings, much can be done applying existing knowledge.

Technological solutions are available and proven, in the form of more energy-efficient buildings, building services and the two together. Basic design, covering, for example, location, orientation and the specification of the fabric, can make significant contributions to lower energy consumption. Passive environmental systems – drawing on natural light, natural air movement, thermal mass, temperature gradients and other phenomena – can deliver satisfactory performance while using much less energy than their mechanical equivalents. The scope for cost-effective use of on-site alternative energy sources, such as combined heat and power, district heating, thermal storage and heat pump applications, is increasing steadily. Guidance on better energy efficiency can be made available through best practice programmes.

Do not pollute – *Understand your environmental impacts and have policies and systems to manage them positively. Use environmental management systems under ISO 14001 or EMAS.*

The four major potential sources of pollution from the construction process are waste materials, emissions from vehicles, noise and releases to water, ground and atmosphere. Strategies for prevention, control and mitigation are well known, and better performance is a matter of better management to ensure that risks are identified and the appropriate techniques and technologies applied. Environmental Management Systems can play an important role in achieving continuous improvement.

Preserve and enhance bio-diversity – *Look for opportunities throughout the construction process – from the extraction of raw materials, through the construction phase, to the landscaping of buildings and estates – to provide and protect habitats.*

Construction has direct and obvious impacts on the biological environment, and has the opportunity to do a great deal, not only to mitigate negative impacts but also to protect and enhance bio-diversity and to secure a sustainable environment. These opportunities and the value derived from them will be enhanced if attention is paid to bio-diversity at the design stage of development rather than treating it as an 'end of pipe' issue.

Conserve water resources – *Design for increased water efficiency in building services and water conservation within the built environment*.

Pressure on water resources is likely to increase, and there is considerable potential for increased water efficiency in the building stock. The main gains for more sustainable construction will come from incorporation of more water-efficient building services. This can be simple such as specifying low flow showers, sprinkler taps and dual flush WCs, or include more comprehensive solutions such as grey water recovery, rainwater recovery, and drainage control.

Water audits of existing buildings will show where savings in water use can be made when refurbishing existing buildings.

Respect people and their local environment – *Be responsive to the community in planning and undertaking construction. Consider all those who have an interest in the project (employees, the local community, contractors).*

Respect for people is at the heart of the social responsibility dimension of sustainable construction. A culture that emphasises respect for people will impact on recruitment and retention, equality of opportunity, health, safety and welfare and neighbourliness. Indicators to measure and monitor respect for people are being developed.

Set targets – Measure and compare contractors' performances with others. Set targets for continuous improvement. Develop appropriate management systems.

The effectiveness of target setting as a tool is increased if the targets are embedded in a corporate sustainable development policy. Policy statements should be supported by open and public reporting of achievement and progress.

A*chieving Sustainability in construction procurement* is available on the internet at http://www.ogc.gov.uk/frame_home.htm

For more information, contact:
Construction Team, OGC, 6th floor, Trevelyan House, Great Peter Street, London, SW1P 2BY, UK
Tel: +44 (0) 20 7271 2652

Towards sustainability – a response by the UK construction industry

Another response, released in April 2000, was a report with the title *Towards Sustainability – a Strategy for the Construction Industry*, published by the Sustainable Construction Focus Group. This was a body of senior people from all sectors of the UK industry, including suppliers of materials and clients, led by the chairman of one of the major contracting companies. Their strategy sets out an industry response to the challenge set by the government, and is presented in a practical, action-based, way, with case studies to illustrate the points made. The document, which has proved popular and persuasive, uses the example of a ladder which has to be climbed to achieve more sustainable performance.

V.3.2. THE NETHERLANDS

V.3.2.1. Best practices and development

I Sustainable urban planning

- Alphen aan de Rijn; Ecolonia
- City of Apeldoorn; fully integrated planning process involving all disciplines.
- Investment Budget for Urban Regeneration (ISV); a subsidy measure in the field of accommodation, space, environment and the physical conditions. ISV is a powerful instrument for applying Sustainable Building to existing towns (extra attention on urban development and existing stock).

II works, process

a) policy

- The Ministry of Housing, Spatial planning and the Environment (VROM) has set up, within the framework of the National Environmental Policyplan, the Policy Programme on Sustainable Building 2000-2004. Main goal is to bring Sustainable Building (SB) to a higher level:
  - wide application: SB will be widely applied in the building sector by the public sector, developers, designers and consultants and builders.
  - suitable conditions: SB is involved in policies, agreements, legislation, provision of know how development and dissemination.
- Sustainable Building is one of the instruments with which the government together with the building sector are giving form and concern to the Sustainable Development of Dutch society. It is about the sustainable development, renovation and maintenance of buildings or works and their environment as a whole, including the demolition and removal.
- National packages on Sustainable Building. National Packages for the different building sectors: housing sector, Utility building, the Civil Engineering Sector and Urban Development.

b) agreements

- SB-agreements public sector and building sector

c) harmonisation, normalisation and certification

- EcoQuantum: assessment method (design tool) for calculating the environmental load for dwellings based on both material based environment figures and environmental loads caused by living. LCA-based technical specifications
- Programme on building construction and demolition waste management
- Environmental declarations building product (MRPI)
- Dutch NEN-standard Material-based Environmental Profile for Buildings (MEPB)

III works, projects

a. housing sector and non-residential sector

Demonstration projects for sustainable and low-energy building. The demonstration projects, in addition tot serving as examples, were also to contribute to the ‘upwards leap in scale’. 47 projects (31 housing construction an 16 non-residental construction) are carefully monitored, generally from drawing tot completion.

b. roads and earth embankment structures

- National Package on Sustainable Building in the Civil Engineering Sector (: Sustainable Building measures);
- Implementing measures in the Standard Conditions of Contracts for Works of Civil Engineering Constructions;
- Energy saving programme for the Civil Engineering Sector.
- SB-demonstration project Motorway A12 (Utrecht-Veenendaal)

V.3.2.2. Sustainable building policy

Recent history

In the nineties, the Dutch government decided upon a stimulus for sustainable building. In 1995 the first Action Plan with fourteen actions and projects was presented. This marked the beginning of the Dutch government's programmed approach to sustainable building. It was aimed to give sustainability a stronger place in the decision-making process on the layout and use of buildings and their environment. In 1997, the second Action Plan followed with 28 actions and projects. Both plans were developed in consultation and close co-operation with the representative organs of all parties involved in the building process. Both plans have had much effect. By the end of 1999, sustainable building has become an important theme in the building process.

Policy Programme 2000-2004

However, in 1999, government and market parties concluded that is was still too early to drop the programmed approach of sustainable building. More time is needed for wide application of sustainable building and embedding it in the daily practice of construction.

Therefore the Policy Programme Sustainable Building 2000-2004, titled "Firmly Embedding", has been presented at the end of 1999. Aim of this programme is that, at the end of this period, sustainable building will be completely embedded in thought and deed of government and construction organizations and that the stimulus of the programmed approach will no longer be needed.

The Policy Programme contains extra policy stimuli in three areas. Energy is one of them. The international agreements on reduction of emission of greenhouse gases require additional effort also from the building sector. Especially existing buildings offer opportunities for this. Therefore the instrument of the energy performance advice is being developed, based on voluntariness.

A further impulse is also needed for sustainable urban development. Recent developments in the field of urban regeneration offer opportunities for sustainable building to make leaps forward.

Third and last extra policy stimulus regards the approach of consumers in their role of demanders and users of buildings. There is still a great potential hidden in the consumer's increasing demand for quality. Promising is the possibility of linking sustainable building to other quality aspects such as comfort, availibility of green space and water nearby, quality of life and public health.

Implementation Programme 2000-2002

The Policy Programme contains an Implementation Programme for 2000 and 2001, with over thirty projects, to be carried out in close co-operation with the market parties. By the end of 2001, the Policy Programme will be updated on the basis of the experiences. The Policy Programme will be evaluated at the end of 2003 in order to draw well-founded conclusions for the future of sustainable building policy.

V.3.2.3. Sustainable building regulation

Towards environmental performance standards for buildings - a description

Sustainable building in the Netherlands has become firmly embedded in governmental policy since 1995. Policy has been elaborated in successive action plans. The core of the action plans are actions grouped along four policy lines, namely: "harmonisation", "realisation", "consolidation" and "preparation". The policy line "harmonisation" is of crucial importance for the building sector. To achieve this, the building sector itself took the initiative to develop a series of so-called "national packages for sustainable building".

So far, functionally formulated measures and solutions were used. However, the building sector prefers formulations in terms of performance requirements which allow designers and builders to choose freely from the solutions they want themselves. This approach is in compliance with Dutch building regulation.

Just as is the case with determining the energy performance of a building, it should be possible to also ascertain its environmental performance. Research into devising a determination method is presently going on and has meanwhile resulted in a prototype method for drawing up a building's material-based environmental profile, derived from the existing, performance-based LCA (life cycle assessment) method. With the help of such a method, socially desirable minimum standards for sustainable use of materials can in due course be incorporated into the building regulations. The use of performance standards leaves room for innovation and creative solutions.
This leaflet presents the method and provides background data and information on future developments in the Netherlands.

Unambiguous environmental information

Sustainable development means minimising environmental pollution so that our children and grandchildren can continue to live in healthy surroundings. Sustainable building contributes to this by ensuring more economical use of finite raw materials and by reducing and above all preventing the accumulation of pollutants and waste. The incorporation of sustainable building standards into the building regulations was mentioned as a goal in the "Sustainable Building Action Plan: investing in the future", published in 1995.

