

# **EUROPEAN RTD ON CONSTRUCTION 1990...2004**



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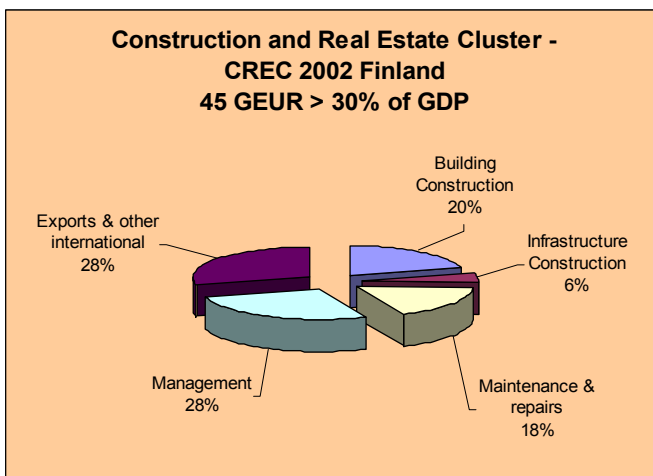
## Preface

This report is to provide the reader with State-of-the-Art of the European Research and Technological Development - RTD on construction-related subjects. Accordingly, this document presents summaries of the related studies and activities in general and actions performed by the undersigned in particular. This report covers a 15-year period up to January 2004.

In advanced European vocabulary "construction" is considered to cover the entire value chain of develop/own, design, manufacture, construct, recycle a building, infrastructure or other constructed assets. This definition is principally considered in this report.

Today in Finland and elsewhere, however, a new expression the Construction and Real Estate Cluster - CREC has been taken to use to cover all activities directly related to construction and real estate (buildings, infrastructure and other facilities = 60-70% of the national wealth). Compared to the above, CREC covers the whole life of a building, hence additional activities concern running the building, which more often is done by facilities management. According to ISO 15686 "*Buildings and constructed assets – Service life planning*", running a facility covers the following activities: Operating, Maintenance, Repairs, Refurbishment, Disposal (and Residual value).

A reason to this approach is the fact that major contractors are moving from plain construction towards taking care of the building/facility for an extended period or its whole life cycle. Also public-private partnership projects (BOOT, PFI; toll roads & bridges, schools, prisons etc) require this approach. This is also a self-evident approach to investors/developers. And any sustainable construction consideration requires CREC!



*Construction and Real Estate Cluster - CREC, year 2002 Finland.*

*Source: VTT, a leading construction/CREC research centre in Europe.*

The above chart shows that while in Finland construction represents 10% of GDP (or 12% if repairs & refurbishment are counted in), CREC represents over 30% of the same GDP. Accordingly, in the EU construction represents 11% of the total GDP, and CREC nearly 30% of the same GDP!

In this report, in the chapters covering the EU's 6<sup>th</sup> Framework Programme for Research and Technological Development – EU6RTD, CREC is considered.

Some parts of this document refer to Finland trying to give the reader a real life picture of what's happening, particularly today.

**Olavi TUPAMÄKI**

## Contents

This is an active table of contents with internal hyperlinks.

Executive Summary .....	5
1 EU's R&D input at low levels.....	7
2 Construction RTD input at very low levels .....	9
3 Period 1990-1994 the EU's 3 <sup>rd</sup> Framework Programme for Research and Technological Development – EU3RTD .....	10
4 Period 1994-1998 the EU's 4 <sup>th</sup> Framework Programme for Research and Technological Development – EU4RTD .....	11
5 Period 1998-2002 the EU's 5 <sup>th</sup> Framework Programme for Research and Technological Development – EU5RTD .....	15
6 Period 2002-2006 the EU's 6 <sup>th</sup> Framework Programme for Research and Technological Development – EU6RTD .....	18
7 Very bad first results .....	23
8 Recommendations for CREC Action.....	25

Total number of pages = 26  
(+ separate appendices 173, not attached to this Internet document)

## Executive Summary

### Objective

To study the position of the construction industries, later the Construction and real Estate Cluster – CREC, in the European Research and Technological Development & Innovation and Demonstration – RTD&ID area (or European Research Area – ERA). The report covers the principal development and activities for the past 15 years up to January 2004. Hundreds of projects are briefed, and all recent development duly covered to help to concentrate on necessary action henceforward.

### Findings

- European RTD input in general is low (EU - 1.9% of GDP) compared to our principal competitors Japan (3.0%) and the USA (2.7%).
- The objective to increase by 2010 the RTD input of the enlarged European Union (EU28) to 3.0% of Gross Domestic Product – GDP, seems impossible to achieve.
- Within CREC, RTD input is very low compared to other industries; usually <1% or even <0.1% of their turnover. Only some 3% of the EU framework programmes' funding goes for the CREC research.

While going through the EU's Framework Programmes for Research and Technological Development – EU RTD, the following development was discovered:

- For early 1990s under EU3RTD, RTD was mainly basic research for materials development.
- At mid 1990s under EU4RTD, the European Commission started to understand the volume, importance and needs of CREC, and more favourable environment was available for construction RTD.
- Towards the end of 1990s under EU5RTD this situation even became more evident, and hundreds of different projects were approved for funding in all the necessary areas of CREC.
- Today early 2004 under EU6RTD, large 10-100 MEUR integrated projects (IP) and networks of excellence (NoE) are expected. For CREC, as well as for many other industries, this is an opportunity, yet more a challenge, which might not be achieved.
- The first results look disastrous; practically all proposals coming from CREC were left without funding.
- The second call in NMP opened 13 Dec 2003, and will close mainly 02 Mar 2004. And there are now new opportunities for CREC, particularly area **3.4.4.1 Human-friendly, safe and efficient construction, fully open for CREC IPs!** Also, specific research activities for SMEs, CRAFT and collective research, are wide open for CREC proposals.

### Recommendations for CREC Action

#### 1 CREC organisations, directly and via their national and European associations, should proactively:

- Generally increase their visibility and improve their image
- More dialogue, promotion and lobbying towards the European Commission (EC), European Parliament (EP) and Council of Ministers (CM) and their components
- Contribute to RTD strategies: to increase RTD input total 1.9 ⇒ 3.0% of GDP (2001: SE 4.3%, FI 3.5%, JP 3.0%, US 2.7%), and CREC RTD input in particular
- Specifically influence and contribute to the work programmes of the forthcoming calls and the next framework programme EU7RTD for 2006...2010

- Do their best to establish for CREC at least one Technology Platform as per the COM(2003) 226 final/2 "Investing in research: an action plan for Europe"; here ECCREDI's proposal "*B4E – Building for a European Future*" is a reasonably good start
- Study, influence and lobby to advance the CREC interests in "European Growth Initiative"; although it already offers good opportunities for construction work, it also offers opportunities for CREC-related RTD&ID
- Prepare a guide for CREC on how to successfully participate in framework programmes: all specific programmes to be covered, updated annually (online)
- Actively participate in different European (EU6RTD, EUREKA, COST) and global (IMS) RTD frameworks and programmes to improve their competitiveness (and to get their fair share of public funding)
- Analyse and provide information on how many CREC proposals / how many approved and their characteristics / why not approved; all programmes
- Be more active at national levels: spread information, promote RTD&ID (press etc), create cooperation between national and European RTD&ID, and activate CREC companies.

## 2 CREC should have more authority in:

- Drawing-up an inventory of RTD&ID needs
- The project selection processes (evaluators, EC officers...)
- The follow-up of the projects (reviewers, EC officers...)
- Monitoring and reporting the effects generated by the project results on industry, citizens and society.

