



Increased exchange in the Building Sector

Reduction of housing construction costs

Bengt Nymann (Editor)

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Preface

This report is a descriptive compilation of initiatives taken to reduce housing construction costs in countries in the Northern Dimension region. The ambition is to provide a picture of the prospects for future co-operation between these countries for the purpose of exchanging experience and new-found knowledge concerning how construction costs can be reduced. The report will serve as a basis for a programme on how such a co-operation can be facilitated. At the same time it is hoped that the report will in itself gain the actors in the market of the Northern Dimension region a better insight into the opportunities for trying new markets in other countries and thereby improving competition in housing construction.

The report is financed by the National Board of Housing, Building and Planning in Sweden and the Ministry of Local Government and Regional Development in Norway and it is produced under supervision of the Steering Group for increased exchange in the building sector between countries in the Northern Dimension region. The national descriptions, have been prepared by persons in government offices and other institutions on behalf of ministries in concern in the participating countries. My contacts for this project in the different countries and especially authors of national descriptions (marked AND in Appendix A) are thus responsible for the factual content of the descriptions. All of these persons have shown me the utmost generosity and considerable patience with my questions and viewpoints, for which I am very grateful. Without their cooperation it would not have been possible to produce this report.

The descriptions and analysis of initiatives taken contributed by the different countries comprise the basis for chapters 2–9 in the report. The descriptions in chapters 2–8 pertain to Denmark, Finland, Iceland, Latvia, Lithuania, Norway and Poland in that order and are intended to correspond in structure to the last description in chapter 9 from Sweden which has served as a template for the other contributions. The chapters vary in scope, in part because the level of description differs but also because the scope of initiatives taken differs considerably between the countries.

Stockholm in March, 2007

Bengt Nyman

Summary

High land prices and high costs for construction labour and building materials are a problem, especially in the rapidly growing areas in the Northern Dimension region. An exchange of experience and newfound knowledge between the countries in question is important in order to reduce construction costs and building prices.

In 2001, the Swedish Government instructed the National Board of Housing, Building and Planning to establish a Forum for Building Costs (BKF) for collecting, analyzing and disseminating knowledge and experience on factors of importance for development, increased efficiency and lower costs to concerned actors in the building sector. BKF is supposed to promote increased efficiency and lower building and housing costs by serving as a knowledge and idea bank for builders, municipalities, national authorities and building contractors.

In 2004 the Norwegian Government initiated a similar initiative by concluding an agreement with representatives of the building industry, the civil engineering industry and the property industry on a 5 year programme for better and more cost-effective housing production by means of reduced production costs and increased productivity. The purpose of the agreement was to bring about a more competitive building industry, better co-operation between the public sector and the industry and a better functioning housing market.

The purpose of the first stage of this project is to survey, describe and analyze initiatives like in Sweden and Norway already taken in the Northern Dimension region countries to reduce housing construction costs. In those descriptions, attention should be paid to possible effects of reduced costs on quality standards or aspects as well as on sustainable development. Country representatives and other actors in concerned countries have been asked to provide information on how programmes are organized and on their evaluated results, if any.

The national descriptions show that all the cooperating countries currently have problems with runaway building costs and housing prices, despite a historically low rate of inflation. The causes are different in the different countries, however, and in those cases where there is a political will to halt the trend the approaches taken to address them vary. The examples from Sweden and Norway show how the state and representatives of the construction industry are trying by means of joint development initiatives to find solutions in the form of industry agreements and good examples. Similar experience exists from Denmark and Finland. Despite great efforts in the Nordic countries to cut costs in housing construction, however, productivity has not improved significantly in recent years and is in most cases poorer than in other sectors of industry.

For the new member states, accession to the EU has led to increased growth and living standards, resulting in a sharp increase in the demand for housing. At the same time, EU membership has led to considerable emigration of skilled labour in particular, which has been greatly detrimental to the domestic construction companies in those countries. Besides increased demand and higher prices for buildable land, the costs of housing construction are also increasing due to capacity problems at a juncture when demand is skyrocketing. Neither in the Baltic countries nor in Poland have any clear initiatives been taken by the governments to reduce high building costs.

A problem for the construction industry in some of the countries in question is a lack of interest in building economics as a profession and an academic discipline. Many engineering schools and universities have too few undergraduate students, inadequate teaching resources and not enough post-graduate students in the field of building economics. Improving productivity and cost-effectiveness in construction companies is not just a question of resources for professional development in the building sector but requires as one condition knowledge of business models that can be adapted to such companies – and such knowledge is unfortunately sorely lacking.

As there is great interest in further cooperation in this field among the experts taking part in the project, one conclusion will be a recommendation to plan a programme for future cooperation in the field of reducing housing construction costs. Discussions in the project have also showed considerable agreement on the following statements as a basis for future co-operation.

- The overall goal of the activities should be to reduce the costs of housing construction taking into consideration quality aspects and sustainable development.
- The cooperation programme should include both government and industry involvement and determine what tools government and industry need to manage the situation.
- The building industry (including the professional owner and client) should be involved in the activities, since it is the target group of measures aimed at achieving more efficient housing construction.

The discussions have also concluded in a recommendation that following aspects should be included in future cooperation.

- National and common dictionaries and vocabularies as well as communication platforms and structures for statistics from each country on costs, prices, quality and productivity,
- National and common clusters of authorities, industry and universities,
- National and common case studies for comparisons of projects and workshops on actual development projects in the Northern Dimension region countries.

1. Introduction

1. 1 Background to the project

High prices, low competition and highly local markets characterize the building and construction market in many countries today. It is assumed that increased cross-border exchange and cooperation in the Northern Dimension region will:

- Improve the functioning of the EU's single market between the countries in the region
- Reduce housing costs by reducing construction costs and building prices.

High land prices and high costs for construction labour and building materials are a problem, especially in the rapidly growing areas in the Northern Dimension region. An exchange of experience and newfound knowledge between the countries in question is important in order to reduce construction costs and building prices. A larger and more transparent market will offer greater opportunities for new processes and forms of cooperation, new tools and methods for utilization of information and communication technology (ICT), and new materials and design solutions. This will in turn boost productivity in the building sector and promote understanding and greater fulfilment of the needs of users and society in buildings and the built environment. Furthermore, it will promote the development of a more sustainable construction and building sector and improve innovation uptake in the sector.