Practically all the players in the building sector need clear environmental information to support their decisions. At the moment they can obtain such information by making use - on a voluntary basis - of instruments such as Eco-Quantum and GreenCalc. If there is a standardised method of assessment, however, all the players in the sector will be required to use the same method and to base their agreements on it. Everyone's decisions will then be based on the same environmental information. If the standardised method is incorporated into the building regulations, this will ensure that it is used by the "stragglers" as well as the "front runners".

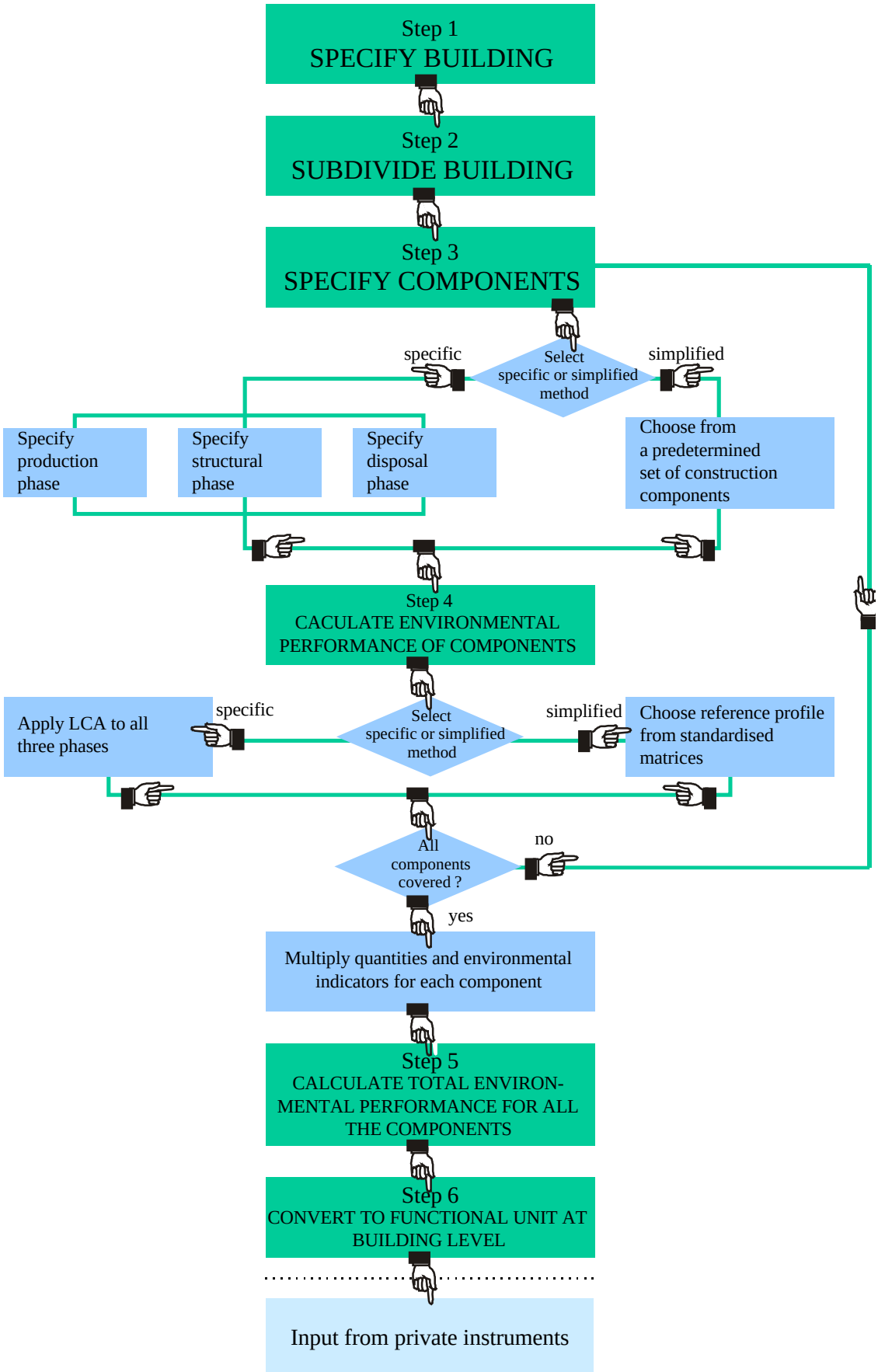
A single yardstick for environmental performance of materials, **the Material-based Environmental Profile for Buildings** (**MEPB)**

Future building regulations could include a new performance standard known as **the Material-based Environmental Profile for Buildings**, or **MEPB**. "Material-based" means that the profile solely concerns the materials used in the building. The **MEPB** reveals the environmental impact of the use of materials throughout their life cycle.

The **MEPB** is a yardstick for the environmental performance of all the materials used in a building. It can be used to draw up environmental profiles for both licensable and non-licensable structural components, installation of materials, and structural and other fixtures. Just as in the case of the energy performance coefficient, the building regulations can lay down limit values, starting with the housing construction sector. As elsewhere in the building regulations, the **MEPB** can be drawn up with reference to standards published by the Dutch Institute for Standardisation (NEN).

In 2000 the Netherlands Minister of Housing, Spatial Planning and the Environment will decide whether to adopt new regulations on the subject. If adopted, such regulations could take effect from 1 January 2002.

Environmental performance standards in 6 steps



The steps in detail

The method for drawing up the **MEPB** consists of six steps:

step 1: Specify the building

The user specifies whether the building is (a) a dwelling which is not located in a residential structure or (b) a residential structure. He determines the usable surface area (in accordance with Dutch standard NEN 2580) and the working life of the building.

step 2: Subdivide the building

The building is subdivided into:

(a) licensable structural components[32];
(b) non-licensable structural components;
(c) other fixtures.

step 3: Specify the components

The user chooses which specification method he wants to use for each structural component. He can choose either
(a) the specific method,
(b) the simplified method, or
(c) a combination of the two.

For the production phase, the structural phase and the disposal phase of each component, the user indicates:

- what products the component consists of, and in what quantities;
- what activities are carried out;
- what kinds of waste are generated, and in what quantities;

Specific method
The user draws up his own list of components.

Simplified method
From a predetermined set of components, the user chooses the ones that are applicable to the building.

Combined method
The user chooses components from a predetermined set of components and adds some of his own.

step 4: Calculate the environmental performance (the environmental profile) of the components

The environmental profile is calculated using the method selected in Step 3: specific, simplified or combined.

Specific method

The user determines the environmental burden generated during the production phase, the structural phase and the disposal phase of each component. The environmental burdens for all the various products, activities and types of waste are then added up. The result is an environmental profile for each component. Information supplied by manufacturers can also be used for this purpose.

[32] Structural component: a component which is used in the construction of a building and which is subject to building regulations under the terms of the Building Decree.

Simplified method

The user starts by drawing up the required environmental budget per unit of the component (e.g. per m^2 expressed in an environmental profile). For this purpose he can make use of predetermined "reference profiles" drawn up on the basis of profiles for large numbers of components, or he can use "ready-made" producer-specific environmental profiles for components. A compilation of environmental product information sheets can also be used if available.

The environmental profile per unit is then multiplied by the quantity of the component (e.g. 100 m^2 of interior wall). The result is the environmental profile for the component concerned.

An environmental profile is expressed in terms of environmental impact categories, in other words the thirteen types of environmental impact or the five environmental value standards (see below information on environmental impact categories).

step 5: Calculate total environmental performance (add up the environmental profiles) of all the components

The environmental profiles for the various components are added up.

step 6: Convert the environmental profiles to a reference unit

On the basis of the data recorded in Step 1 (including surface area and working life), the results from Step 5 are converted to a unit which enables them to be compared with the standard. This eliminates differences in environmental impact due to the type of building (mid-terrace dwellings, end-of-terrace dwellings, bungalows, etc.) and so allows proper comparisons to be made. The specific details of this step are still being studied.

Example of how the steps are applied

step 1: Specify the building

Our example is the “Novem” sun lounge reference dwelling. The usable surface area of the dwelling is 111 m^2. The estimated working life of the dwelling is 75 years. It is a mid-terrace dwelling in a row of eight.

step 2: Subdivide the building

The building is subdivided into its component parts. The user then takes one of the structural components - the window frames, which are licensable - and proceeds through Steps 3 and 4, using the simplified method.

step 3: Specify the components

According to the specification, there are 18 m^2 of window frame in the reference dwelling.

step 4: Draw up the environmental profile of the components

Using the simplified method, the user proceeds as follows:
The type of window frame to be used in the dwelling is known. The user takes the types of environmental profile from the corresponding environmental profile and subsequently calculates the environmental performance of the dwelling, using the appropriate calculation units. Alternatively, the type of product used for the window frames may not yet be known. In that case the user selects indicators/environmental budgets within which the environmental profile of the window frames to be used must fall.

ENVIRONMENTAL REFERENCE PROFILE : WINDOW FRAME, BRAND X						
Environmental value standards	**Cat. 1**	**Cat. 2**	**Cat. 3**	**Cat. 4**	**Cat. 5**	**Cat. 6**
Raw materials						
Emissions						
Energy						
Waste						

Key: Step 4, using the simplified method. The type of window frame and the corresponding environmental profile are known.

step 5: Add up the environmental profiles of the components

The user adds the environmental profile for the window frames to the profiles for other components used in the dwelling. The total is the environmental profile for all the materials used in the dwelling.

step 6: Convert the environmental profiles to a reference unit

The user converts the environmental performance of the dwelling to the functional unit (e.g. square metres of usable surface area).