To achieve the said objectives, a suitable organisation comprising research, industry and other stakeholders within CREC should be vested with the said authority by the EC (outsourcing/externalisation):

- Probably a legal entity (EEIG, company, association) under a long-term contract with the EC
- Inventory, selection, follow-up, exploitation
- Project funding; or the EC
- Closely monitored by the EC
- This might not be easy for several juridical, political, red tape and not-invented-here reasons.

## Finally

A brand new, comprehensive book **European RTD 2004 – Guide for the Construction and Real Estate Cluster – CREC** ( ISBN 951-97676-8-1, 2004, 94 p), is now available in Villa Real's Online Bookshop at [www.villareal.fi](http://www.villareal.fi).

## 1 EU's R&D input at low levels

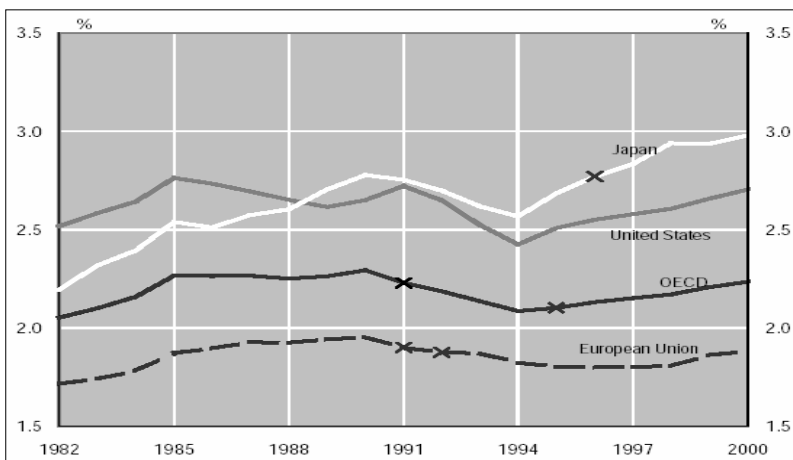
In the following I repeat the results of my study about the possibilities to increase the EU R&D input to 3% of GDP by 2010. This document was sent 10 Dec 2002 to Commissioner Philippe BUSQUIN.

Fresh data and information received thereafter, such as

- *Towards a European Research Area - Key Figures 2002,*
- *Third European Report on Science & Technology Indicators 2003,*
- *Investing in research: an action plan for Europe,* and
- *Towards a European Research Area - Key Figures 2003-2004*

only confirm what I have said.

**In accordance with** the agreement of the Barcelona European Council in March 2002, Commissioner Philippe BUSQUIN's issued a communication document *More research for Europe - Towards 3% of GDP (Brussels, 11.9.2002 COM(2002) 499 final)*. There are two principal objectives set: by 2010 to raise the enlarged EU R&D input to 3.0% of GDP and to get 2/3 of this funded by business (industry). In the document, for the three industrialised competitors, comparable figures are given as follows: Japan 3.0%, USA 2.7% and EU(15) 1.9% of GDP. It also says that the gap is widening, since 1994 as proven by following chart. It also shows that EU's percentage has been 1.8-2.0% for the past ten years, no growth at all but decline, actually.

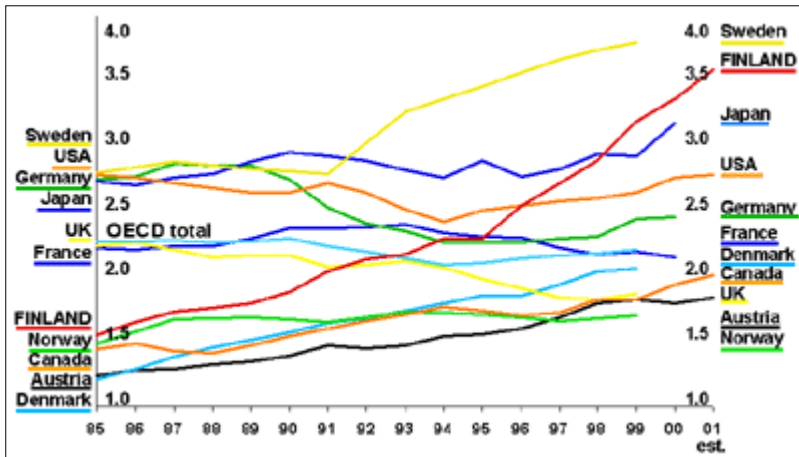


R&D Intensity (GERD/GDP) for the EU, United States, Japan and the OECD countries total; 1982...2000

Source OECD, May 2002

**Two small member** states Sweden and Finland have already achieved the 3% objective. Let's take a closer look at Finland, which successfully carried through a dramatic change from low R&D input to the #2 position in the world.

**Last year 2001 Finland** used 3.5% of GDP for R&D, out of which 72% came from industry (also this is above the EU target of 67% aforesaid). If we take a look at history, we can see that it took 15 years in Finland to rise from 1.5% to 3.0% as you can see in the chart below.



R&D Intensity (GERD/GDP) for the selected Nordic and EU countries, United States and Japan; 1985...2000/01

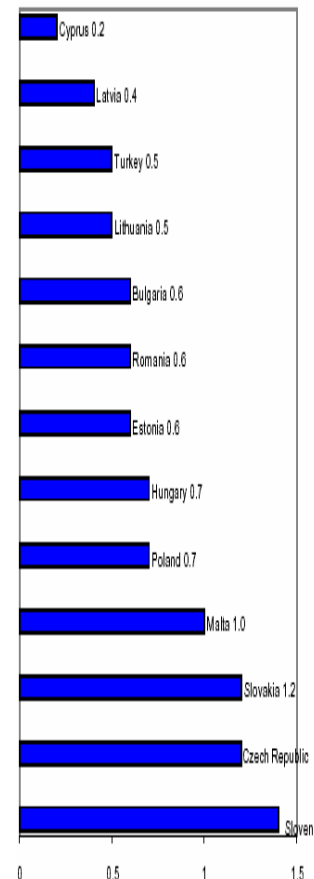
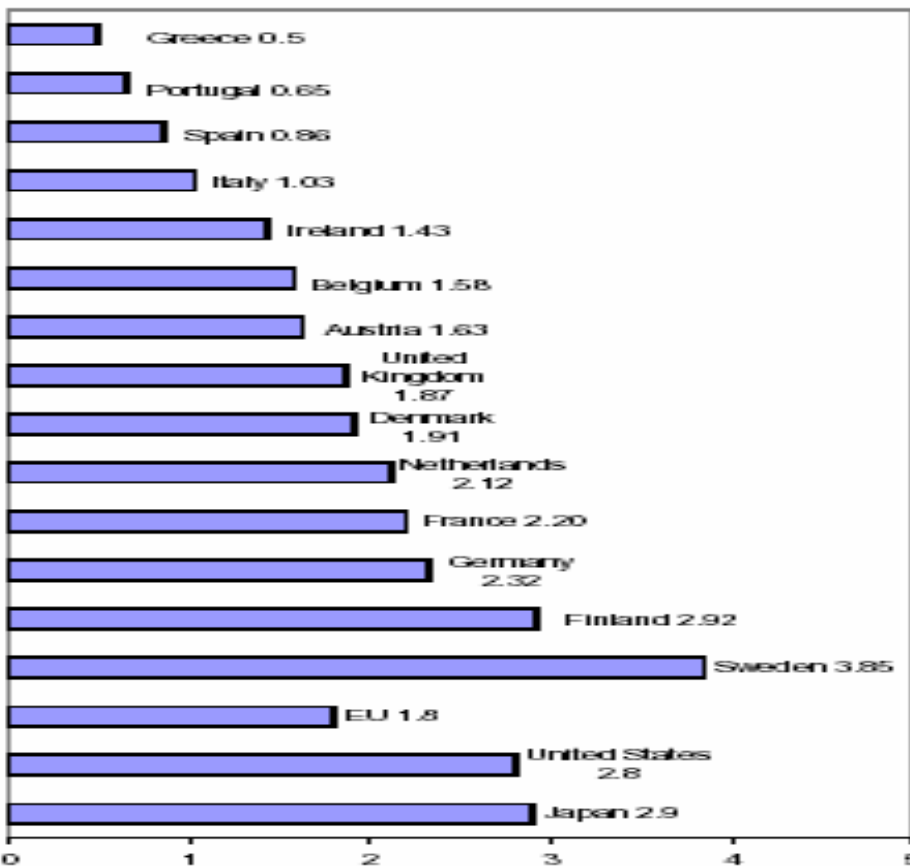
Source (OECD &) Tekes FI, Aug 2002

You also can see that Finland was the only country able to make this change. It was achieved through the determined government strategies supported by industry plus good fortune. At the same time Germany, the largest member state and the biggest R&D spender in the EU, has been actually declining.