1. 1. 1 Increased productivity and less construction errors

One reason for increasing housing costs in many countries today is decreasing productivity in the construction sector together with high costs for construction errors. In most countries the productivity in other industry sectors in recent years has been far better than in the construction sector. The cost of correcting construction errors alone often comprises between 5 and 15 per cent of the total cost. If the cost of other so-called *non-value-adding activities* that occur on a building project are included, there are researchers who claim that there is a saving potential of at least 30 per cent of the total cost.

Even if reduced costs do not automatically translate into reduced prices, they would lead to higher profitability in the sector. In view of the fact that the sector in many countries has long been plagued by poor profitability, such a development will undoubtedly be welcomed by all concerned. Better profitability means more resources for both enhanced quality and invest-

ments in skills and product development. This leads to even lower construction costs, and eventually lower property management costs. Furthermore, the construction sector's competitiveness would be strengthened, which will be necessary for survival in countries exposed to greater international competition.

1. 1. 2 Industrialized construction

One way for increasing productivity with less construction errors would be to adopt a more industrialized mode of working. The building industry has a lot to learn from fixed industry in general, and from the automotive industry in particular. New construction projects are started, organized and administered in many cases as if they were the first projects ever started. Large parts are procured without requirement specifications, and the work is begun before all parts of the project have been designed and before all components have been procured or purchased. This would never be accepted in fixed industry, where the products have been defined and designed in detail and where everything has been procured at the best price before production begins, and based on intensive development and innovation activities.

By adopting an industrialized mode of working, the one-off design work for each individual project can be replaced by continuous product development in order to enhance quality and reduce costs. A natural part of the industrial approach is to prefabricate everything that can be prefabricated, but this does not exclude the possibility that the planning and design phase, as well as production on the building sites, can also be systematized and process-controlled. Industrialized building thus doesn't mean that everything has to be prefabricated or based on standard solutions. Builders shouldn't standardize *what* they do but rather *how* they do it.

1. 1. 3 Utilization of ICT

Other means for increased productivity in the construction sector would be increased utilization of ICT. Studies show that as much as up to 25–30 per cent of building and construction costs will be caused by a fragmentary building process and lack of communication among the actors. Same information will as an average be recreated at least 7 times during the building process. This results in unnecessary work as well as mistakes and sources of construction errors. Digital solutions are here to stay even in the building and construction sector. Increased utilization of ICT within the sector will be of vital importance for the possibilities to get a more rapid and effective building process resulting in better products for clients and consumers.

1. 1. 4 Construction with a life cycle perspective

It is important to not focus solely on the price of what is built today, but also to think about the costs incurred during the buildings' lifetime (life cycle perspective). It is therefore important that buildings will be well designed

and socially, ecologically and economically sustainable. This means that in addition to low costs, the buildings also shall feature a high standard and high quality, with dwellings that are well designed and furnished and built with good long-range properties. So it's about more than just building cheaply. It's about building cheaply and well, which is difficult and requires a little extra effort on the part of all concerned.

1. 2 The project

1. 2. 1 Goal and deliverables

The long term goal of this project, as a part of the Action Plan for increased exchange in the Building sector between countries in the Northern Dimension region, is to broaden the experience and newfound knowledge base concerning how construction costs can be reduced, taking into consideration quality aspects and sustainable development, by:

- Increasing the clients' (owners') competence and ability to lead the building process,
- Reducing the number of defects in building construction and management,
- Eliminating non-value-adding activities during the building process,
- Focusing on early phases (planning, sketching and design) and feedback of experience into the building process,
- Introducing an industrial approach (processes, logistics, procurement and purchasing, both at the factory and the construction site),
- Stimulating a life cycle cost (LCC) approach in building construction and management,
- Utilization of ICT.

The purpose of a first stage, from which this report has been produced is to survey, describe and analyze initiatives already taken in the Northern Dimension region countries. In those descriptions, attention should be paid to possible effects of reduced costs on quality standards or aspects as well as on sustainable development.

Country representatives (members of a Working Group) and other actors in concerned countries have been asked to describe, analyze and provide supplementary information on how programmes are organized and on their evaluated results, if any. An early description of Swedish initiatives has served as a template for other national descriptions. With these descriptions as background the report will propose the main outlines of a programme for further cooperation to reduce housing construction costs.

The first stage of the project should thus give following deliverables:

- A network (a Working Group) for exchange of experience and newfound knowledge on how costs of housing construction can be reduced,
- A written report with descriptions and analyses of governmental and/or industrial initiatives and programmes for reducing the costs of housing construction,
- A seminar (a Working Group meeting) where the national descriptions as well as problems and possibilities with different approaches are discussed,
- A proposal for main lines of a programme on how the experience and newfound knowledge base can be broadened among countries in the Northern Dimension region.

1. 2. 2 Network for exchange of experience and newfound knowledge

The members of the Northern Dimension Steering Group on increased exchange in the building and construction sector, representing 9 cooperating countries, have been asked to appoint national representatives to a Working Group for this project on initiatives to reduce housing construction costs. With exception of Estonia, all countries have appointed national representatives to the project.

According to Guidelines for Working Groups approved by the Steering Group, a Working Group should support the project leader:

- In finding national and international sources of information and knowledge in project related issues,
- In bringing in new ideas and unconventional solutions to the project,
- In giving the project a Northern Dimension aspect,
- In securing the relevance of the project to the Action plan,
- In commenting on a draft project report before publishing.

In this project the national representatives should also be able to document national initiatives taken in recent years to reduce housing construction costs. In some cases the national representative(s) are not the same person(s) as the author(s) of a national description. Chapters 2–9 of this report are based on those national descriptions.

A 2-day seminar (Working Group meeting) was held in Stockholm in January 2007. The aim of the seminar was to review and discuss the national descriptions as well as to discuss problems and opportunities in different approaches to reduce housing construction costs. The participants also proposed a number of topics for further cooperation on this issue as well as some ideas on how such cooperation could be organized.