Background

Integrated environmental assessment

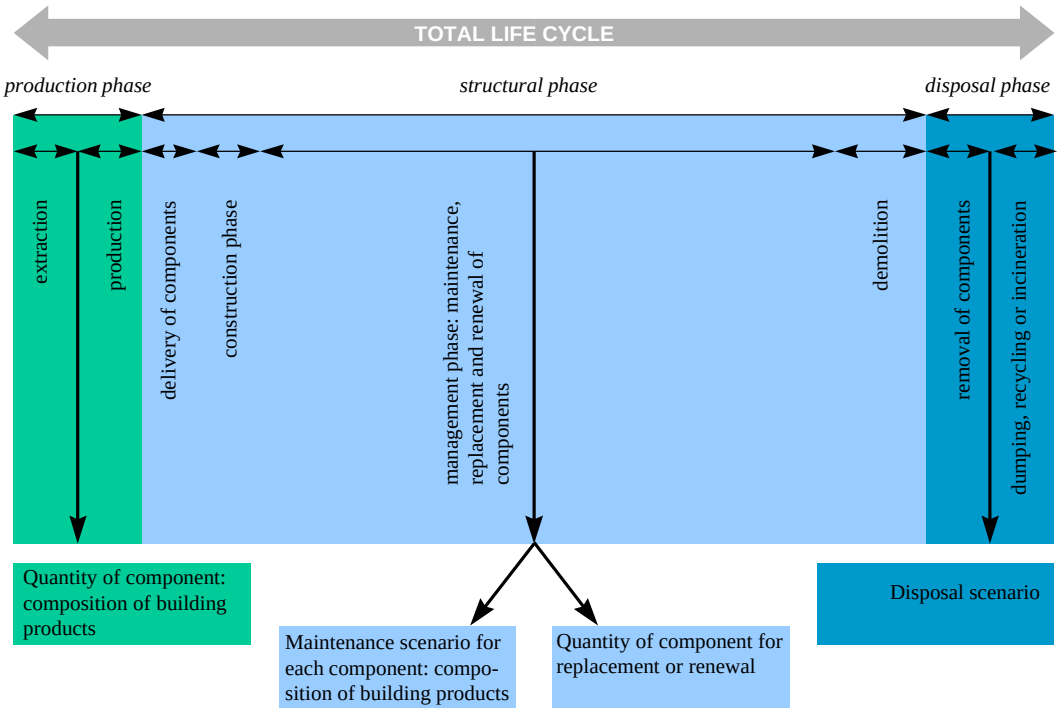
The various players in the building sector want to see integrated environmental assessment of buildings. The energy performance coefficient has been an integral part of the regulations since 1995. Radiation and water performance standards are currently being developed. Noise abatement and other health aspects are covered by the building regulations. These are all components of integrated environmental assessment of buildings. This leaflet focuses on the development of another component, the material-based environmental profile for buildings (**MEPB**) - one more step on the way towards integrated environmental assessment of buildings.

Total life cycle

The assessment method is based on life cycle assessment (LCA), which covers the entire life cycle of a building. The life cycle of the building consists of three phases:

1. Production phase: the production of building products, from extraction of raw materials, transportation to the factory and production of semi-finished products, to the finished product at the factory gate.
2. Structural phase: all the activities involved, starting with transportation of products to the building site, construction, maintenance and replacement, and ending with demolition. Each activity involves products (such as façade components), subsidiary activities (such as hoisting), accessories (such as props), equipment (such as hoists), and waste that requires disposal.
3. Disposal phase: from transportation of demolition material to final disposal (dumping, incineration, recycling or reuse).

The environmental performance of each component and activity, as well as any waste generated, is determined for each phase. The sum total represents the environmental performance of the building.



Life cycle assessment (LCA)

LCA examines the entire potential environmental impact of a product "from the cradle to the grave". It provides a picture of the entire life cycle of a product (from extraction of raw materials to demolition and recycling), of the processes that take place during that life cycle, and of their environmental interactions and impact. Environmental interactions are raw materials and energy. Environmental impact means depletion of raw materials and fossil fuels, release of emissions, and generation of waste. After an inventory of the environmental impact has been drawn up - using various calculations which are subsequently standardised as part of the assessment method - the various performances are put together to create an environmental profile. The environmental profile reveals the environmental impact of the product in question.

Environmental profile

An environmental profile is made up of environmental characteristics. These may be the thirteen types of environmental impact or the draft five Dutch environmental value standards, namely *raw materials*, *emissions*, *energy*, *waste* and *nuisance* (the nuisance value standard is not yet operational). The thirteen types of environmental impact are depletion of raw materials, depletion of fuel resources, the greenhouse effect, damage to the ozone layer, summer smog, human toxicity, ecotoxicity in water, acidification, eutrophication, use of non-renewable energy resources, waste, hazardous waste, and radioactive waste. The draft five Dutch environmental value standards are determined after weighing the thirteen types of environmental impact.

What will this mean in practice?

Changing responsibilities

When the new procedure is introduced, all applications for building permits will also be assessed for compliance with the new environmental performance standards. This will affect the responsibilities of many of the players in the building sector:

- *Those commissioning new structures* will be responsible for deciding what measures must be taken to comply with the limit values and for providing an environmental profile of the structure.

- *Designers* will be responsible for making calculations and producing designs which meet the standards for the **MEPB**.

- *Local authority housing inspectors* will be responsible for assessing applications for building permits and ensuring compliance with the terms of the permit.

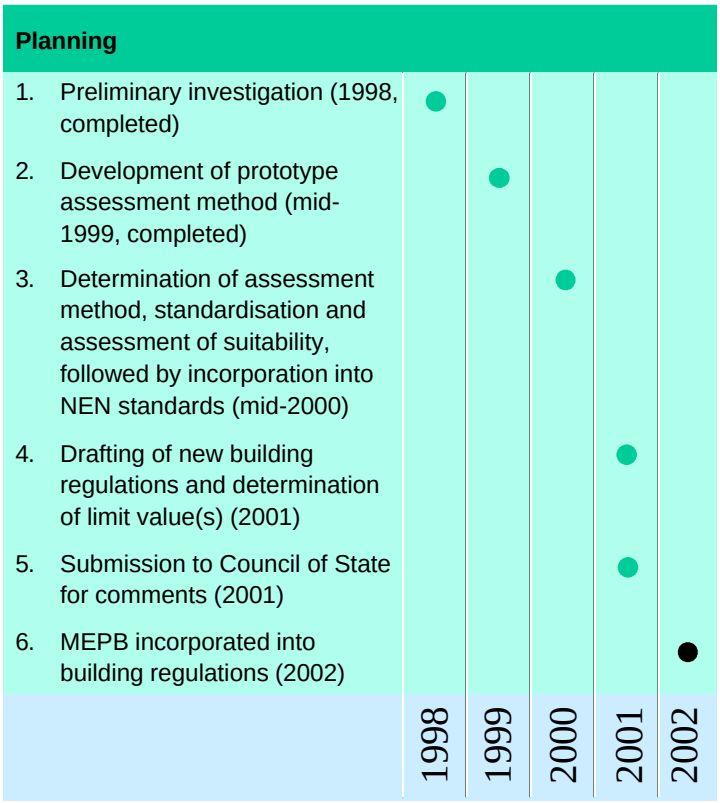
- *Contractors* will be responsible for carrying out the work in accordance with their instructions, i.e. in accordance with terms of the building permit.

- *Suppliers* will be responsible for supplying products which will enable applicants for building permits to comply fully with the **MEPB** for the structure concerned.

Application procedure

The **MEPB** must be submitted to the local authority together with the application. The procedure is the same as for the strength of a structure. In practice, it is expected that building permits will include a clause stating that the calculations demonstrating compliance with the **MEPB** will be submitted at a later stage. The calculations must be submitted before the structural components are used. Calculations submitted in connection with building permit applications will often be based on knowledge of families of building products and the corresponding indicators. Detailed choices of products and producers will be made later. Products and producers must be chosen in such a way as to comply with the **MEPB**. In the event of failure to comply with the **MEPB**, an application must be made to have the building permit amended. By choosing different components and corresponding environmental profiles, evidence can then be provided that the limit values have been complied with after all.

Consultation platform



The Building Regulations Consultation Platform (OPB) has set up a Steering Group on Sustainable Building Standards in the Building Regulations to supervise the incorporation of **MEPBs** into the building regulations. The OPB is a forum for consultation on building regulations between market players in the building sector and the Directorate-General for Housing of the Ministry of Housing, Spatial Planning and the Environment.

The current prototype has been submitted to the OPB and will be discussed there before proceeding to the next stage.

The assessment method was designed by a consortium consisting of TNO-Bouw and TNO/MEP (the building and environmental sections of the Netherlands Organisation for Applied Scientific Research), IVAM Environmental Research, W/E sustainable building consultants, Intron, and CML.

Further information

For further information on the incorporation of sustainable building standards into the building regulations, please contact P. J. van Luijk, e-mail: piet.vanluijk@bd.dgvh.minvrom.nl, or H.W. Verkès, e-mail: henk.verkes@bd.dgvh.minvrom.nl, at the Netherlands Ministry of Housing, Spatial Planning and the Environment.