Then, let's take a look at the enlarged EU and the candidate countries in particular. In a very informative document of Mr Philippe BUSQUIN again, *Towards a European Research Area* (Brussels, 18 January 2000 COM (2000) 6), the following two charts show the R&D percentages of GDP a few of years ago (original source OECD, EuroStat et al) for the countries concerned.

Intensity of R&D (GERD/GDP) for the EU, United States and Japan - 1998 or most recent year

R&D intensity (GERD/GDP) of applicant countries - 1998 or most recent year





**As the EU(15) R&D input** is 1.8-1.9% of GDP, what then will be the same percentage after the enlargement (planned to be completed by 2010)? I have adjusted the above charts to show the reality (the same horizontal scale for intensity in both charts). Anybody can immediately see that the R&D percentage of GDP will drop remarkably after enlargement. According to my quick estimation, the EU(28) R&D of GDP would drop by 0.1% (percentage points).

**I showed above that the EU R&D input as percentage of GDP has not increased during the past ten years. In the forthcoming ten years - without a clear strategy and action plan established and duly carried through by the EU and all member states - the union enlargement is going to drag this percentage even lower.**

***MY JUDGEMENT:***

***In the EU, the objective to raise R&D input to 3% of GDP by 2010 will not be achieved, not for the present 15 members and even less so for the enlarged union.***

PS In the European Research 2002 Conference, 11-13 November Brussels, I heard Mr Hans-Olaf HENKEL, one of the three keynote opening speakers, expressing the 3% objective as wishful thinking and comparable to the 30 years old pledge to raise the developing world assistance to 0.7% of GDP (today the EU aid is less than half of this objective).

## **2 Construction RTD input at very low levels**

The construction industries are the largest industrial cluster in the European Union (EU) representing 11% of total gross domestic product (GDP) or a quarter of total industrial output. Their 2.7 million enterprises directly and indirectly employ almost 30 million people, 97% of them small and medium-size enterprises (SMEs) with fewer than 20 employees.

There is a constant need for housing. Ageing infrastructure requires massive renovation. Traffic congestion and transport delays cause increasing waste. The costs of preserving the cultural heritage are accumulating.

In order to make all the necessary work affordable, construction technologies and processes must be developed. As construction affects the overheads of other industrial and commercial activities, their competitiveness can be improved with better construction productivity and efficiency.

According to various studies and experiments, the following targets could be achieved:

- 30% more construction at no extra expenditure,
- 50% reduction in delivery time,
- 50% reduction in operation & maintenance costs,
- 50% reduction in primary energy consumption,
- 50% reduction in waste & pollution, and
- 50% reduction in accidents at work.

Assuming a 5% cost saving, construction volume could be increased by 45 GEUR (billion euros) annually in the EU (EU15 total construction investment in 2002 was 900 GEUR).

Relative to other industries, the construction cluster is less developed. Whereas 2-3% of GDP is generally used for RTD, in the construction industries the percentage is considerably under 1% of their own turnover, even 0.1% in some sub-sectors. This is, because the present-day construction process does not allow any reward for RTD in most sub-sectors.

To serve consumers and society better and to improve their competitiveness and productivity, the European construction industries should substantially increase their RTD expenditure. Unlike other industries, construction takes place in all countries, hence results benefit all. Europe could win with efficient processes and high-technology.

To make this possible, awareness within the European construction industries and the European Commission, the European Parliament and other decision-makers must be increased. Also, more positive attention and additional funding from national and European sources are necessary.

In addition to research & technological development, innovation, demonstration, dissemination and technology transfer should be an essential part of implementation. Here in particular, industry-led integrated RTD between large companies and SMEs is effective. In vertically arranged projects the requirements of customers and end-users can also be properly observed.

Different European and national frameworks and programmes should be made available: the European Union Framework Programmes for Research & Technological Development (EU RTD), EUREKA and COST, as well as PHARE, TACIS, MEDA and the structural funds.

In September 1996, a study was completed in the European Commission – EC titled *Construction – European RTD and Related Activities and Concentration of RTD Priorities* (App 1, 22p). In this report David MILES, Head of Unit in DG Research, came to the following conclusions:

- Within the EC at least 19 different services across 8 Directorate Generals (DG) are working on activities related to construction RTD.
- Some 300 MEUR of the EU's 4<sup>th</sup> Framework Programme for Research and Technological Development – EU4RTD will be on projects of particular interest to the construction industries. This represents less than 3% of the EU4RTD total funding of 11,879 MEUR.
- The construction process has considerable potential for technical improvement to the benefit of all citizens.
- Resource should be concentrated into 3 areas: Lean construction, Sustainable construction and Technology transfer & training.
- The inter-service group to be extended to prepare a set of detailed technological targets and priorities.

The conclusive recommendations were partly then reflected in another, very influential document titled *The Competitiveness of the Construction Industry, issued in November (COM(97) 539 final)* issued in the following year by DG Enterprise (App 2, 29p).

Today there are two newly established interlocutor groups, where the construction industries can easily discuss their strategies and plans, problems and ideas:

- **The Construction Contact Point – CCP** towards the EC (established in October 2002 by Mr Vicente LEOZ-ARGUELLES, Head of Unit in DG Enterprise), and
- **The Forum in the European Parliament for Construction – FOCOPE** towards the European Parliament (established in May 2002 by Mr Den DOVER, MEP).

I am an invited member of both these groups for Villa Real / FutureConstruct.

### **3 Period 1990-1994 the EU's 3<sup>rd</sup> Framework Programme for Research and Technological Development – EU3RTD**

Here, as well as earlier, a top-down approach was typical, ie the objectives or priorities were written down by the EC from the start. Also, funding was mainly targeted at basic research.

At this period construction was largely considered as “no-tech” industry, which even cannot develop anything at all. Also, the volume and importance of the construction industry was not understood at all in the EC.

During this period, construction RTD was mainly concentrating at material research. This is demonstrated by my report *European RTD on Concrete* (App 3, ISBN 951-97676-2-2, 2000, 69p).

This report provides the reader with State-of-the-Art of the European RTD on concrete-related subjects. The document presents summaries of all related ongoing projects under the EU's 4th and 5th framework programmes for RTD (EU4&5RTD). Altogether 29 projects were under execution. A selection of recently completed projects is added. 26 projects are presented comprising practically all concrete-related projects completed under the programmes Brite-EuRam 2 & 3. Also the SME Specific Measures, ie Exploratory Awards and CRAFT projects are included. While most of the related work is in deed done under the framework programmes, there are also opportunities in the EUREKA initiative and the COST programme. For this purpose, a couple of sample projects are also presented here. This report is available in Villa Real's Online Bookshop at [www.villareal.fi](http://www.villareal.fi).