The names of the national representatives to the Working Group, as well as of the authors of the national descriptions and of the participants in the seminar, are given in Appendix A. As there is great interest in further coop-

eration in this field among those experts, one conclusion of the project will be a recommendation to

Plan a programme for future cooperation in the field of initiatives to reduce housing construction costs based on the network created in this project.

1. 2. 3 Some conclusions of the national descriptions

The cooperating countries in the Northern Dimension region all currently have problems with runaway building costs and housing prices, despite a historically low rate of inflation. The causes differ, however, and in those cases where there is a political will to halt the trend the approaches taken to address them vary.

In 2001, the Swedish Government instructed the National Board of Housing, Building and Planning to establish a Forum for Building Costs (BKF) for collecting, analyzing and disseminating knowledge and experience on factors of importance for development, increased efficiency and lower costs to concerned actors in the building sector.

BKF is supposed to promote increased efficiency and lower building and housing costs by serving as a knowledge and idea bank for builders, municipalities, national authorities and building contractors. The purpose is to disseminate knowledge concerning building projects or processes that lead to lower building costs without compromising quality or equipment standards, and to reduce building costs and, above all, housing costs in the long term by means of information, education and development.

The point of departure for the work initiated has been the knowledge that it is possible to build functional, healthy, aesthetically appealing and sustainable housing for households with ordinary incomes. It has therefore been important to show that there are builders who defy the widespread notion that it is not possible to build new housing for households with ordinary incomes. By carrying out pilot projects, BKF has shown that it is possible to cut building costs despite claims to the contrary. But then all those involved, from municipal town planners and building permit processors to landowners, designers, contractors and material suppliers, and not least the builder himself, must want the same thing at the same time and in the same project.

Several of the pilot projects have focused on the building process per se, and not least opportunities for reducing building costs and improving quality by applying a consistent industrial approach. Careful planning and design, an industrial process that is carefully thought out in advance, new procurement procedures, new purchasing channels and purchases agreed on in good time before the start of production have led to considerable cost reductions, more efficient production, fewer errors, higher profitability, and low long-term housing costs.

In 2004 the Norwegian Government initiated a similar initiative by concluding an agreement with representatives of the building industry, the civil

engineering industry and the property industry on a 5 year programme (2005–2009) for better and more cost-effective housing production by means of reduced production costs and increased productivity. The purpose of the agreement was to bring about a more competitive building industry, better cooperation between the public sector and the industry and a better functioning housing market.

The programme will focus on 3 main areas:

- Increased client competence and development of buildings that are more cost-effective to operate,
- Fewer construction defects,
- Increased productivity by means of innovation, industrialized building processes and utilization of ICT.

The programme is intended to stimulate new thinking and innovation. Efforts will be concentrated on areas where the industry is already successful and at the forefront of progress. The programme will attach great importance to the use of existing knowledge and technology. Feedback and re-use of experience will be facilitated, which can contribute to learning and transfer of expertise between value-adding activities in the building process as well as between different building projects.

Strategies to be used will include dissemination of information and new knowledge, establishment of meeting places, investigation and analysis, subsidizing of pilot projects, measurements and evaluations.

These examples from Sweden and Norway show how the state and representatives of the construction industry are trying by means of joint development initiatives to find solutions in the form of industry agreements and good examples. Similar experience exists from Denmark and Finland. In Denmark in particular, great resources have been devoted for many years to research and development aimed at improving quality, increasing productivity, reducing construction defects and lowering costs. Despite great efforts in the Nordic countries to cut costs in housing construction, however, productivity has not improved significantly in recent years and is in most cases poorer than in other sectors of industry.

For the new member states, accession to the EU has led to increased growth and living standards, resulting in a sharp increase in the demand for housing. At the same time, EU membership has led to considerable emigration of skilled labour in particular, which has been greatly detrimental to the domestic construction companies in those countries. Besides increased demand and higher prices for buildable land, the costs of housing construction are also increasing due to capacity problems at a juncture when demand is skyrocketing. Neither in the Baltic countries nor in Poland or Iceland have any clear initiatives been taken by the governments to reduce high building costs.

A problem for the construction industry in some of the countries in question is a lack of interest in building economics as a profession and an academic discipline. Many engineering schools and universities have too few

undergraduate students, inadequate teaching resources and not enough post-graduate students in the field of building economics. Improving productivity and cost-effectiveness in construction companies is not just a question of resources for professional development in the building sector but requires as one condition knowledge and implementation of business models that can be adapted to such companies – and such knowledge and reaction is unfortunately sorely lacking.

1. 2. 4 Main lines of a programme for future cooperation

The countries in the Northern Dimension region share a common interest in cooperating for the purpose of finding new ways to reduce construction costs and share knowledge. In some countries, no political initiatives have been taken to reduce housing construction costs in a systematic way. On the other hand, a couple of countries have implemented extensive programmes for reduction of construction costs, and their experience from these programmes will be of great value to the other cooperating countries.

Discussions at the seminar in January 2007 showed considerable agreement on the following statements as a basis for future cooperation.

- Reducing the costs of housing construction, taking into consideration quality aspects and sustainable development, should be the overall goal of the activities.
- The cooperation programme should include both government and industry involvement and determine what tools government and industry need to manage the situation.
- The building industry (including the professional owner and client) should be involved in the activities, since it is the target group of measures aimed at achieving more efficient housing construction.

The discussions at the seminar also concluded in a recommendation that the following aspects should be included in future cooperation.

- National and common dictionaries and vocabularies,
- National and common clusters of authorities, industry and universities,
- National and common communication platforms and structures for statistics from each country or sub-region on costs, prices, quality and productivity,
- National and common case studies for comparisons at project level,
- National and common workshops on actual development projects in the Northern Dimension region countries.