V.3.3. FINLAND: Government Programme for ecologically sustainable construction

V.3.3.1. Outlines for ecologically sustainable construction

The Finnish Government Programme for Ecologically Sustainable Construction lays out for the construction and real estate sectors the targets and actions of the Finnish Government Programme for Sustainable Development approved in summer 1998.

The Programme for Ecologically Sustainable Construction underpins the new Land Use and Building Act, which has the principal aim of furthering ways in which land use and building can promote sustainable development, reduce environmental hazards and conserve natural resources. The EU, too, is focusing on the development of ecologically sustainable land use and building in many different ways.

Various regulations dealing with building have been revised in the last few years to support ecologically sustainable construction. The revised fire regulations are intended to allow more use of wood. Building regulations dealing with unobstructed movement, sound insulation and moisture are aimed at extending the life cycles of buildings. Campaigns and special programmes to increase the use of renewable resources have specifically promoted the use of wood in construction. Using wood in building can help to improve atmospheric carbon dioxide levels.

Damp and mould cause problems costing billions. As well as regulations, surveys and campaigns, we need measures that promote ecological thinking, energy economy and good quality indoor air and hygiene in buildings in order to avoid these problems in the future. The Programme for Ecologically Sustainable Construction incorporates these aims.

Over the last few years, the attitude taken by the construction and property sectors towards environmental protection has become more favourable. The sector has prepared and implemented joint strategies and action programmes in which the environmental aspect has been singled out as one of the key competitive factors in construction. Construction technology and know-how that conserve and improve the environment can become one of the Finnish construction industry's strengths, making this a competitive factor in international markets.

The Programme concentrates on ecological sustainability in construction, repair and property maintenance and it also touches on the economic, social and cultural aspects of sustainable development and the problems of community land use. The Programme does not, however, deal with community planning and development, although land use and community structure have a key influence on the volume of traffic and the emissions it causes.

The degree to which hazards to residents are caused by noise pollution, air pollution, impure indoor air, and soil contamination depends on land use and construction procedures. A healthy and pleasant living environment and healthy, pleasant housing and building stock are also primary goals of ecologically sustainable development. A good environment that is full of vitality increases people's sense of well-being.

The goals and actions contained in the Programme are aimed at the near future. The implementation of the goals and the effects of the Programme on environmental loading will be assessed at the follow-up stage when any necessary further action will also be decided on.

The Finnish Government Programme for Ecologically Sustainable Construction has been drawn up by a team of experts at the Ministry of the Environment. As key representatives from the construction and real estate sectors and officials have had a say in drawing up the Programme and in deciding on its content and focal points, it has been possible to incorporate into it the kinds of measures that depend primarily on the construction sector's own approaches for their implementation. The authorities and the construction and property sectors have expressed their commitment to cooperation in promoting practical measures to further sustainable development in their own fields.

V.3.3.2. WHY A PROGRAMME?

The construction and property sector is one of the biggest segments in Finnish business and industry. The built environment makes up two-thirds of the total value of national assets, with a significant amount of raw materials, energy and cultural values tied up in it. The construction and use of buildings always place loads on the environment.

Energy

The total consumption of heat and electrical energy in the construction industry, building operations and the existing building stock amounts to over 40% of all primary energy produced.

Emissions

The construction and real estate sectors produce one-third of Finland's annual carbon dioxide emissions.

Waste management

As well as greenhouse gas emissions, construction also produces other emissions and generates waste, consumes raw materials and affects land use. By applying life-cycle thinking in construction and taking ecological questions into account in property maintenance, the quantity of waste generated can be reduced.

Water conservation

The use of buildings puts a strain on raw water reserves and the municipal waste carried by the water used in buildings pollutes the waterways. Ways of conserving raw water resources and reducing the amount of water used could be taken into account far more than they are at present in land use planning and building.

Materials

The choice of materials has an effect on ecological sustainability.

Health

Problems caused by damp and mould can be avoided by good building practices and ecological solutions.

Because the use of buildings has a significant effect on the state of the environment and thus on the quality of life, it is important that the potential of the existing building stock is utilized to further sustainable development.

In implementing Finland's international commitments and national environmental policy, the construction sector must reduce the environmental loading caused by building.

Several European countries are taking a voluntary line of action, coping with environmental impact by using models and good examples, and widely publicizing model solutions. It has often been found, too, that action to increase people’s knowledge and awareness, and setting environmental targets for their own activities is more effective than issuing rules and regulations. When there is sufficient know-how and skill, it will be easier to set binding regulations.

Through the Programme for Ecologically Sustainable Construction, the Government lays down the goals and actions by which the principles of sustainable development will be implemented in the construction and repair of buildings and in property maintenance. In addition, the Programme outlines the concept of ecologically sustainable construction, encourages debate and supports the construction and property sectors in developing their operations in line with the principles of sustainable development. In relation to environmental loading, the goal is that the construction and property

sectors will be ready to do their part in responding to the requirements of the Kyoto Protocol, so that the targets can be reached by 2010.

V.3.3.3. WHAT IS ECOLOGICAL CONSTRUCTION?

The principles of sustainable development include securing people's well-being without endangering the environment. According to the Finnish National Commission on sustainable development, there are three practical dimensions to sustainable development: the ecological, municipal and cultural dimensions.

The basic principle of ecologically sustainable development is the preservation of biodiversity and the adaptation of all human activity to the available natural resources and ecological tolerance levels. For the construction and property sectors, this means that, in new construction and the existing building stock, attention must be paid to the consumption of energy and water, waste disposal, indoor air quality, and the durability and life cycle of the building and all its parts. The aim should be to fulfill the operational requirements set for a building by using resources in a way that causes minimal damage to the environment. In ecologically sustainable construction and property maintenance, consumption of energy and raw materials, emissions and waste should be carefully checked.

V.3.3.4. STRATEGIC GOALS

Environmental loading caused by construction and buildings will be substantially reduced

Decision-making connected with the built environment and the design, construction and maintenance of buildings will be based on life-cycle thinking. The building stock is an important resource providing cultural, economic and ecological benefits. The energy economy and eco-efficiency of the existing building stock and of new buildings will be significantly improved. Renewable sources of energy and raw materials will become common. The flexibility of buildings and the multiplicity of their uses will be increased and the durability and ease of maintenance of building components will be improved. Opportunities for taking advantage of the most up-to-date technology will be improved.

The environmental effects caused by construction will be examined as a whole. Over time, the proportion of buildings in the building stock that are ecologically sustainable, will be increased.

Environmental expertise and environmental technology will become nationally competitive factors for the construction industry

The ecological aspect will be incorporated into the economic aims of the construction and property sectors. Property values are affected more and more by buildings' life-cycle costs and expectations of return, and are increasingly dependent on environmental characteristics. Environmental awareness will guide demand in the construction field both at home and abroad.

Energy economy and eco-efficiency in product manufacturing, and in the construction and maintenance of the existing building stock will be improved. Construction technology that conserves and improves the state of the environment will create a favourable image for the construction and property sectors. An ever more important part of the export of equipment, products and materials will be based on eco-efficiency. This will establish the conditions for a profitable business for the future and for new kinds of jobs and exports based on environmental expertise.

The readiness of the construction and property sectors for environmental-based and customer-oriented decision-making will increase

The environmental awareness of property owners, property developers and users of buildings will increase. The demands of owners and residents will require interactive design and customer-oriented implementation. Developers must have the ability to set environmental requirements, designers must have the skill to create buildings that are innovative and that have minimal effect on the environment, and building contractors and the construction industry as a whole must have the know-how to manufacture products and to use those products, methods and services which do not cause harm to the environment. In consumer education and marketing, the aim will be for users to be able to base their choices on the environmental effects of these products, methods and services.

Environmental management in the construction and property sectors requires closer cooperation, expertise in many fields, new kinds of contractual practices and better training. Critical decisions affecting the environment will be made at the design stage, so that its importance is increasingly emphasized. The essential instruments for assessment and verification in product information and decision-making will be developed and put to use on an ever broader scale.

Ecological sustainability will be strengthened in community development

Development of the built environment will rely on approaches that are the most ecologically sustainable and economic in terms of life cycles and the most functional from the social point of view, and that create and conserve cultural values best. Emissions from traffic and the energy consumption in buildings, which are the most significant environmental loadings produced by communities, will be reduced. In siting and constructing new buildings, the existing municipal infrastructure and public transport services will be utilized. Biodiversity in the natural environment and variety in the built environment will be important considerations in community development. The goal for a healthy community structure is the welfare of its people and the vitality of its natural surroundings.

V.3.3.5. ACTION

V.3.3.3.5.1. THE ENVIRONMENTAL ASPECT AS A BASIS FOR DECISION-MAKING

The Government wishes to emphasize that the environmental aspect must be linked to all decision-making and the responsibility for this rests in all quarters. Environmental thinking will become established practice for operations in the construction and property sectors.

The construction and property sectors will incorporate environmental aims into quality requirements and company management systems.

The main idea in sustainable development is that the environmental aspect should be linked to all decision-making. In the construction and property sectors, environmental thinking is being developed into a unifying factor that will improve their productivity and brighten their image. The various parties in the sector will encourage companies to define their own environmental goals and environmental programmes and to make a commitment to use them in construction operations.

The instruments and procedures for design and verification will be developed further in existing projects and will become established practice. Developers will evolve methods for setting environmental requirements and designers will evolve tools for planning buildings that conserve the environment. The construction industry will adopt procedures for continuous improvement of the environmental properties of building products. Contractors, too, will develop methods of building that reduce environmental hazards and take into account environmental loading in maintenance at an earlier stage. The property sector will improve waste management and develop property care, maintenance and cleaning operations in line with sustainable development.