#### **4 Period 1994-1998 the EU's 4<sup>th</sup> Framework Programme for Research and Technological Development – EU4RTD**

Two important reports were contributing to EU4RTD: *Construction, a Challenge for the European Industry - Defining priorities for R&D* (KD-Consultants for the EU 1991) and *Strategies for the European Construction Sector* (the SECTEUR study by W S Atkins International for the EU 1994).

In EU4RTD a major change was taking place. The programme was moving towards a bottom-up approach and applied research, where all well prepared proposals for existing problem solving or new idea development at a company level were able to get funding.

Yet, in the first drafts there was very little available for construction. It then so happened that I was chairing the Brite-EuRam Advisory Board in Finland for 1993-97 (Brite-EuRam is a European RTD programme on Industrial and Materials Technologies). Finland was very active already before the EU accession. And as I was clearly representing the interest of the construction industries, I got through actions officially in the name of Finland. This proactive work actually caused the Brite-EuRam3 programme being rewritten in March 1994. After this, the programme offered objectives and priorities very suitable to the needs of the construction industries. On top of this, one of the only three targeted research actions was titled "Environmentally friendly construction technologies".

In early 1995 in Finland with Tekes (the national RTD funding agency in Finland) support an initiative called **FutureConstruct** was commenced. FutureConstruct was an initiative to increase RTD within the European construction industries. The initiative was run by Villa Real and myself and supported by leading enterprises from eight European countries. Its members were (from north to south):



Finland (FI)

- Viatek (design)
- Partek, today Consolis (manufacture, concrete)
- Rautaruukki (manufacture, steel)
- Schauman Wood (manufacture, wood)
- YIT (construction)



Sweden (SE)

- Jacobson & Widmark (design)
- Scancem (manufacture, cement)
- ABB Fläkt (building services)
- Skanska (construction)



Poland (PL)

- Budimex (construction)



Germany (DE)

- Hochtief (construction)



Netherlands (NL)

- Heidemij, today Arcadis (design)
- TNO-Bouw (research)
- NBM-Amstelland (construction)



United Kingdom (GB)

- Taylor Woodrow (construction, developer)



France (FR)

- CSTB (research)
- Saint-Gobain (manufacture)
- Bouygues (construction)



Spain (ES)

- Dragados (construction)

FutureConstruct was active in increasing awareness in the European Commission, the European Parliament and other European and national decision makers about the importance and needs of the construction industries. FutureConstruct had major influence on the David MILES's report mentioned earlier. This was made through my written contributions plus face-to-face discussions in Brussels and Finland.

One of the objectives of FutureConstruct was to establish an EC-recognised and partly funded "Task Force" to permanently advance its objectives. Task forces were an initiative of that time Commissioner for research, Edith CRESSON. A few task forces were actually established, yet not for CREC. Today's activity to establish European Technology Platforms – ETP has practically the same purpose. Today 1 ETP has been established and 15 others are in making, including "B4E – Building for a European Future".

FutureConstruct also published a book titled *RTD Strategies for European Construction* (ISBN 951-97676-0-6, March 1997, 64 p). A free summary of this document in eight languages is available in Villa Real's Online Bookshop at [www.villareal.fi](http://www.villareal.fi).

The SECTEUR study led in December 1995 to the establishment of The European Council for Construction Research, Development and Innovation – ECCREDI ([www.eccredi.org](http://www.eccredi.org)), which is supposed to represent the whole CREC R&D towards the EC. Members today are most European associations (of national associations) representing CREC:

- Architects' Council of Europe – ACE
- Consortium of European Building Control – CEBC
- European Liaison Committee for Social Housing - CECODHAS
- The European Cement Association – CEMBUREAU
- Council of European Producers of Materials for Construction – CEPMC

- European Asphalt Pavement Association – EAPA
- European Council for Building Professionals – ECBP
- European Council of Civil Engineers – ECCE
- European Convention for Constructional Steelwork – ECCS
- European Federation of Engineering Consultancy Associations – EFCA
- European Large Geotechnical Institutes Platform - ELGIP
- European Network for Building Research Institutes – ENBRI
- The European Network of Construction Companies for Research & Development – ENCORD
- European Organisation for Technical Approvals – EOTA
- Forum of European National Highway Engineering Consultancy Associations - FEHRL
- European Construction Industry Federation – FIEC

As an ECCREDI activity, in 1997 Targeted Research Action - Environmentally Friendly Construction Technologies – TRA EFCT ([www.tra-efct.com](http://www.tra-efct.com)) was established under the Brite-EuRam 3 programme. This 100% EU-funded network project was to bring together EC-funded research projects from the Brite-Euram, SMT, Environment, Steel and CRAFT programmes which relate to construction. In particular this TRA aimed to:

- provide a European forum for the development, dissemination, and exchange of scientific and technological knowledge, and of ideas relating to all aspects of construction,
- accelerate dissemination and exploitation of research results,
- improve the synergy and co-ordination of research being carried out in EC programmes, and
- inform RTD programme planners of the research needs and priorities of tomorrow.

This project was completed in December 2001. Over 200 different projects were participating in the network. The final evaluation of its success is yet to come. I was Network Adviser appointed by the European Commission (EC) for this network project.

In 1998 another book titled *Construction Can!* (ISBN 951-97676-1-4, June 1998, 58p) was published by arrangement of the European Network of Construction Companies for Research and Development – ENCORD. The booklet was actually created and written by me, and reflects much of the earlier FutureConstruct document. ENCORD's vision 2010 and some other chapters of the book are repeated below.

### **"Vision 2010**

Some of the changes expected in the European construction sector in ten years' time are listed below:

#### **Individual Customers**

- Individual requirements of demanding customers and end-users will increase; high quality, individuality, lower prices, easy to buy, easy and economical to use, delivery now
- Rising requirements for fittings and finishing and increasingly adapted technical building services.
- Rising requirements for the indoor environment as well as for outdoor infrastructure and services.
- Quality/price ratio will be more favourable.

#### **Changing Society**

- Requirements for sustainability and environmentally friendly technologies by market forces will increase and be made mandatory by the authorities.
- Requirements for total quality will increase.
- The European construction market will be further opened to cross-border competition; also competition from outside the EU will increase.
- The market volume will remain stable; yet big changes in different countries and a major improvement in the transition economies of Europe.
- Rapidly developing information and communication technologies make nearworking (teleworking) increasingly popular. This will cut down on

daily commuting and decrease the need for office buildings but increase the need for home building and possibly for near/satellite office facilities. Similarly, electronic trade will limit the need for shops and other commercial buildings.

- The rapidly increasing number of elderly and disabled people will need special attention for their autonomous living.
- The renovation and modernisation of the existing buildings and infrastructure and the preservation of the European cultural heritage is a major challenge.
- *The city of tomorrow will be different from the city of today!*

#### Advancing Industries

- Competitiveness in relation to other industries will be better.
- The European Union will be the home market for large and specialised top-end enterprises, the rest of Europe a neighbour and the rest of the world a frequently visited and familiar place for business.
- Increased competition in the common market will lead to competitiveness in the global market.
- Productivity will rise.
- New construction processes will be used.
- Cooperative networking between big companies and SMEs as well as the integration of different disciplines will be in use.
- New procurement and contracting processes will be used.
- High-performance materials, products and systems will emerge.

#### Executive Summary

ENCORD – The European Network of Construction Companies for Research and Development is a permanent grouping established in 1989 by several leading European construction companies. ENCORD's strategic objective is to increase awareness of the potential of industry-led research and development in the construction field to enable European companies to enhance their competitiveness.