Finally, a future cooperation programme should be planned for a period of 3–5 years and organized in 3 different constellations:

- A programme group of 1–2 representatives from each country to organize and lay down guidelines for the work to be done,

- A knowledge group of representatives from industry, universities and authorities to develop comparable national statistics on costs, prices, quality, efficiencies and productivities and create a common language,
- An improvement group for an industry cluster to discuss solutions and set targets for improvement, measured for example in terms of the number of defects, effectiveness, quality and costs and how to compare different building projects between countries and sub regions.

2. Denmark

2. 1 Introduction

The Danish section is divided into 12 different parts, which together describe four different blocks as seen in figure 2. 1.

Parts 1–3 in block

- a) *Public analyses, policies and foundations* contain a general description of last year's governmental initiatives and policies in Denmark as well as initiatives from the private player Realdania. Parts 4–7 in block
- b) *Processes* describe initiatives in four different segments in the planning and building process, and parts 8–11 in block
- c) *Competences* describe four different competence topics in relation to each process: Lean construction, ICT, quality and cost. The last part, part 12 in block
- d) *Evaluation, education and innovation* describes initiatives in the innovation process from research, development, demonstration projects, education and evaluation.

In the descriptions, we have tried to explain policies and initiatives as elements in a common change process, where the effect can be measured in terms of improved productivity, quality, competence or value for end-users. Based on the description the following questions are raised and proposed as a basis for further discussions.

- We claim that normally the first small effects will first appear after 10
- or 20 years, if at all, when new initiatives are implemented, and, still,
- the objectives for new initiatives are set at a much higher level and to
- be realised sooner in the process than indicated from experience!

How can the innovation process be accelerated, the effect be measurable earlier or the objectives set at a realistic level?

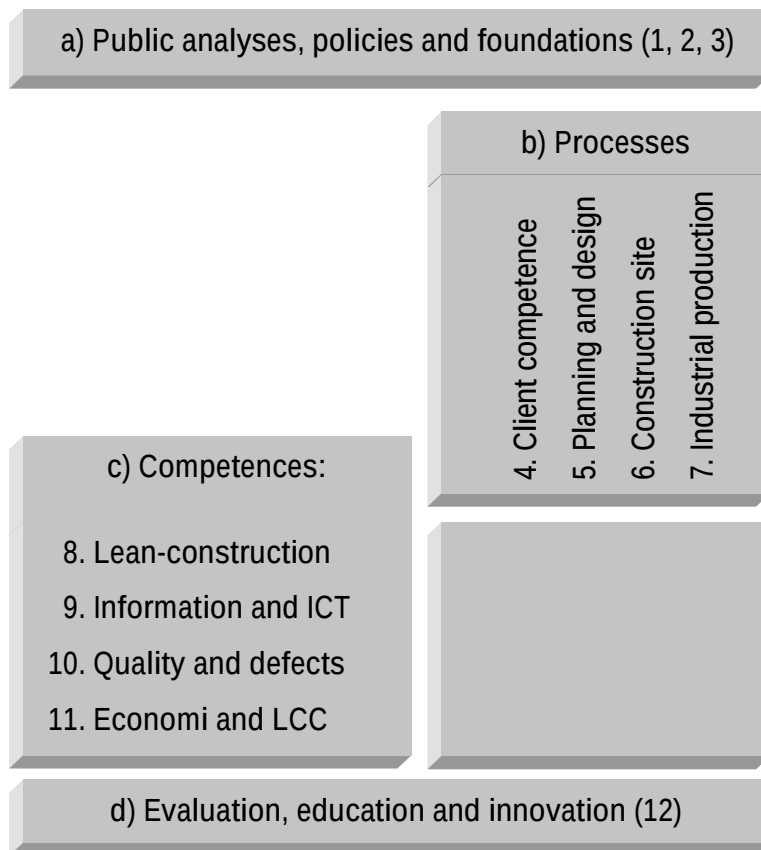
- We claim that more responsibilities are transferred to the private
- sector. The idealised, economic models controlling the national
- initiatives have not been successful and there is a gap between
- formulating the great visions and taking responsibility for solving the
- main problems, particularly where there is a risk!

How can initiatives in the different segments in the sector be implemented with success and at the same time coordinated with others to fulfil the common objectives of the sector?

- We claim that it is not possible today to compare national productivity figures, quality levels and performance between countries!

How can we measure and compare improvements and national performance standards between the different countries?

Figure 2. 1. The 12 parts in the description are arranged in four different blocks, and the four process parts (block b) together with the four competence parts (block c) form a matrix in 4x4 dimensions.



2. 2 Public analysis, policies and foundations (block a)

2. 2. 1 Part 1: Public-sector analyses and programmes within the last 10 years

In the early 1990s, the Danish Ministry of Trade and Industry prepared a business economic analysis for the resource area building/housing [National

Agency for Trade and Industry, 1993]. The analysis pointed out the need for launching three core programmes: “Proces- og Produktudvikling i Byggeriet (PPB)” (Process and Product Development in Building), “Projekt Renovering” (Project Regeneration) and “Projekt Hus” (Project House).

“Proces- og Produktudvikling i Byggeriet” (PPB) was carried out from 1994 to 2001. The four new development consortia, CASA NOVA, Comfort House, Habitat and the PPU-consortium, completed a total of 33 demonstration building projects including 1,600 non-profit housing units, completing 50 different development tasks. A key theme was to promote long-term collaboration between enterprises and enhance the competitive ability through process development and innovation.

“Projekt Renovering” was carried out from 1994 to 1998 with a total budget of DKK 300 mill (40 mill €). The programme focussed on trials and development in the housing renovation sector and the aim was to improve productivity by 15 per cent. The programme included a total of approx. 100 development projects in the following areas for initiative: process development, product development, ecology and environment, and internationalisation.

“Projekt Hus” was carried out from 1998 to 2001 according to the vision “Double value at half the price”. Ten theme groups with participators from a broad range of building and research institutions worded a number of ideas for specific development projects. Several of the ideas from “Projekt Hus” were developed in subsequent years and tested in pilot building projects and transferred to the Building Policy Task Force. Moreover, the most important challenges for the construction sector were described in four folders to stir debate [Ministry of Housing and Urban Affairs, 2001a–d]:

- The Client as Change Agent,
- Close Collaboration in the Construction Phases,
- New Industrialisation,
- Construction with Communication.