Life-cycle thinking and eco-efficiency. In construction decision-making, life-cycle thinking means examining the whole life cycle of the built environment. Eco-efficiency means production and operational efficiency with as little environmental impact as possible. Applying life-cycle thinking to construction will help to maintain property values and improve efficiency in use. The requirement for eco-efficiency will extend throughout all construction and maintenance. More efficient use of the existing building stock will cut down on the use of resources. Parameters for assessing environmental effects are needed alongside the established parameters and indicators of the financial economy.

Environmental aims and management systems. Ecologically sustainable construction and property maintenance requires the development of management systems. Companies must be able to see the fundamental environmental aspects and set requirements in line with them. The systematics and reference values needed in setting targets will be developed in an environmental cluster programme coordinated by the Ministry of the Environment and the TEKES Environmental Technology in Construction Programme (RYM). With the help of quality and environmental systems, companies can ensure that the goals set are implemented and can demonstrate this to their customers.

V.3.3.3.5.2 PROCEDURES FOR ENVIRONMENTAL IMPACT ASSESSMENT

Procedures for environmental impact assessment of construction and maintenance will be developed for use in the construction and real estate sectors.

The construction and real estate sectors need procedures for predicting and controlling environmental effects that occur throughout the entire life-cycle of buildings. Key tools here are environmental loading of and energy calculations for buildings, service life planning and life-cycle assessment.

As well as the energy economy of a building, environmental loading, too, affects the service life of the building and of its component parts. Service life is also prolonged by flexibility in the use of building and the variety of uses to which it can be put. Consequently, methods for assessing and improving the flexibility in the use of buildings are required. Similarly, easy accessibility and the absence of obstructions to free movement will both prolong the service life of a building and make it easier to change its use. When designing buildings, tools for planning the service life and the flexible use of buildings, and for environmental assessment will be developed. Corresponding tools, such as energy calculations and indoor air classification, are already becoming standard in building design.

The effects of buildings on the environment can be expressed using environmental classification. Developing environmental assessment procedures will also help to increase user interest and thus create the demand for products - and buildings - that affect the environment less.

Life-cycle assessment and environmental assessment procedures for buildings. Life-cycle Assessment (LCA), which is used for investigating the potential environmental effects of a building, a product or an operation throughout its entire life cycle, is best suited to product development or the construction of environmental systems. An ISO standard has been published on the framework of the procedure.

Data on environmental effects at different stages of the life cycle can also be used in assessing buildings. Methods based on checklists and computations are, in fact, already in use and common international assessment methods are being developed. The environmental classification of buildings is a method of publicly verifying the environmental characteristics of buildings and is based on environmental criteria set by the authorities and the construction sector. The purpose of environmental classification is to arrive at a situation where the environmental characteristics of different buildings are mutually comparable.

Service life planning. Taking the service life of buildings and building components into account has so far been rather sporadic in building design. The fact that there has been insufficient information available on the service life of products has slowed the spread of service life planning, nor have there been any procedures for setting life-cycle requirements for buildings. The knowledge base in building design has become broader and systems for updating and transferring the data have improved. Maintenance and instruction manuals developed for property maintenance have also improved service life planning.

V.3.3.3.5.3 BUILDING LEGISLATION

The Ministry of the Environment will introduce the environmental aspect into regulations, instructions and administrative procedures dealing with construction. Eco-efficiency and environmental impact will be taken into account in developing regulations dealing with construction.

Legislation will help create the conditions for a good living environment that is in line with sustainable development. The new Land Use and Building Act incorporates the requirements of ecologically sustainable development. As Finnish environmental legislation evolves and becomes more integrated, there will be more emphasis on the resource economy and overall environmental thinking.

Ecologically sustainable development in the construction and property sectors will not be guided by norms alone, but by voluntary methods in line with international practice. Land use planning and other local authority building guidance will define environmental requirements at the local level. The environmental aspect can be brought out more prominently than at present in building regulations, conditions applied to the release of building sites and planning regulations.

Reform of building legislation. The key aim of the new Land Use and Building Act is to improve the conditions for land use planning and to promote sustainable development, reduce environmental hazards and conserve natural resources. The emphasis in building guidance will be on environmental questions, life-cycle thinking, encouraging renovation and ensuring quality in building. Ecologically sustainable construction and renovation will be promoted by requirements set for construction which provide that a building must be fit for its purpose and also repairable and serviceable, and its use must be flexible. Eco-efficiency and environmental effects must therefore be taken into account in developing these regulations. The requirement for a maintenance manual, currently applicable to State-subsidized housing construction, will be extended to cover all construction and renovation.

V.3.3.3.5.4 LOCAL AUTHORITY MEASURES FOR SUSTAINABLE DEVELOPMENT

[Local authorities will incorporate the aims of ecologically sustainable construction into their programmes of sustainable development measures.

The local authorities are encouraged to specify ecological construction procedures for operations on local authority owned land and for projects and properties developed and managed by local authorities. Principles of ecological land use planning, the release of building sites, development, and property maintenance are important elements to be included in local Agenda 21 programmes, for example.

V.3.3.3.5.5 ENERGY ECONOMY AND HEALTH

Energy efficiency and other forms of eco-efficiency in buildings will be improved and a healthy built environment will be promoted.

Measures for improving energy efficiency will also be directed at the existing building stock. Comfort and indoor air quality in terms of cleanliness and health will be dealt with at the same time.

Construction will be guided towards approaches that increase the use of renewable energy sources.

In reducing environmental loading in the construction and real estate sectors, energy economy has a key role. The energy economy of buildings is guided by legislation, and the reasonably high energy efficiency of the Finnish building stock is also based on fairly strict energy regulations. It has been shown in recent years that the energy consumption of new buildings can be halved using existing technology.

The know-how for improved energy efficiency has been increased by a number of research and technology programmes and development projects, and with the help of energy-efficient equipment. For the construction and property sectors to be internationally competitive in the future, it is important that methods of calculating energy requirements, air changes and heat insulation for buildings are defined with the help of European design standards.

It is not possible, however, to improve the energy efficiency of the building stock very quickly through new building, since this represents only 2% of the total building stock annually. On the other hand, new building is of crucial importance in terms of developing new technology and energy efficient approaches and their introduction into regular use. The effects of the decisions made today on new building will be felt for the next hundred years.

The design, construction and use of buildings will be improved to make their deleterious environmental effects as minimal as possible. The focus will be on factors that reduce the environmental loading of buildings at the design stage, as well as on other factors such as energy economy, long life, reliability, ease of repair, the flexibility of use and the healthiness of buildings, and the environmental properties of products and systems. Additionally, local factors, biodiversity, microclimate and the cultural and social characteristics of the built environment will all be taken into account at the design stage.

Construction will be guided towards approaches that increase the use of renewable energy sources. The construction and property sectors will be encouraged to take advantage of the existing expertise

and technology. Creation of new innovations will be promoted at the same time. New and better tools for monitoring and managing eco-efficiency will be developed.

Energy saving. The 1995 Government resolution on energy saving aimed at a 10-15% reduction in overall energy consumption compared with the computed level in 2010 with no change in energy policy. Consumer habits are of crucial importance in realising this target. Use of energy certification, consumption calculations and property surveys, as well as energy efficiency marking on equipment, are all tools for reducing energy consumption. Energy conservation methods mentioned in EU legislation or developed in international research programmes will also be adopted in Finland. Consumer behaviour is being studied in the LINKKI 2 research programme on decision-making and behaviour in energy saving.

The energy economy of buildings, the use of renewable energy sources and of more efficient equipment and electronics in maintenance have been promoted by two TEKES energy technology programmes: RAKET on energy use in buildings and NEMO 2 on new forms of energy and new technologies.

About a year ago, the EU published a White Paper on promoting the use of renewable energy sources, which set the target of doubling of the proportions of total energy consumption represented by renewable energy sources. During 1998-2010, the EU intends to encourage the introduction of renewable energy sources by speeding up investment and building 100 model communities based entirely on renewable energy. Although the Viikki ecological housing area is to be connected to the district heating network, the utilization of solar energy will also be tested there. Various ministries should cooperate with the construction and property sectors to initiate new model and experimental building schemes, some of which will be funded through the THERMIE programme.

Use of electricity. Distinct reductions have been made in the heating energy requirements of new buildings in Finnish pilot projects, but in these buildings, too, there has been a clear increase in both domestic and non-domestic electricity consumption. Special attention must also be paid in construction and renovation projects to lower electricity consumption, and to electricity-saving design approaches, the maximum use of natural light, the energy efficiency of equipment and building services systems, and the replacement of electricity with renewable forms of energy. Consumer habits will be influenced mainly by disseminating information. Opening up the energy markets to competition has aroused consumer interest in the generation, costs and environmental effects of electricity.

Health. Legislation on building, occupational health and safety, and health protection limit the use of dangerous and harmful building materials and building products, but in order to for the legislation to be effective, product specifications for building products are required. These help the consumer and the specifier of materials and products to avoid dangerous and injurious substances. The classification of internal air quality, construction work and finishing materials also helps to guide design and construction.

Damp and mould problems in buildings have been studied through development projects and other measures by the Ministry of Social Affairs and Health and the Ministry of the Environment. Assessment procedures and renovation methods have been developed for mould problems in buildings, regulations have been overhauled and maintenance manuals have been prepared, and the importance of building maintenance has been underlined. The aim has been to communicate the latest information to officials and the construction and property sectors through briefings and training.