The construction industries are the largest industrial cluster in the European Union (EU), representing 11% of total gross domestic product (GDP), or a quarter of total industrial output. Their 2.7 million enterprises directly and indirectly employ almost 30 million people. There are several successful big European design, manufacturing and construction companies that are world leaders, yet 97% of European construction companies are small and medium-size enterprises (SMEs) with fewer than 20 employees.

A change towards lower costs, sustainability and comfort & quality for citizens can only be achieved through collaborative research and technological development & innovation and demonstration (RTD&ID) at European levels.

For competitive growth, procurement and construction processes and technologies must be developed. As construction affects the overheads of other industrial and commercial activities, their international competitiveness can be improved with better construction productivity and efficiency. Networking, partnering, lean management and the increasing use of information and industrialised technologies make lower costs possible.

More efficient and customer-friendly processes must be developed to satisfy demanding, individual and changing customer needs and user requirements.

Urban people live in the built environment and spend 90% of their lives indoors. Thus the quality of the living and working indoor environment is especially important; for health, comfort, productivity, safety and security. In twenty years, a quarter of the ageing population will be more than 60 years old. Their special requirements for comfortable and autonomous living must be properly observed.

Sustainability is a matter of satisfying the needs of present generations without compromising the ability of future generations to fulfil their own needs. Sustainable development means sustainability not only ecologically and economically but also socially and culturally. New environmentally friendly technologies must be developed to reduce the environmental impact of buildings and of construction and renovation work. Life-cycle costing (LCC) and environmental life-cycle analysis (LCA) will be essential considerations.

Buildings consume 40% of total energy and account for 30% of CO<sub>2</sub> emissions. Major savings are obtainable with energy-oriented design for construction and renovation together with new building services technologies and combined heat and power generation.

Building products should be reusable and materials recyclable. The use of materials and other resources must be minimised and the utilisation of renewable raw materials encouraged. Durability and long service life are environmental priorities.

In accordance with various studies and experiments, ENCORD believes that the following ambitious targets are achievable: 30% more construction at the same cost and 50% reduction in delivery time. Assuming a 10% saving in costs, construction volume within the EU could be increased by ECU 70 billion annually.

In order to achieve these targets, sufficient efforts must be made through an integrated RTD&ID programme or project cluster and construction-focused calls. Even RTD&ID alone is not enough; European policies and regulations also need to be changed.

### **Needs for regulatory changes**

The following list shows topics and changes in the European regulatory environment that are deemed necessary to make the aforesaid positive developments possible. They concern, in particular, overcoming organisational, institutional, legal and behavioural barriers to the successful application of RTD&ID results, particularly in procurement and contracting rules and construction processes and systems.

- clear warranty and liability rules with related insurance policies
- qualification and registration of enterprises, professionals and craftsmen
- requirement for documentation on specifications and use & maintenance
- full use of CE marking with conformity to essential requirement
- best practice procurement procedures
- competition on quality, LCA and LCC
- competition based on design & build, and other "new" processes
- performance requirements / specification instead of prescriptive ones
- performance-based competition
- encouraging public-private partnership
- encouraging partnering and alliances, including SMEs
- opening up the in-house design in the public / para-public sector
- performance standards instead of prescriptive norms
- abolishing national restrictive standards and codes of practice
- public / para-public sector as educated, ideal clients
- warranty and liability rules with related insurance policies for innovative, non-established new technologies
- ensuring industrial and intellectual property rights"

This book is still available free of charge in Villa Real's Online Bookshop at [www.villareal.fi](http://www.villareal.fi).

## **5 Period 1998-2002 the EU's 5<sup>th</sup> Framework Programme for Research and Technological Development – EU5RTD**

The new programme was moving even further towards a bottom-up and applied research. Now also the effect of all different activities towards better possibilities for construction research was visible. Altogether 10 priorities, now called key actions, were fully available for CREC research.

For EU5RTD, the earlier-mentioned TRA EFCT prepared a list of construction-related projects titled *Overview of Construction projects funded by the EC* (App 4, 10p). Some 200 projects are listed in the document and more details can be found in the EC's Cordis service at [http://dbs.cordis.lu/EN\\_GLOBALsearch.html](http://dbs.cordis.lu/EN_GLOBALsearch.html). It can be estimated that altogether some 400 CREC projects were approved for funding under EU5RTD.

Amongst many good CREC projects under EU5RTD, it is worthwhile here to mention European Construction Research Network - e-CORE (<http://www.e-core.org/>), a "continuation" thematic network to TRA EFCT. The project is headed by CSTC Belgium and participated by VTT and Arkkitehtitoiminta Kai Warttinen of Finland. Its objectives are the following:

- To establish a single access point where information on national and pan-European construction research projects can be obtained that have been recently finished, are on-going and/or are in an advanced planning stage and to foster, where possible, synergy and collaboration between related projects. Analysis of this information will promote the provision of advice on "blind spots" in construction RTD and to initiate synergy between emerging actions seeking to address such "spots". Specifically it will allow and is expected to initiate and promote networking on strategic construction RTD topics.
- To contribute in the field of construction to an effective information flow in view of the European Research Area (Communication of Commissioner Busquin). In particular to increase the awareness in standardisation committees of ongoing relevant RTD work and to promote in this way the transfer of RTD results to relevant standardisation work. References to E-CORE in standardisation work will facilitate monitoring the impact of the network in this respect.
- To provide a channel for filtering technology that might have useful applications in construction against the dual requirements of the technology's contribution to the improvement of productivity (leading to better value for the customer) and sustainable development. In this respect, a particular objective is to further stimulate SMEs both to participate in RTD actions and to benefit from the RTD efforts of others.
- To identify RTD needs for the sector and the development of a RTD strategy for the European construction sector.

In September 2000 I made a study on wood construction. I never completed it to a proper distributable report but the over two thousand pages of raw material remains unedited. I, however, studied through this material comprising 126 projects, and a related informative article (also signed by Ilkka PÖYHÖNEN, Lappeenranta University of Technology and Chairman of TRA EFCT / Wood Properties and Technologies for Construction) appeared in TRA EFCT's Newsletter, Issue 14. As the TRA EFCT's website seems to have disappeared totally, I reproduce the article below.



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## WOOD CONSTRUCTION – HISTORY OR THE FUTURE?

In the beginning, we had three construction materials, ie natural materials wood, stone and mud. Wood was widely used for buildings everywhere. The oldest existing wood buildings are soon 1000 years old. They are the admirable Norwegian stave churches, where the art of a Viking ship was utilised: Urnes dating back to 1050, Borgund 1150, never added or rebuilt, with a runic inscription "*Tor wrote these runes in the evening at the St. Olav's Mass*",



referring to the first king of Norway, and many others. Also temples and palaces in China and Japan, dutifully maintained and reconstructed, are splendid examples of wood construction.

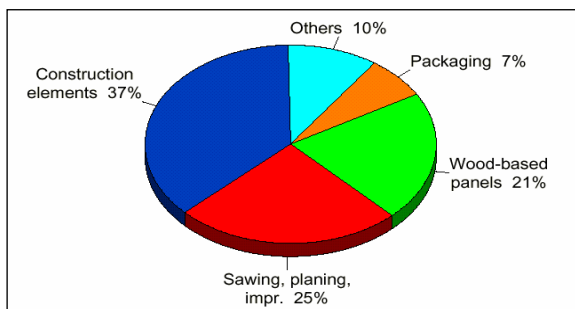
After the war, wood has lost much of its earlier position in Europe, even in the Nordic countries. In the EU today, the share of wood construction varies between zero to over 50% in Scotland.

While comparing the total wood product consumption in different parts of the world, big differences can be seen.