The Building Policy Task Force in 2000

At the same time as “Projekt Hus” was completed, an inter-ministerial work group was established to come up with specific proposals for how the government could solve the construction sector’s current problems. In December 2000, the Ministry of Housing and Urban Affairs and the Ministry of Trade and Industry published the result in a report: “Byggeriets fremtid – fra tradition til innovation” (The Future of the Construction Sector – from Tradition to Innovation) [Ministry of Housing and Urban Affairs, 2000e], which proposed 28 initiatives, of which the following may be of interest in this context:

- Tendering subsidised construction contracts and breaking down the distinction between non-profit and private clients.
- Knowledge about the price and quality of housing construction. The Benchmark Centre for the Danish Construction Sector

- [www.byggeevaluering.dk] was established in 2002 by players in the construction sector in collaboration with the Realdania (a main private foundation with a non-profit purpose in the construction sector and the building environment).
- Subsidised housing construction as pioneer building projects, more pilot building projects, guidelines for partnering and communication of new collaboration opportunities will be realised through different executive orders.
- “Byggeriets Brugerinformation” (The Construction Sector’s Information for Users) and greater transparency of construction product prices. Launched in 2003 but closed down again due to lack of support from the sector.
- Development tools and experiments with public-private partnership projects and new opportunities for collaboration under new tendering legislation and tendering of public works in cross-disciplinary modules were realised through executive orders.
- “Det Digitale Byggeri” (Digital Construction) launched in mid 2003 and expected to end in 2007 (more about this further on.).
- Design contest for a new generation of construction components was held and the project EVOLUTION – new industrial architecture [www.dac.dk/evolution] was launched in 2004.
- National Action plan for Construction Research was published in 2002 in the committee report: “Byggeriet i Vidensamfundet” (Construction in the Knowledge Society) [National Agency for Enterprise and Housing, 2002]. It proposed nine initiatives aimed at a broader scope of construction research, increased focus on the sector, increased level of learning in the sector, “Byggeriets Innovationsfond” (The Construction Sector’s Innovation Fund), and improved research training. sector research programmes worth DKK 6.2 mill. (0.8 €) were transferred from SBI and put out for public tender, and in 2006 these were part of the ERABUILD programme “Research on transformation of the Construction Sector through industrialisation’ between the partners from Denmark, Sweden, Finland, France, and Austria.

Action plan for defects and non-acceptance in 2005

Quality assurance guidelines from 2003 [National Agency for Enterprise and Construction, 2003b], which constitute the latest tightening of the quality reform from 1986, were followed in 2005 by another attempt at improving the quality of construction, focussing on the reasons behind the many defects and non-acceptance. A report from the Danish Building Research Institute [National Agency for Enterprise and Construction, 2004a] showed that the costs of remedial actions to correct failures in construction amount to DKK 12 billion (1.5 billion €) annually, which is 10 per cent of the total production value of the sector.

This report caused National Agency for Enterprise and Construction to publish “Byggeriets handlingsplan mod fejl og mangler” (The Construction Sector’s Action plan against Defects and Non-acceptance) [National

Agency for Enterprise and Construction, 2005] including eight proposals for initiatives. All central players in the sector gave their contribution to the action plan, which dealt with the building process itself, a collective agreement about fewer defects and non-acceptance, standard agreements for private customers, optimisation of the building process, and faultless and on-time delivery, as well as initiatives aimed at engineer and technical education programmes and exposing the causes of defects and non-acceptance. It is expected to be able to measure effects of these initiatives by the end of 2008, including whether the target of halving the number of defects and non-acceptance has been reached.

Vision 2020 and proposals for realisation in 2006

Vision 2020 is the latest analysis initiated by National Agency for Enterprise and Construction. In 2005, National Agency for Enterprise and Construction invited 20 leaders from the sector to formulate a vision for the future of Danish construction [National Agency for Enterprise and Construction, 2006]. The vision was debated at a number of dialogue meetings where a broad cross-section of players from the sector were given the opportunity to identify future challenges and discuss which initiatives they wished to work on and realise. The response from the different segments and proposals for future initiatives are included in SBI report 2006:14, “Realising af Vision 2020” (Realising Vision 2020) [Bertelsen, 2006].

The response from the sector was quite interesting, since it showed consensus on what is the sectors greatest problem: reducing the number of defects and non-acceptance, whereas there was no support for establishing a joint organisation for the construction sector. There was broad agreement to give high priority to the other important problems, namely including the end-users in the planning process, developing the educational system, reorganising the building process, Life Cycle Costing (LCC) evaluation, and buildings with added value, aesthetics and flexibility.

The report stressed that these initiatives must be anchored in a common action plan with support from the sector. The following must be determined: how to divide the responsibility for development; what should be developed in common; and what should be developed by enterprises individually? It was proposed that the ideas were grouped into 9 important areas for initiative, which fall under the three main areas: buildings, processes and innovation:

- The buildings, the value to end-users and to the global community:
- Knowledge about and tools for analyses of end-user and society needs.
- Buildings with functionality, aesthetics, and value to the end-user and the client.
- Cross-disciplinary competences, specialisation and certification.
- The process, prefabrication and industrialised construction, and actions against defects and non-acceptance:
- Process control with focus on common objectives, quality and overall economy.

- Reduction of defects and non-acceptance and greater precision in construction projects.
- Development of prefabrication and industrialised construction and standardised services.
- Combating accidents, poor working environment and “swindlers”.
- Education, research and control of innovation in the construction sector:
- Education and training, better competences and the education system.
- User-driven innovation, research and Vision 2020.