The healthiness of buildings and the built environment will again be promoted by the extensive research and technology programmes that are under way. The internal air quality and health characteristics of buildings are being improved by the TEKES technology programme, The Healthy Building - Construction Technology, Indoor Climate and Quality, which is being implemented jointly by the construction and property sectors, the health sector, and research and industry. The Research Programme on Environment and Health launched by the Academy of Finland will produce data for assessing the links between the environment and people's health, and will be of use in developing methods for promoting environmental health.

V.3.3.3.5.6 ECOEFFICIENT BUILDING MATERIALS, PRODUCTS AND SYSTEMS

The use of eco-efficient building materials, products and systems will be encouraged, as will recycling.

Besides material and energy flows, the eco-efficiency of construction encompasses durability and recyclability. The environmental properties of building products are expressed as environmental statements based on life-cycle assessments. Environmental properties are going to affect the choice of building methods, materials and products to an increasing degree. Special attention must be paid to renewable raw materials resources such as wood. The ecological properties of wood, in addition to its recyclability, are the low energy consumption involved in its production, the ease of harvesting and its ability to bind up carbon dioxide. Using locally grown wood reduces fossil fuel consumption caused by long transport distances.

With the support of technological advances, the conditions will be created for utilizing the by-products of industry and construction waste in a profitable way. The availability and use of recycled products and materials will be increased by improving information and storage systems. Construction sector companies will prevent the formation of construction waste and improve waste management procedures on construction sites in line with the Waste Act and the Government Decision on construction waste. As working methods, logistics and packaging methods improve, the consumption of raw materials and the amount of waste generated will decline. Development projects and staff training in the construction sector have a key role here.

Environmental declarations. The environmental declaration for a building product, issued by the building products industry, include details of the product's environmental loading, conditions for use and recyclability. Data on environmental properties will also be included in product specifications, building product information and the environmental declaration. The aim is a voluntary joint Nordic practice for environment declaration. Environmental labelling for building products can also be used alongside the environmental declaration.

V.3.3.3.5.7 WATER RESOURCES

Raw water reserves will be protected and water supply and wastewater management will be developed.

Water-saving technology will be promoted along with the use of water-saving fixtures and fittings.

The Council of State decision-in-principle on water pollution control targets up to 2005 requires that bodies of water should remain fit for human use and environmentally sound, that biodiversity should be preserved and that they should be kept suitable and wholesome for water supply purposes. Efforts will continue to prevent and reduce eutrophication. The quality and quantity of ground waters will be maintained at least at their present levels.

As far as construction is concerned, sources of raw water will be protected by avoiding construction and the extraction of sand and gravel in important groundwater areas and by improving treatment methods for storm water and wastewater. Several studies have shown that diffuse source pollution is currently the major cause of eutrophication. It can also be a risk to raw water resources in places. Consequently, water supply and sewerage in sparsely populated areas need to be improved and action will be taken to promote the supply of potable water for domestic consumption and to reduce waste and wastewater loads so they do not cause environmental pollution.

Although the overall situation regarding raw water reserves in Finland is good, there are grounds for reducing water consumption. Lower water consumption means savings in the amounts of energy and chemicals used in raw water and wastewater treatment and smaller investments in plant.

Reducing consumption of warm water saves energy. Technology and fittings that save water have been adopted extensively in Finland, along with water meters and other equipment. These are important export products and they offer good prospects for increasing sales.

V.3.3.3.5.8 PUBLIC SECTOR BUILDING PROJECTS

Ministries are setting targets that promote sustainable development in the offices and departments under them dealing with construction and property maintenance. Public sector building projects must set a good example.

[The adoption of recommendations on eco-efficiency in public sector projects will be encouraged.

Public sector building must set a good example to other developers and property owners. Ministries will set objectives promoting sustainable development in the targets of government agencies dealing with construction, building guidance and property maintenance.

The relevant government agencies will prepare ecological development and property maintenance programmes and procedures according to the State Real Estate Board model. The principles followed in public funding will be amended to make the environmental impact of buildings throughout their life-cycles one of the principal grounds for project funding and other decision-making. The Ministry of Trade and Industry will prepare recommendations on energy efficiency in public sector projects based on the Council of State decision on energy saving.

Local authorities will be encouraged to develop procedures that promote ecological development and property maintenance. In competitive tendering, special attention will be paid to the environmental characteristics of products and services and they will be specified as the basis for selection criteria. This approach will extend to all fittings and materials needed in construction.

V.3.3.3.5.9 ECOLOGICAL TARGETS FOR HOUSING CONSTRUCTION

The Ministry of the Environment is drawing up ecologically sustainable construction targets for State-subsidized housing.

The regulations for State-subsidized housing construction that came into force at the beginning of September 1998 require construction projects to be examined from the point of view of life-cycle economy. The goal in both new construction and renovation is to achieve long life, economical repairs and a high degree of flexibility in the use of buildings. The emphasis will be shifted from minimizing the initial project cost of housing to examining life-cycle costs and the effects on the environment and health.

It is a basic principle of housing construction that properties are looked after and properly maintained. Systematic property maintenance and upkeep will be a precondition for State subsidies. In assessing the necessity for and economics of construction and renovation, attention will be given to a proposed building's functional, technical and economic suitability, long life, flexibility and multiplicity of use, and energy economy. In selection of heating methods, the basic principle will be to minimize environmental loading, because both heating and energy generation methods have a fundamental effect on environmental loading.

The Ministry of the Environment will set targets for the Housing Fund of Finland that will promote the ecological sustainability of housing construction, and will draw up criteria for ecologically sustainable construction in State-subsidized housing construction.

V.3.3.3.5.10 RESEARCH, DEVELOPMENT AND EXPERIMENTAL BUILDING

Research and development work and experimental building in the field of ecologically sustainable construction and maintenance will be encouraged. Research and development programmes in the construction and property sectors will incorporate the aims of sustainable development.

Investigations will be carried out into ways of preparing new solutions for possible risks connected with experimental building.

Research and development projects improve the efficiency and competitiveness of the construction sector. The construction sector has, for years, been actively carrying out research and development work on environmental questions, with links to international development work. In order to implement the aims of the Programme, completed development work will be put into practice, and new research will be initiated and results published. In addition, tools for planning and decision-making will be developed further and key indicators for monitoring will be specified.

The aims of sustainable development will be incorporated into all new research and development projects in the construction and property sectors and into technology programmes. National research and development programmes funded by ministries, TEKES and the Academy of Finland will be increasingly implemented jointly by businesses, research institutes, universities, and other relevant sectoral educational establishments.

The goal is for Finnish environmental expertise to rise to a level that will give it a competitive edge in export markets, too. In addition, Finland can also stress the environment-saving aspect in preparatory work on and implementation of EU development and support programmes. Before being put to wider use, new solutions and methods will be developed, adapted and tested with the help of model and experimental building schemes. The aim here is to create a system where the risks and possible failures inherent in the latest procedures can be minimized. Practical experimental building can also be used to develop administrative and other guidance procedures and to evolve and adapt new methods of design and implementation. The results of experimental building will be published and distributed to a greater extent.

Research and development work. Ecologically sustainable construction has been more actively promoted through a number of research and development programmes and by model and experimental building since 1994. The TEKES Environmental Technology in Construction Programme (RYM) has furthered the development of internationally competitive products, and has helped to create methods for life-cycle assessment and improve design and production methods.

The Environmental Cluster Programme, coordinated by the Ministry of the Environment, supports cooperation between business and industry and the authorities to promote sustainable development and environmental entrepreneurism. The Biodiversity Programme launched by the Academy of Finland is advancing knowledge on the diversity of nature and how it can be preserved through the wise use of natural resources. The TEKES technology programme on developing the construction process (ProBuild) is furthering customer orientation, improvements in the acquisition of services in construction and the promotion of high quality buildings and flexibility in the use of buildings. The Ministry of Agriculture and Forestry has been supporting research and development and experimental building linked to the use of wood in construction and also the use of vegetable fibre as an insulation material.

Finland's most important experimental ecological building scheme is the ecological housing area being built at Viikki in Helsinki. In conjunction with experimental construction, the following have also been pursued: sustainable land use planning, advanced conditions for the release of building plots, and ecological criteria for buildings that also act as guidance for building design and conditions for building permits. On the basis of the experience gained in Viikki, decisions will be made on broader application of the procedures to other areas owned by the City of Helsinki. Approaches in line with sustainable development will be supported by TEKES research and product development grants to property owners.

V.3.3.3.5.11 VOLUNTARY AGREEMENTS

Voluntary agreements to reduce environmental loading in the construction and property sectors will be encouraged.

The construction and property sectors will be encouraged to use the environmental aspects of schemes as the main criteria in the distribution of annual prizes and other awards in the construction field.

Mutual cooperation between different interests in the construction and property sectors will be increased and advanced by voluntary agreements promoting environmental affairs. A good example

of these are the energy-saving agreements that the Government has made with industry, the energy generation and distribution side, the oil-heating sector, local authorities and government property units.

In order to promote sustainable development and achieve the common aims of the construction and property sectors, the main selection criteria to be used for prizes and awards in the construction sector during 1999 and 2000 will have environmental conditions.