Wood Product Consumption	
Area	(kg/capita)
EU	100
Nordic Countries	200
USA & Canada	300

In the USA's second largest metropolis, Los Angeles County, 96% of all buildings are wood-framed. In Europe consumption figures are low.

The total production value of the wood product industries without furniture in the EU is 60.4 billion EUR (1998) divided in different product groups as shown in the following pie chart. Some 80% of the total volumes are used in construction.



*Production value of the European Wood Product Industries 1998*

*Source: CEI-bois*

Wood is a renewable material. And, if used in buildings, it works also as a long-term CO<sub>2</sub> sink. Doubling wood product consumption in the whole EU to the level of the Nordic countries would mean an additional market of 60 billion EUR and a big opportunity to the European wood product industries, which mostly are SMEs.

To increase the use of wood, a lot of research, development, innovation, standardisation, education and other related activities are needed. While looking at the RTD projects completed during the past ten years, it can be said that projects are many but scattered, as shown in the following two tables (the search words "wood", "timber" and "forest" were used in this study).

European RTD Projects on Wood	
Framework	Number
EU RTD (1+2)	92
1 Ongoing	29
2 Completed	63
EUREKA (1+2)	25
COST (1+2)	11
Total	128

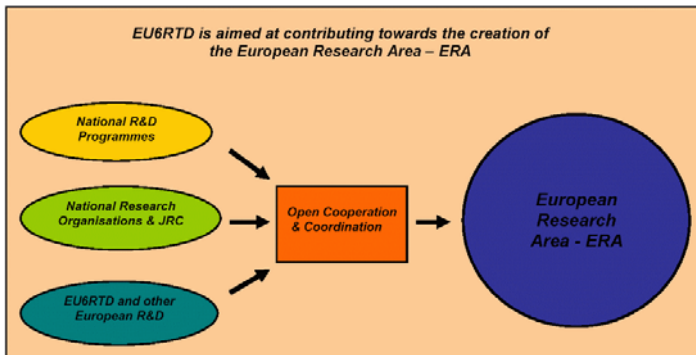
European RTD Projects on Wood	
Area of RTD	Share (%)
Manufacture, process	38
Products	23
Treatment, coating	18
Construction, renovation	11
Other	10
Total	100

Only a few of them are developing structural systems, information and communication technologies (ICT) and necessary models for the implementation processes.

A widely adopted **European open wood building concept** utilising sustainable industrialised technologies should be developed to offer citizens and society high quality housing and other buildings at affordable prices. Here a joint action by the wood product industries together with the actual construction industries is necessary. Then wood construction will be the future. *[This statement is still valid in 2004.]*

## 6 Period 2002-2006 the EU's 6<sup>th</sup> Framework Programme for Research and Technological Development – EU6RTD

The approach is changing completely, once again. First, it is good to understand that EU6RTD is related to the European Research Area - ERA, introduced by Philippe BUSQUIN, the Commissioner in charge of R&D. The idea is to get various national R&D programmes, EU6RTD and other European R&D frameworks/programmes as well as national research organisations and JRC through open cooperation & coordination to create a (joint) ERA, as illustrated in the chart below.



*The concept of EU6RTD*

Similar to all earlier framework programmes, EU6RTD is principally a total of the under-listed documents, in particular:

- **Framework Programme** - basic structure, budget and contents
- **Participation rules**
- **Specific programmes** - "flesh on the bones" description
- **Work programmes** - the actual documents to read and observe (chancing for each call)

In the following table the principal structure of EU6RTD is presented.

Objectives and Activities	Funding MEUR
<b>EU6RTD</b>	<b>16,270</b>
<b>1 FOCUSING AND INTEGRATING COMMUNITY RESEARCH</b>	<b>13,345</b>
<b>1.1 Thematic priorities</b>	<b>11,285*</b>
1.1.1 <b>GPH - Life sciences, genomics and biotechnology for health</b>	2,255
1.1.1.1 Advanced genomics and its applications for health	1,100
1.1.1.2 Combating major diseases	1,155
1.1.2 <b>IST - Information society technologies</b>	<b>3,625</b>
1.1.3 <b>NMP - Nanotechnologies and nanosciences, knowledge-based multifunctional materials and new production processes and devices</b>	<b>1,300</b>
1.1.4 <b>A&amp;S - Aeronautics and space</b>	1,075
1.1.5 <b>FSQ - Food quality and safety</b>	685
1.1.6 <b>SDGE - Sustainable development, global change and ecosystems</b>	<b>2,120</b>
1.1.6.1 Sustainable energy systems	810
1.1.6.2 Sustainable surface transport	610
1.1.6.3 Global change and ecosystems	700
1.1.7 <b>C&amp;G - Citizens and governance in a knowledge-based society</b>	225
<b>1.2 Specific activities covering a wider field of research</b>	<b>1,300</b>
1.2.1 <b>Policy support and anticipating scientific and technological needs</b>	<b>555</b>
1.2.2 <b>Horizontal research activities involving SMEs</b>	<b>430</b>
1.2.3 Specific measures in support of international cooperation	315
<b>1.3 Activities of the Joint Research Centre (JRC)</b>	<b>760</b>
<b>2 STRUCTURING THE EUROPEAN RESEARCH AREA – ERA</b>	<b>2,605</b>
2.1 Research and innovation	290
2.2 Human resources and mobility	1,580
2.3 Research infrastructures	665
2.4 Science and society	80
<b>3 STRENGTHENING THE FOUNDATIONS OF THE EUROPEAN RESEARCH AREA – ERA</b>	<b>320</b>
3.1 <b>Support for the coordination of activities (ERA-NET)</b>	<b>270</b>
3.2 Support for the coherent development of policies	50
<b>EURATOM</b>	<b>1,230</b>
<b>GRAND TOTAL</b>	<b>17,500</b>

The most interesting programmes for CREC are highlighted yellow.

\* 15% of this for SMEs.

Now big projects, actually more like project clusters or programmes, are expected. Accordingly new instruments (or project types) are introduced, as follows.

### Integrated Projects – IP

- Clearly defined development objectives.
- Typically industry-led project.
- Duration 3-5 years.
- Magnitude >30 MEUR.
- EU funding max 50%; usually less, and complementary funding is necessary

### Networks of Excellence – NoE (or NE)

- Advancing research and integrating the activities of the consortium partners on a particular research topic and spread achieved excellence.
- Research centre/university-led project; 100-500 researchers in the network
- Duration over 5 years plus continuation thereafter without EU funding
- Magnitude >10 MEUR
- EU funding as per the number of researchers in the network, max 25%.

Typical to both instruments is the autonomy of the project and the consortium (externalisation). The project contents will be refined during the implementation of the project. New sub-projects can be established and new partners taken in through own public call. The budget and received EU funding can be used pretty freely without the detailed scrutiny of person-hours and cost categories by the Commission, which is then concentrating on the results, output instead of input, which is right.

In the last minute of the EU decision-making process, also the conventional projects were - fortunately - approved, described as follows:

### **Specific Targeted Research Projects – STREP (or STRP)**

- Similar to earlier RTD projects
- Typically industry-led project
- Duration 2-4 years
- Magnitude 2-10 MEUR
- EU funding max 50%

This conventional instrument ( project type) was returned to the EU6RTD by the European Parliament, as required by European Council of Civil Engineers - ECCE in their position paper (I was chairing the ECCE R&D Task Group).

### **Specific research projects for SMEs<sup>3</sup>:**

#### **Cooperative research – CRAFT**

- Similar to earlier CRAFT projects; any subject.
- SME-led project, where R&D is mainly performed by research organisations.
- Duration 1-2 years.
- Magnitude 0.5-2.0 MEUR.
- EU funding max 50%.