2. 2. 2 Part 2: Housing and building policy action plans by the government

In 1997 the Minister for Housing and Urban Affairs presented a building policy report to the Danish Parliament which resulted in “Byggepolitisk Handlingsplan’98” (Building Policy Action plan 1998) [Ministry of Housing and Urban Affairs, 1998]. In this action plan, the Ministry of Housing and Urban Affairs focussed on 13 initiatives, including within the following areas for initiative:

- The quality of buildings (the role of the client, Life Cycle Costing (LCC), building damage).
- Productivity and collaboration (forms of collaboration, information technology, “Projekt Hus” (Project House) (see above)).
- Activities development in the sector (monitoring the market)
- International competitiveness.
- Research and knowledge utilisation (utilisation of knowledge about the sector in the Oresund region).

An invitation to tender concerning a training programme about the role of the client ran into the sand, however, the debate about the role was continued.

The initiative on Life Cycle Costing (LCC) aimed at government building projects, and in the guidelines “Totaløkonomiske beregning i statslig byggevirkksomhed” (Calculation of LCC in Government Building Projects) [Ministry of Urban and Housing Affairs, 2001e] a calculation tool, called Trambolin, was presented which aimed at facilitating compliance with the new requirements in the executive order. Furthermore, a Top 10 list of building damage was prepared with the purpose of putting focus on the most substantial problems in subsidised housing construction.

The initiative “Nye samarbejdsformer” (New Forms of Collaboration) was initiated and ran until 2002 when it was transferred to the network “Bygherrer skaber værdier” (Clients creating Value) until 2006. Here, exchange of experience from developing and testing new tools for collaboration in the construction process took place, with emphasis on partnering and the role of the client. Moreover, a number of pilot building projects were implemented and the experience gained from these was documented for the individual project. The projects focussed, in particular, on: forms of collaboration/partnering, sustainable construction, LCC, and documentation of qual-

ity properties. Read more about the individual projects on: www.ebst.dk/forsoegsbyggeri_pub/0/8/0.

With regard to information and communication technology (ICT), this area never really got going until later, which becomes apparent when reading about Digital Construction, which is described in a later topic.

There was a wish for better quality of data for use in monitoring the market, and a panel of experts under Byggepolitisk Forum (building policy forum) came up with a proposal for improvements. These improvements, however, first became a reality in later programmes.

Utilising knowledge about building and construction resulted in the action plan “Bedre byggeskik skik på byggeviden” (Improved Building Practices based on Building Knowledge) [Ministry of Urban and Housing Affairs, 1999], which e.g. suggested a broader communication of development and testing in collaboration between research, training and industry players, as well as benchmarking of services from the sector. This paved the way for the later initiative concerning “Udvalg for byggeforskning i Danmark” (Committee for Building Research in Denmark) [National Agency for Enterprise and Housing, 2002], and what followed from this, described in the previous section on the Building Policy Task Force.

The Oresund region was given special focus as an example of cross-border collaboration, and the Danish Ministry of Urban and Housing Affairs together with the Swedish Ministry of Enterprise, Energy and Communications and the Swedish Ministry of Finance collaborated on the preparation of a building and housing policy action plan for the Oresund region [Ministry of Urban and Housing Affairs, 2000b]. In 2004, a comparison of Danish and Swedish housing construction was prepared, cf. the report “Integration af bygge/boligområdet i Øresundsregionen” (Integrating the Building/Housing area in the Oresund Region) [National Agency for Enterprise and Housing, 2004]. There have been few follow-up initiatives in this area.

New government in 2001 presented new housing and building policy, including new targets for growth

Following the parliamentary election on 20 November 2001, a new government consisting of Venstre (the Liberal Party) and Det Konservative Folkeparti (the Conservatives) took power and realised its policies in the area of housing and building with off-set in “Konkurrenceevnepakken – Vækst med vilje” (The Competitiveness Package – Determined Growth), [Ministry of Economic and Business Affairs, 2002a] and the report “Vækst med vilje” (Determined Growth), [Ministry of Economic and Business Affairs, 2002b]. Here, the new government launched a growth strategy with new directions for business and commerce, and the goal for the construction sector was enhanced competitiveness and improved productivity. As follow up, the government’s policies were given more concrete shape e.g. in the area of housing and in government-funded housing.

More housing, private rental and a competitive sector

The policy of the new government in the area of housing was presented in “Flere boliger – Vækst og fornyelse på boligmarkedet – Regeringen” (More Housing – Growth and Renewal of the Housing Market – The Government) [Ministry of Economic and Business Affairs, 2002c]. The aim was to contribute to more housing, including more housing for young people and more private rental housing. At the same time, the government proposed a gradually more market-oriented policy, in which its role in the housing market was reduced and targeted at those who needed help the most. The following initiatives were launched:

- More private rental housing through tax reform, establishing loft apartments in existing buildings, and providing better opportunities for pension funds to build rental and owner-occupied housing.
- More housing for young people through increased subsidies and better opportunities for independent youth housing associations, as well as converting family accommodations into youth accommodations.
- More housing for handicapped people.
- Reforming the non-profit sector, increasing the number of new buildings, working with mixed ownership forms, and capitalising funds from the National Non-Profit Housing Fund (Landsbygge-fonden) and a number of associated proposed legislative amendments.
- Urban regeneration made more simple and modern, and private efforts enhanced.
- The competitiveness of the construction sector improved through a building package and measures aimed at subsidised building projects.

The Government as client is a driving force for innovation

On the basis of the report “Vækst med vilje” (Determined Growth) [Ministry of Economic and Business Affairs, 2002b], the Ministry of Economic and Business Affairs also prepared a government policy for government building projects which was published in August 2003 in “Staten som bygherre – vækst og effektivisering i byggeriet” (The Government as Client – Growth and Efficiency Improvement in the Construction Sector) [Ministry of Economic and Business Affairs, 2003a].

The government wanted government building projects to be the driving force for other parts of the construction sector, creating improved competitiveness and productivity throughout the sector. Danish building and construction is at a average level compared to ten other industrialised countries, and the Danish government wanted to raise Danish productivity to the productivity levels of leading countries and ensure a supply of better and cheaper buildings with high quality.

The new government wanted the government as client to make active demands e.g. through increased use of new forms of tendering and collaboration, and of partnering and key figures. Emphasis should be on giving the private sector a greater role to play, using public-private partnerships as an active tool. In these partnerships (PPPs), the authorities call for tenders that

include financing, building, administration and maintenance in one overall contract.