ProGresS. Important cooperation in terms of the commitment of the construction and property sectors has already been launched in the form of the ProGresS project (Profitable Green Development in Real Estate Business). Under the project, applies the know-how gained from research and development projects will be applied to companies and actual buildings. The aim is to bring in environmental expertise as a part of business operations through collaboration in the construction and property sectors. Environmental expertise is also profitable for business in the long term. The project, which lasts up to the end of 2001, is being coordinated by RAKLI, the Finnish Association of Building Owners and Construction Clients.

V.3.3.3.5.12 TRAINING AND INFORMATION

Training in and dissemination of information on ecologically sustainable construction will be increased.

The principles of sustainable development will be incorporated into vocational training in the construction and property sectors.

Training and dissemination of information will be used to improve knowledge about the environmental effects of building and about construction, according to the principles of sustainable development, in the administration of construction, amongst land use planning and building control officials and in the construction and property sectors. The principles of sustainable development will be incorporated into the curricula of vocational schools in the construction and property sectors, and supplementary training to enhance environmental expertise will be increased.

Information can help guide consumer choices and help consumers to set environmental requirements for products and services. Energy and water consumption and refuse quantities are particularly dependent on the behaviour of consumers. Consumers are also affected by company product information and marketing. The development of environmental declarations and environmental labelling is based on consumer demand for more information, on the one hand, and on the desire of firms to market their environmental expertise, on the other.

Because a real change in the approach of the construction and property sectors requires mainly commitment, environmental requirements and education will be integrated into the day-to-day activities of different sectors and incorporated into cooperation networks and subcontractor chains in the same way as quality thinking. Environmental knowledge based on research and information about environmental impacts will be offered on a broad front to both the construction sector and to consumers.

V.3.3.3.6. IMPLEMENTATION OF THE PROGRAMME

This programme will be taken into account by ministries and other government agencies in developing legislation, administrative procedures and action programmes that are connected with or have an effect on land use, construction or upkeep of the built environment. The ministries will support ecologically sustainable construction and maintenance schemes and will increase cooperation between the administration and actors in the sector. It is important for the implementation of the programme that local authorities, too, promote the aims and actions of the programme.

The Government takes the view that the construction and property sectors should be responsible for implementing the aims and actions of the programme within their own area of operations. Companies and organizations will launch their own projects that support the programme.

Training and information have a key role in the implementation of the programme. Information campaigns aimed at the administration, consumers and the construction sector will be used to pass on knowledge gained from research and experience and to encourage the construction and property sectors to actively promote ecologically sustainable development.

V.3.3.3.7. MONITORING IMPLEMENTATION OF THE PROGRAMME AIMS

The Finnish Government Programme for Ecologically Sustainable Construction and the Finnish Government Programme for Sustainable Development will be monitored jointly. The National Commission on Sustainable Development will monitor the situation in sustainable development in Finland and the implementation of the different actors' programmes. On the basis of the reports it receives, the Commission will prepare an overall assessment of the implementation of the various programmes for the 10-year follow-up to the UN Conference on Environment and Development in 2002.

Indicators and predefined variables will be used as tools in monitoring and assessment. The UN Commission on Sustainable Development and the Finnish National Commission on Sustainable Development have defined the indicators by which the effects of actions taken will be measured. These indicators will be used in monitoring the Government Programme on Ecologically Sustainable Construction and, for instance, the following aspects will be investigated: changes in energy consumption of the building stock, use of renewable forms of energy, changes in water consumption, the market share of eco-efficient products and solutions, and instruments such as environmental management systems and the use of environment declarations for building products.

The authorities and the representatives of the construction and property sectors who have prepared the Government Programme on Ecologically Sustainable Construction and are committed to it, will submit a progress report to the Finnish National Commission on Sustainable Development covering the aims and actions of the programme and the resulting effects in their own fields. The impact of the programme on the environmental loading caused by the construction and maintenance of buildings will be examined at the same time. The report will be ready by summer 2001 and will include an assessment of the need for further action and for adjustments to the programme.

V.3.3.3.8. EFFECTS OF THE PROGRAMME

The programme will not increase government expenditure, but it may require some redeployment of resources. Those investing in buildings will need incentives and support to ensure that the new innovations and the results of research and product development will penetrate public awareness and will be adopted in everyday life. In the long term, as the construction and property sectors become more efficient and more competitive internationally, the approaches of ecologically sustainable construction will reduce the costs to society.

Implementing the programme will reduce the harmful environmental loading caused by construction and property maintenance. Improving the quality of the environment will lead to an increase in people's well-being.

V.3.4. SWEDEN, Ministry of Environment – Sustainable Construction

The following summary describes activities in progress at different levels: at the broad policy level, the local level, company level and product level.

V.3.4.1. The overall level

1. The Swedish Government's overriding goal for environmental effort is that our legacy to the next generation will be a society in which the major environmental problems in Sweden have been solved. It is also said that Sweden should try to be one of the countries that lead the way in the transition to an ecologically sustainable society in the international arena.

2. In year 1999 the Riksdag (Swedish Parliament) adopted 15 national environmental objectives. These objectives demonstrate what environmental situation should be achieved in the perspective of one generation. The 15 goals are:

1. Clean air,
2. High-quality groundwater,
3. Sustainable lakes and watercourses,
4. Flourishing wetlands,
5. A balanced marine environment, sustainable coastal areas and archipelagos,
6. No eutrophication,
7. Natural acidification only,
8. Sustainable forests,
9. A varied agricultural landscape,
10. A magnificent mountain landscape,
11. A good urban environment,
12. A non-toxic environment,
13. A safe radiation environment,
14. A protective ozone layer,
15. Limited influence on climate.

More information could be found on internet. www.environ.se (English), www.miljo.regeringen.se (English), www.smn.environ.se (English), www.virtualsweden.net (English), www.eu2001.se (English and French).

3. The Government is responsible for establishing sub-goals if such prove necessary in order to achieve the environmental objectives. These subordinate goals will constitute point of departure for a more detailed definition of goals and strategies in different sectors of society at different levels.

4. Progress towards the achievement of the environmental objectives will be continuously monitored and evaluated. A parliamentary committee appointed by the Government presented a consultation-paper (approx. 2000 pages) last summer. The paper has been circulated to approx. 150 organizations. The Government has recently presented a proposal with more precise sub-goals to the Swedish Parliament.

5. The Environmental Code and the national environmental objectives lay the groundwork for a decentralisation of environmental endeavours. This boost opportunities and interest, above all in the business and industrial community, to initiate measures promoting a better environment. The objectives themselves provide guidelines for application of the Code.

6. The most relevant national environmental objective in this context is the one concerning a good urban environment, which is expressed as follows: *Urban areas must provide a good, healthy living environment and contribute to improvement of regional and global environment. Natural and cultural assets must be protected and developed. Building and amenities must be located and designed in accordance with sound environmental principles and in such a way as to promote prudent long- term*

management of land, water, energy and other natural resources. Buildings and the built environment are affected by many of the other 14 environmental objectives.

7. The Government´s proposal (mentioned in para 4) to the Swedish Parliament submits 7 sub-goals to the national environmental objective A good urban environment.

Basis for planning

Sub-goal 1. No later than 2010 all physical planning and sustainable development shall be based on programmes and strategies for

– how to accomplish a varied range of housing, workplaces, service and culture so that the use of cars can be reduced and the conditions improved for transports that are environmentally adapted and resource efficient;
– how heritage buildings and aesthetical values are to be preserved and developed;
– how green areas and water zones in and near population centres are to be safeguarded and developed, and the proportion of hardened (watertight) ground surfaces is not increased;
– how the use of energy is made more efficient, how renewable energy sources are taken care of and how to promote expansion of production facilities for district heating, solar energy, non-fossil fuels and wind power.

Heritage buildings

Sub-goal 2. No later than 2010 heritage buildings of cultural and historical importance are to be identified and a programme shall be in place for their preservation. At the same time, a minimum of 25 % of the heritage buildings shall be protected on a long term basis.

Noise

Sub-goal 3. The number of people subjected to disturbing traffic noise that exceeds the guidelines the (Swedish) Parliament has adopted concerning noise levels in housing is reduced by 5 % in 2010 compared to 1998.

Extraction of gravel

Sub-goal 4. By 2010 the extraction of gravel in the country shall be maximum 12 million tonnes per year and the proportion of re-used material constitute a minimum of 15 % of the use of ballast.

Waste

Sub-goal 5. The quantity of deposited waste, excluding waste from mining, shall decrease by a minimum of 50 % by 2005 compared to levels of 1994 while the total quantity of generated waste is not increased.

Sub-goal 6. All waste depositories have by 2008 reached a uniform standard and have met high environmental demands in accordance with the EU Waste Disposal Directives.

Use of energy etc in buildings

Sub-goal 7. The environmental impact from use of energy in housing and facilities decreases and is lower 2010 compared to 1995. This will among other things be accomplished by making the total use of energy more efficient, while aiming to decrease it.

8. Indoor air and health aspects
Today about 40 pro cent of school-children in Sweden have or have had asthma, eczema etc. when they begin primary-school. Some examples of factors that effect our health are radon, smoke from cigarettes, formaldehyde, house-dust-mites and “damp buildings” which often are buildings that are not ventilated enough. The contents of the indoor air must be important as we stay inside buildings during 90 percent of our life-time. Substantial efforts have been made over the years to address the Environment factors that have an adverse impact on human health. The connection between the

indoor environment and sickness such as allergic reactions is not fully understood. An efficient ventilation system, which is appropriate to the activities carried on in the building, is essential for a good indoor climate. Due to health reasons compulsory ventilation checks were introduced in Sweden in year 1992.