The ITRE Committee of the European Parliament proposed that Exploratory Award (25,000 – 50,000 EUR) should be returned into EU6RTD, as required by European Council of Civil Engineers - ECCE in our position paper (I was chairing the ECCE R&D Task Group). The parliament, however, gave up after compromise negotiations.

#### **Collective research**

- Medium-term research activities carried out by technical research organisations for industrial associations or industry groupings in entire sectors of industry dominated by SMEs at the European level; any subject.
- Duration 2-3 years.
- Magnitude 2-5 MEUR.
- EU funding max 50%.
- Two-stage proposals

The Commission published 20 Mar 2002 a call to chart on what kind of integrated projects and networks of excellence there possible are in preparation. These proposals are to give the Commission advice on what areas the actual calls should be placed, and they are also to influence the EU6RTD's work programmes.

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<sup>3</sup> SME is a company:

- with fewer than 250 employees;
- either with an annual turnover which does not exceed 40 MEUR or with an annual balance sheet total which does not exceed 27 MEUR;
- with less than 25% of its capital controlled by organisations which are not themselves SMEs. This threshold may be exceeded if the SME is owned by public investment corporations, venture capital companies or institutional investors.

Over 11,700 Expression of Interest – Eoi were received by the European Commission by 07 Jun 2002. They are publicly available at [http://eoi.cordis.lu/search\\_form.cfm](http://eoi.cordis.lu/search_form.cfm). The outcome was very high in numbers, much higher than expected. Yet, according to the Commission report of 02 Oct 2002, “only about 15 - 20% of the submissions were seen as fully meeting the requirements” and “it is evident that there is a lack of understanding over the new instruments”.

In the following table the activeness of all EU member states and associated states is presented. While comparing Finland to other EU states, one can say that our performance at 2% is average (as per capita or GDP; smaller member states always have this ratio higher than that of the big states).

Country of submitter	Share	Country of submitter	Share
1. Austria	2%	21. Malta	<1%
2. Belgium	4%	22. Netherlands	5%
3. Bulgaria	<1%	23. Norway	2%
4. Cyprus	<1%	24. Poland	6%
5. Czech Republic	1%	25. Portugal	<1%
6. Denmark	2%	26. Romania	1%
7. Estonia	<1%	27. Slovak Republic	<1%
8. Finland	2%	28. Slovenia	<1%
9. France	9%	29. Spain	8%
10. Germany	15%	30. Sweden	4%
11. Greece	2%	31. Switzerland	<1%
12. Hungary	<1%	32. Turkey	3%
13. Iceland	<1%	33. United Kingdom	15%
14. Ireland	<1%	34. Pan-European assns	<1%
15. Israel	<1%		
16. Italy	10%		
17. Latvia	<1%		
18. Liechtenstein	<1%		
19. Lithuania	<1%		
20. Luxembourg	<1%		

e-CORE compiled a list of CREC-related Eols (see [www.e-core.org/frames/index\\_database\\_eoi.html](http://www.e-core.org/frames/index_database_eoi.html)). Their total number is 311 Eols (~3% of total); the respective document *FP6: Tentative overview of Eols in the field of construction research* is attached (App 5, 18p). Yet, 166 projects only are described on the above website.

In the Brokerage Event on CREC-related topics 03-04 Oct 2002, Brussels BE, 82 selected Eols were discussed in more details representing the following classifications, as per e-CORE:

- IP .....66%
- NoE .....33%
- By priority thematic areas (79%):
  - IST ..... 15%
  - Materials & processes .....37%
  - 1.1.6 Sustainable development ....27%
- Most important sub-priorities (77%):
  - 1.1.3 iii New production processes and devices .....26%
  - 1.1.6.1 Sustainable energy systems ..... 24%
  - 1.1.2 i Applied IST research addressing major societal and economic challenges .....12%
  - 1.1.3 ii Knowledge-based multifunctional materials .....9%
  - 1.1.6.2 Sustainable surface transport .....6%

In the Brokerage Event aforesaid, an idea was to develop 15-20 IP and/or NoE proposals out of 311 or 82 Eols listed. No report on this work, however, is available.

About the Finnish origin Eols, this 100% EU-funded network managed to find 13 projects. Later I analysed all the 238 Finnish Eols, and I found 26 projects ie a double. This number is pretty high representing 11% of all Finnish Eols! They all are listed in the following table, and their public

information & details are attached (App 6, CREC - FINNISH Expression of Interest – Eols 07 Jun 2002, 15p).

<b>Project Title</b>	<b>Acronym</b>	<b>Coordinator</b>	<b>Contact Person</b>
1. <i>Development of Methods To Ensure Sustainable Water Resources</i>	DEMESWAR	Kemira Chemicals	Timo KENAKKALA
2. <i>Supporting European Competitiveness in the Changing Forest Sector</i>	Secure-forests	Finnish Forest Research Institute (METLA)	Gerardo MERV
3. <i>Demand-Based Optimisation Of Sustainable Forest-Woodchains</i>	DEMOWOOD	VTT	Arto USENIUS
4. <i>Third generation of engineered wood products</i>	EWP3G	Wood Focus	Aarni METSÄ
5. <i>Research and development of knowledge based, ICT intensive mechanical wood production processes, new wood based products and sustainable use of wood resources.</i>	eWOOD	Lappeenranta University of Technology	Jaakko VUORILEHTO
6. <i>Ecological, Energy and Material Optimised Wood Production System</i>	EcolOptWood	YTI Research Centre of Mikkeli Polytechnic	Hannu KUOPANPORTTI
7. <i>Innovative Integrated Tailored Public Transport</i>	INNO-INPUT	Helsinki City Transport	Seppo VEPSÄLÄINEN
8. <i>Sophisticated Simulation Methods and European Traffic Models</i>	SIMTRAM	LT Consultants	Jarkko NIITTYMÄKI
9. <i>Nanosopic Simulation of Traffic</i>	NANOSIM	VTT	Juha LUOMA
10. <i>Development of Interoperable Pan-European Rail Freight Business</i>	RAILNET	VTT	Pekka LEVIÄKANGAS
11. <i>Network of Center of Excellencies of Industrial Ventilation</i>	INVENTERA	HUT	Markku LAMPINEN
12. <i>Procedures for the Encouragement of Participation in Urban Planning</i>	PEP-UP	HUT	Tarkko OKSALA
13. <i>Global excellence network for environmental rating and performance assessment of buildings</i>	GeneratE	Motiva	Ilari AHO
14. <i>Functional Building Materials</i>	FUBUMAT	VTT	Anne-Christine RITSCHKOFF
15. <i>Intelligent product catalogs for construction</i>	i-CAT	VTT	Matti HANNUS
16. <i>Management of lifetime monetary economy of civil infrastructures</i>	INFRALIFEEC ONOMY	VTT	Markku TUHOLA
17. <i>Optimisation of performance, usability and service life of buildings</i>	na	VTT	Laura APILO
18. <i>Risk management of contaminated built environment</i>	BENRISK	VTT	Auli KUUSELA-LAHTINEN
19. <i>Smart and flexible</i>	SmaF	VTT	Leena SARVARANTA
20. <i>Sustainable intelligent urban infrastructure</i>	SINUS	VTT	Pekka LAHTI
21. <i>Whole life optimised building concept models</i>	LIFEOPTIMU MBUILDINGS	VTT	Asko SARJA
22. <i>Flexible working – providing highly serviced, re-configurable building space</i>	FLEXCORE	VTT (RAKLI)	Brian ATKIN
23. <i>Healthy living – innovative solutions for delivering affordable, safe, adaptable homes</i>	HELPFUL	VTT (Kiinteistöliitto)	Brian ATKIN
24. <i>Intelligent decision tools – enabling accurate predictions of a building's impact</i>	INDECORE	VTT (RT)	Brian ATKIN
25. <i>Sustainable communities – workable sustainability concepts, buildings and infrastructure</i>	SUSCORE	VTT (RAKLI)	Brian ATKIN
26. <i>Tele-care – utilising innovative housing and advanced ICT in the home</i>	MEDICCORE	VTT (Kiinteistöliitto)	Brian ATKIN

My company Villa Real was a partner in four Eols and was seriously preparing one Integrated Project (size 50 MEUR, also included in the appendix) plus appearing as a "sleeping partner" in two other projects.