From January 2003, the municipalities have had to put the construction client role out for tender to non-profit and private construction clients, and it is possible to invite tenders where the target price is fixed and the tenderers compete to provide most quality for the money.

In 2004, the use of PPPs in government building projects was followed up by a general strategy “Handlingsplan for Offentlig-Private Partnerskaber (OPP)” (Action plan for Public-Private Partnerships (PPPs), [Ministry of Economic and Business Affairs, 2004], which was to target society in general. The following was targeted specifically at the housing and construction area:

- More government pilot projects and demands for PPP assessments of all government building projects.
- Qualification of PPP consultants and preparation of PPP guidelines and standard contracts, as well as building a competence unit in the ministry to promote PPP.

In addition to PPP, “Staten som bygherre” (The Government as Client) also mentions the launch of the Digital Construction initiative (see later topic), and that quality should be improved by involving the architects more in new industrialisation. Furthermore, the government committed itself to ensuring that government clients demand more detailed key figures for the relevant building projects and the government prepare detailed executive orders as well as give support to the completion of the key figures system under the Benchmark Centre for the Danish Construction Sector (BEC).

The aim was also to increase the transparency of the market for construction products and services by establishing a new internet portal “Byggeriets Brugerinformation” (The Construction Sector’s Information for Users), which came online on October 2003. The initiative, however, proved untenable and the portal was closed down in 2005 because the suppliers were unwilling to collaborate.

2. 2. 3 Part 3: Realdania – a non-profit foundation in the construction sector

Realdania is a private foundation that supports non-profit and charitable purposes within the built environment. Realdania was founded in 2000 and had a capital of about DKK 30 billion (4 billion €) by the end of 2005. In 2005, Realdania distributed about DKK 1.1 billion (150 mill. €) to development of the built environment.

The fund's support to development projects within the built environment falls within three focus areas:

- Qualities of the Urban area,
- The Building Heritage,
- The Future of the Construction Industry.

For more information on Realdania's history, organisation and current development projects see: www.realdania.dk.

The Future of the Construction Industry

A great number of initiatives have been launched in the focus area "The Future of the Construction Industry"; with a view to making an innovative and future-proof construction sector.

In general, Realdania's efforts within "The Future of the Construction Industry" aim at improving the efficiency of the building processes and reducing the costs of building, but, more importantly, the goal is to create more value and develop basic competences within the industry. With its work in this focus area, Realdania can be said to be an innovation broker.

Most of Realdania's large initiatives are still ongoing or are in the planning phase and actual experience and recommendations are therefore still scarce.

Innovation by the Construction Sector (Building Lab)

"Innovation by the Construction Sector" is an initiative under the focus area "The Future of the Construction Sector". This initiative was commenced in 2005 and will run until the end of 2008. "Innovation by the Construction Sector" has a total budget of about DKK 82 mill. (10 mill. €), of which Realdania contributes DKK 52 mill. (7 mill. €) "Innovation by the Construction Sector" works to enhance innovation by the construction sector, and thus to contribute to making future building projects cheaper and enhancing their quality, including for housing construction. "Innovation by the Construction Sector" is organised with a secretariat that provides both consultancy and financial support to company-driven innovation consortia. The objective is for the consortia to go through a number of development processes and come up with good ideas for use and commercialisation in practice.

The development projects can take different shapes: product and process innovation; innovation in services; innovation in organisations and business models etc; or combinations. By mid 2006, six pre-projects and two main projects had been launched or completed. The participating consortia represent all sub-sectors of the construction sector; Danish as well as foreign enterprises, as well as enterprises outside the construction sector. see also: www.buildinglab.dk.

Other initiatives by Realdania

Realdania is also involved in a number of other relevant initiatives with a view to developing the construction sector in Denmark in collaboration with ministries, construction partners and experts:

- Digital Construction, which is a partnership with National Agency for Enterprise and Construction. The project has carried out extensive development work since 2003. The development aspect of the project will end by the end of 2006. Results are to be implemented from January 2007 [www.digitaltbyggeri.dk].
- The Benchmark Centre for the Danish Construction Sector (BEC). Realdania is co-founder of the BEC, which was founded in 2002, and has contributed actively to the development of other activities in the BEC. “Byggeriets Nøgletalssystem” (The Construction Sector’s Key Figures System) was put to use in 2005. The system was evaluated in 2006 and the evaluation report was made public at the end of 2006 [www.byggeevaluering.dk].
- “Renovering 2010”, with special focus on developments in the area of renovation. This initiative, amongst other things, is to follow up on the development programme, “Projekt Renovering”, of the former Ministry of Housing and Urban Affairs, and is to ensure the co-ordination of initiatives in the area. The project is being carried out in a partnership with The Landowners’ Investment Association (Grundejernes Investeringsfond, GI). Project period: 2006 – 2010. Total budget: DKK 50 mill. (6.5 mill. €) [www.renovering2010.dk].
- “AlmenNet”, an initiative carried out in collaboration with “Landsbyggefonden” (The National Non-profit Housing Fund), aims at developing the innovation competence of non-profit housing client organisations, and creating a basis for future-proofing the existing non-profit housing stock. Project period: 2005–2007. Total budget: DKK 11 mill. (1.5 mill. €) [www.almennet.dk].

Finally, Realdania has initiated and financed two relevant research centres:

- Center for Management Studies of the Building Process, which is part of Copenhagen Business School, and which concerns issues of management in the construction sector. Financial support from Realdania: DKK 25 mill. (3 mill. €).
- “Center for Bolig og Velfærd” (Centre for Housing and Welfare), which is a part of the Institute of Sociology at the University of Copenhagen, and which covers a number of research institutions with different areas of specialisation. Financial support from Realdania: DKK 25 mill. (3 mill. €).