V.3.4.2. Local level

9. The Swedish Parliament has approved the allocation of a total of SEK 6500million for investments at the local level. The purpose of the Government's support to local investment programmes is to speed up Sweden's transition to a sustainable society. The objectives of this supremely important undertaking include reducing environmental impact, promoting more efficient use of energy and other resources, etc. The local perspective is emphasised. It is at the local level that most of the knowledge and expertise about environmental problems and conditions for sustainable development are to be found.

10. Grants to local investment programmes amounting to about SEK 5000 million have been approved so far. The investment programmes are estimated:
- to create jobs
- to reduce the annual energy-consumption by 2.1TWh
- to replace fossil fuels and electricity corresponding to 1TWh with renewable energy sources, primarily bio fuels
- to reduce CO2 emission by 1,6 million tons per year. This corresponds to half the total amount of carbon dioxide emitted by all heavy goods vehicles in Sweden. (To affect this reduction of CO2 many local authorities are extending their district heating networks and implementing a variety of measures aimed at reducing road traffic, such as public information campaigns and the promotion of public transport and cycling.)

11. The European Housing Fair, Bo01, which is to be held in Malmö in southern Sweden in the year 2001, will provide a unique opportunity to demonstrate ideas and technical solutions for ecologically sustainable development. The new housing area will have a number of special features, for example:

1. Ecological cutting-edge technology, in which energy will be produced locally with the held of renewable energy sources. (This project is supported by the EU-commission).
2. Very stringent environmental requirements will be applied to the building process and communications in the area (A special quality programme has been designed for this).
3. "Intelligent homes", which means that each household will have access to the most advanced technology that the information society has to offer. This technology will be harnessed to monitor environmental development in the area.
4. The European Village, an area of single-family houses where 29 European countries have been invited to erect a house and exhibit their technical solutions from different aspects.

More information is to be found on Internet (www.bo01.com, www.europeanvillage.org)

12. In a new housing area in Stockholm or more a new part of the town (Hammarby Sjöstad) there is a focus on efficient use of resources and environment. Energy efficiency and new technical solutions will be used. (www.hammarbysjöstad.stockholm.se)

V.3.4.3. Company level

13. In Sweden the client is responsible for ensuring that construction is carried out in accordance with current regulations. The client is also responsible for maintaining the buildings and constructions so they fulfil the essential requirements during a reasonable period of service life. The client's ability to formulate specifications and implement tender procedures is crucial to the development of the construction and management sector.

14. Efforts to introduce sustainable construction and efficient use of resources require the ability to formulate specifications for construction materials and constructions on the basis of criteria such as

durability and life - cycle principles. It is also essential to create conditions that are conduce to greater reuse of construction materials and equipment. Important questions in this context are for example; how can clients obtain reliable data that enable them to formulate the various requirements that combine low life - cycle cost and efficient use of resources and the effect of materials on indoor air, environment and the environment for the employees.

A basic prerequisite for the efficient use of resources in the construction industry is that the sector prepares "a list of methods" for quality assurance that covers all levels of construction and management from individual standardised construction products, to individual participant's professional skills (by means of authorisation/ licensing showing that the holder possesses both theoretical training and practical experience verified by documentation of project). It is the client who must formulate the requirements with regard to quality assurance. (Swedish studies on the cost of defects in the construction industry show/estimate that altogether the costs of defects in construction projects significantly exceed 10 percent of production costs). The Government commissioned in year 1999 to the public clients and managers to cooperate to strengthen the clients roles and competence and start a process of creating a Quality Council among themselves and also widen it to the private sector. A report has to be presented to the Government in June this year.

15. The National Board of Housing, Building and Planning is conducting a pilot project to find out which factors should be included in a declaration of a buildings. The purpose is to get information concerning safety in use, access for disabled people, energy efficiency, products that could have impact on indoor air and health (for instance radon) and environment further fire security etc.

16. Subsidies for ecological sustainability in housing construction.
To increase construction of blocks of flats (apartment buildings), the Swedish government has decide to subsidize projects with an ecological sustainable profile and with low building costs compared to other buildings in the area. The subsidy is to compensate the extra costs for investments to support ecological sustainability for new, rebuilt or renovated buildings.

The subsidy is for measures that will decrease the impact on the environment.
Measures could for example:

- decrease or make more effective the use of energy and other natural resources
- increase the possibility to reuse and recycle
- decrease the total waste
- decrease the total of waste water

The maximum grant is SEK 2000 per sqr meter and maximum SEK 70 000 per apartment

17. The Swedish construction sector has voluntarily undertaken to reduce the amount of construction waste by one half within a specified period of time.

18. A delegation has two years ago been appointed by the Government to promote the ecological aspects of public procurement. For further information www.sustainable-sweden.gov.se (English)

V.3.4.4. Product level

19. The Swedish construction industry has compiled a list of trade descriptions based on environmental criteria.

V.3.5. IRELAND, Department of the Environment and Local Government– Promoting Environmentally Sustainable Construction

V.3.5.1. National Climate Change Strategy

- Published by the Minister for the Environment and Local Government in November 2000.
- **Minister's Press Statement "Climate Change-We must Act Now**"
- **Chapter 6** of Strategy deals with "Built Environment and Residential Sector"

Measures proposed include:

- **National Spatial Planning Strategy to 2020-**indicative Policy Documents to be published, for public comment, by end June 2001. Definitive policy proposals by end 2001. Action to counter suburban sprawl and associated private car transport/congestion/ long commuting periods. About 35% of housing output (90% in rural areas) comprises "one off" detached private houses, many of which are served by single sewage disposal systems
- **Residential Planning Guidelines (September 2000)-**encouraging higher densities.
- **More Energy Efficient and Better Insulated New Buildings;** Minister published preliminary details of proposals to amend **Part L of the national Building Regulations** for new dwellings in November 2000 . Definitive proposals to be published by end July 2001, to be implemented, in single stage, from 2 mid-2002. Part L proposals for non-residential new buildings to be published in 2002.
- **improved Energy Efficiency from Existing Buildings, including Housing.**
- **improved Energy Efficiency of domestic and other Energy Using Appliances.**
- **changing Fuel Mix to greater use of less CO2 intensive fuels and renewable energy sources.**

V. 3.5.2. Proposed Financial Incentives-New Houses

- **First Timer Buyer Grant for New Houses (3810 Euro);** to be re-structured by 2002 to favour new dwellings exceeding energy performance standard in Part l of Building Regulations; and other sustainable building elements e.g. dual flush toilets, solar heating panels etc.

- **Proposed Support Scheme for Demonstration Low Energy Housing Projects-** details to be developed by DOE/LG, in partnership with the Irish Energy Centre (IEC)**.**

V. 3.5.3. Present Financial Incentives – Existing Houses

- **Essential Repairs Grants (means-tested) for older houses.**

- **Special Housing Aid for the Elderly.**

- **Remedial Works Scheme for Local Authority Housing / Estates.**

- **Works eligible for above financial incentives may include energy saving measures (repair or replacement of doors, windows, roofs etc; and insulation of attic / hot water tank etc.)**

V. 3.5.4. Energy Efficient Rating

- **New Housing:** voluntary energy rating system introduced via technical guidance on national Building Regulations 1997. IEC arranged for UCD/ERG to develop energy rating software package for designers and builders- available free of charge.

- **Existing Housing;** vendor to be required to produce Energy Efficiency Certificate, to be developed by the IEC, to buyer. Legislative measures and operative date yet to be determined.

- **Commercial Buildings-** proposed mandatory Energy Rating System, with possible adjustment of tax incentives to reduce energy consumption from 2003.

- **State Buildings**- to be benchmarked against best international practice by 2002 and to achieve energy saving by 2003. Scheme of financial support, launched on 12 June, 2001, to provide for early assessment of technical and economic feasibility of energy efficient design and technology solutions in new public sector building and refurbishment projects

V. 3.5.5. Annual Sustainable Building Award

- Introduced by Minister for Environment in 1999, as part of annual "Construction Excellence" awards.

- **Award Criteria for 2001-** available from the DOE/LG**.**

V.3.5.6. Lifetime Adaptable Housing

- **Part M of National Building Regulations 2000** requires new housing commencing on or after 1 January 2001 to be visitable by people with disabilities (level access, door wide enough for wheelchair, toilet at entry level etc.). Improved access will benefit all citizens, not jut the disabled.

- Significant **first step** towards achieving **Lifetime Adaptable Housing.**

V. 3.5.7. Re-use/Recycling of Construction and Demolition (C&D) Waste

- **Policy Statement Changing Our Ways" (1998)-**set following re-use/ recycling targets for construction sector, the biggest single source, by weight, of landfill waste:
    - **2003- reuse/recycle 50% of C&D waste.**
    - **2013-re-use/re-cycle 85% of C&D waste.**

- **Forum for the Construction Industry (FCI)**- broadly representative of all parties to construction process, including private/public sector clients.

- **FCI Task Force B4-** deals exclusively with C&D waste.

- **(Draft) Final Report of FCI/TF B4 (May 2001)- "Development and Implementation of a Voluntary Construction Industry Programme to meet the Government's objectives for the recovery of Construction and Demolition (C&D) Waste"**

- **National Construction & Demolition Waste Council (NCDWC)** proposed to finalise and implement Voluntary Plan. Running expenses of Council to be funded by the industry. Research projects may attract State co-funding. [8080-mcc]