In Finland, there was a EU6RTD promotion action, titled **FutureConstruct**, again. This work was funded by the Finnish CREC and performed by Villa Real. The action is well described in Villa Real's website ([www.villareal.fi](http://www.villareal.fi)). As part of this work, early 2003 I prepared a comprehensive guide to European RTD programmes, particularly the ongoing EU6RTD with its first round of 49 calls open for proposals. The guide is written principally for CREC in Finland but most parts are also in English and good for everybody. This guide, *Eurooppalaiset teknologiaohjelmat – Opas rakennus- ja kiinteistöklusterille* (ISBN 951-97676-3-0, 2003, 115p), attached to this document (App 7) is freely available at [www.villareal.fi](http://www.villareal.fi).

Similar guide for the European CREC was just completed in English for the second round of calls, now open for proposals. This guide, **European RTD 2004 – Guide for the Construction and Real Estate Cluster – CREC** (ISBN 951-97676-8-1, 2004, 94 p), is available in our Online Bookshop at [www.villareal.fi](http://www.villareal.fi).

## 7 Very bad first results

In principle, EU6RTD would offer a real opportunity to carry forward CREC's needs as a large over 100 MEUR integrated project. Unfortunately, however, the EU6RTD including its specific and work programmes does not make any reference to construction, building or other principal activities within CREC. Thus, already from the outset, EU6RTD looked unpromising for the needs of CREC. This is clearly demonstrated by development on the two most important programmes in the past, ie GROWTH and IST.

The programme following EU5RTD/GROWTH NMP - Nanotechnologies and nanosciences, knowledge-based multifunctional materials and new production processes and devices. Here there is a weak reference to construction under "Knowledge-based Multifunctional Materials" and "Surface science and engineering".

The programme following EU5RTD/IST is again called IST - Information society technologies. Here a weak reference to construction is made under "Products and Services engineering 2010".

The first round of calls opened 17 Dec 2002 and closed in March-April 2003. My snap-shot study on general success rates in the NMP and SDGE programmes gives the following scorings (Success rate % = 100 \* approved/applied; lower figures are typically for NMP):

All proposals	Success rate (%)	Comment
Proposals over threshold	20-50	
Proposals approved for funding	5-30	
Funding total	5-20	Very tight it is for all

CREC's success was very bad. According to e-CORE et al, in NMP 12 proposals for Integrated Projects and 6 proposals for Networks of Excellence were submitted with the following sad results:

NMP: CREC Proposals	Success rate (%)	Comment
Proposals over threshold	2	Generally much under
Proposals approved for funding	0	Zero
Funding total	0	Total zero!

Also in IST, the results are very bad. According to information received from Construction ICT Roadmap – ROADCON, an IST R&D road mapping project for CREC, none of the proposals were approved for funding!

In SDGE under "Sustainable surface transport", a couple of CREC-related projects were approved. And, there must be a number of CREC-related STREP projects and SME specific CRAFT and Collective Research projects funded in various programmes. Information not available.

The second call in IST closed 15 Oct 2003. No results available.

The second call in NMP opened 13 Dec 2003, and will close mainly 02 Mar 2004. And, there are now new opportunities for CREC, particularly area **3.4.4.1 Human-friendly, safe and efficient construction, fully open for CREC IPs!**

Also, specific research activities for SMEs, CRAFT and collective research, are wide open for CREC proposals.



## 8 Recommendations for CREC Action

The following recommendations are as proposed by this writer and earlier discussed in TRA EFCT (I was Network Adviser for 1977...2001) and ECCE (I was chairing ECCE's R&D Task Force for 2001...2003) plus two new proposals concerning the fresh topics of Technology Platforms and "European Growth Initiative".

### 1 CREC organisations, directly and via their national and European associations, should proactively:

- Generally increase their visibility and improve their image
- More dialogue, promotion and lobbying towards the European Commission (EC), European Parliament (EP) and Council of Ministers (CM) and their components
- Contribute to RTD strategies: to increase RTD input total 1.9 ⇒ 3.0% of GDP (2001: SE 4.3%, FI 3.5%, JP 3.0%, US 2.7%), and CREC RTD input in particular
- Specifically influence and contribute to the work programmes of the forthcoming calls and the next framework programme EU7RTD for 2006...2010
- Do their best to establish for CREC at least one Technology Platform as per the COM(2003) 226 final/2 "Investing in research: an action plan for Europe"; here ECCREDI's proposal "*B4E – Building for a European Future*" is a reasonably good start
- Study, influence and lobby to advance the CREC interests in "European Growth Initiative"; although it already offers good opportunities for construction work, it also offers opportunities for CREC-related RTD&ID
- Prepare a guide for CREC on how to successfully participate in framework programmes: all specific programmes to be covered, updated annually (online)
- Actively participate in different European (EU6RTD, EUREKA, COST) and global (IMS) RTD frameworks and programmes to improve their competitiveness (and to get their fair share of public funding)
- Analyse and provide information on how many CREC proposals / how many approved and their characteristics / why not approved; all programmes
- Be more active at national levels: spread information, promote RTD&ID (press etc), create cooperation between national and European RTD&ID, and activate CREC companies.

### 2 CREC should have more authority in:

- Drawing-up an inventory of RTD&ID needs
- The project selection processes (evaluators, EC officers...)
- The follow-up of the projects (reviewers, EC officers...)
- Monitoring and reporting the effects generated by the project results on industry, citizens and society.

To achieve the said objectives, a suitable organisation comprising research, industry and other stakeholders within CREC should be vested with the said authority by the EC (outsourcing/externalisation):

- Probably a legal entity (EEIG, company, association) under a long-term contract with the EC
- Inventory, selection, follow-up, exploitation
- Project funding; or the EC
- Closely monitored by the EC

This might not be easy for several juridical, political, red tape and not-invented-here reasons.

Finally, I attach here my Curriculum Vitae, which is demonstrating the fact that I have been deeply involved in European R&D; promoter, adviser, writer for project preparation, project proposals evaluator, project reviewer and actual partner contractor to make research (App 8, 5p).

## **Appendices**

Not attached to this Internet document.

- 1 *Construction – European RTD and Related Activities and Concentration of RTD Priorities; the EC DG Research 1996, 22p*
- 2 *The Competitiveness of the Construction Industry, issued in November (COM(97) 539 final), the EC DG Enterprise 1997, 29p*
- 3 *European RTD on Concrete (ISBN 951-97676-2-2); O Tupamäki 2000, 69p*
- 4 *Overview of Construction projects funded by the EC; TRA EFCT 2002, 10p*
- 5 *FP6: Tentative overview of Eols in the field of construction research; e-CORE 2002, 18p*
- 6 *Construction and Real Estate Cluster - CREC - FINNISH Expression of Interest –Eols 07 Jun 2002; O Tupamäki 2002, 15p*
- 7 *Eurooppalaiset teknologiaohjelmat – Opas rakennus- ja kiinteistöklusterille (ISBN 951-97676-3-0, 2003); O Tupamäki 2003, 115p*
- 8 *Curriculum Vitae; 2004, 5p*