2. 3 Processes (block b)

2. 3. 1 Part 4: Client competence and ability to manage the building process

The launching of “Projekt Hus” in 1998 [Ministry of Housing and Urban Affairs, 2000c] marked the first serious attention given to the end-users of buildings, the value of buildings, and the role of the client in the tendering procedure and when selecting collaboration partners. These issues were accentuated even further in debate folder no 1 [Ministry of Housing and Urban Affairs, 2001a], which was one of four folders prepared toward the end of the project. In this folder, the professional construction client and building administrator, as well as the property market, were underlined as central players in the future development of the construction sector. Focus was put on the future role of the professional construction client and support tools such as the need for labelling houses; better descriptions of demands; the role of the client in new collaboration forms; the client as change agent; quality control of development projects; and completion of pilot construction projects.

In combination with other similar initiatives, this initiative gave rise to the establishment of the Danish Association of Construction Clients in 1999 [www.bygherreforeningen.dk]. The Danish Association of Construction Clients is an interest organisation for professional Danish construction clients with regard to both the government, municipal, non-profit and private construction. The purpose of the Association is to promote the development of the Danish building and construction sector. The Association is a forum for communication and maintenance of the opinions and interests of professional construction clients. According to the Association, the client acts as buyer in the construction sector’s supply system and therefore has a clear interest in challenging the other players in the sector and effecting a development toward better and less costly buildings.

The Danish Association of Construction Clients has been collaborating with other Nordic construction client associations since its start-up. In the Oresund region, ministries, housing associations and researchers worked together from 1999 to 2004 on an analysis of the development opportunities of the common housing market [National Agency for Enterprise and Housing, 2004].

In recent years governmental policies have focused primarily on encouraging more private construction projects, government clients as pioneers, and improving the efficiency of non-profit housing construction. The majority of initiatives have been new or tightened requirements e.g. on documentation of key figures, Life Cycle Costing, collaboration in partnering and PPPs (Public Private Partnerships), and utilising ICT (Information and Communication Technology), as well as reducing the number of defects and non-acceptance and improving quality control in general.

Development has been primarily through individual initiatives e.g. by the Danish Association of Construction Clients and the Danish University and Property Agency. For instance: developing the early planning process and

visualisation [www.ubst.dk]; common guidelines; testing in demonstration building projects and developing competences [www.almennet.dk]; as well as the competences of the professional construction client and building administrator. In 2006, a new development programme, “Renovering 2010”, was initiated by Realdania and The Landowners’ Investment Association [www.renovering2010.dk], which e.g. is to follow up on the public initiative “Project Renovering”.

With regard to the technical and specialist aspects, current developments centre on topics 8–12 in relation to the construction client needs and influence from other players in the sector. It also seems that the role of the public sector is changing to budget management of government and non-profit construction clients, whereas private players and associations have taken over much of the technical development of professional construction clients and building administrators and of the property market. The Digital Construction project (see topic 9) is however an exception.

The most recent analyses [Bertelsen, 2006] show continued great interest in the property market in developments within:

- Knowledge on and tools for the analysis of end-user needs and end-user involvement,
- Making the functionalities, aesthetics, and values of buildings more apparent to the end-users,
- Improving the competences of specialists.

In summary:

- The end-user and values of building are in focus,
- New association of professional construction clients,
- Non-public programs: Renovation 2010, non-profit housing innovation network and DUPA (UBST),
- Competence of the professional construction client.

2. 3. 2 Part 5: The early planning phases and the design process

“Projekt Renovering” and “Projekt Hus” worked with several sub-projects and experiments targeted at the design phase and the early planning phases of the consultants. In many situations, this work is carried out in collaboration with construction clients, owners and building administrators. A large part of the projects which have been carried out up to 2006 on new forms of collaboration have had to do with the early planning and design process. However, in overall terms, except for the projects in topics 4 and 8, no large common initiatives targeted at this area are being carried out. The majority of development activities have taken place in connection with individual development programmes carried out in collaboration between architects and large construction clients such as the Danish University and Property Agency [www.ubst.dk]. One example worth mentioning is “Fag og rum i

folkeskolen” (Subjects and Space in Primary and Lower Secondary School) [Kirkeby, 2003b] and “3D-visualisering i arkitektkonkurrencer” (3D-visualisation in Design Contests) [Bertelsen, 2004].

In summary:

- More planning in partnership between end-user, client and consultants,
- Activities in individual demonstration projects.

2. 3. 3 Part 6: Production on construction site in an industrial approach

There have been numerous efforts aimed at the construction site and the construction part of the building process. Experiments with new forms of collaboration in terms of different types of partnering have often been initiated and managed by large contractors, and activities to improve the process through the use of lean construction, cf. topic 8, have also been led by the contractors. Efforts concerning PPPs, cf. topic 1, focused mainly on the construction part, as in the development projects under “Projekt Renovering”.

Debate folder no 2 from “Projekt Hus” [Ministry of Housing and Urban Affairs, 2001b] contains a specific proposal for how to develop this area and the proposal has been continuously realised since then. In addition to new forms of collaborating (topic 8) efforts include large parts of the Digital Construction project regarding the implementation of ICT (topic 9) which aim directly at construction and the construction site. Furthermore, the Benchmark Centre for the Danish Construction Sector (BEC) (see topics 1 and 2) has also placed emphasis on the area, looking at the use of key figures for improving the efficiency of the building process.

Most initiatives have focused primarily on large contractors and the principal contractor’s management of the building process, but there have also been initiatives which aim at specialist contractors and the workmen on the construction site. These include e.g. projects aimed at interdisciplinary construction teams and the self-governing construction site, where sub-initiatives have focused on cross-functional collaboration between workman and new forms of management of construction team on the construction sites and measuring their productivity [National Agency for Enterprise and Housing, 2003], [Bertelsen, 2005b].

Recent efforts have looked at piecework contracts and pay schemes in the construction industry as well as winter construction.

Less seasonal variation and increased winter construction

The need to spread construction work more evenly across seasons and increase winter construction has been addressed several times politically and by the sector itself. In a discussion paper from 2003 to National Agency for Enterprise and Construction from the sector, the sector presented a number of proposals for initiatives. This led to the analysis by several players of a number of key issues [National Agency for Enterprise and Construction, 2004b], and provided the basis for the preparation of a policy catalogue from National Agency for Enterprise and Construction [National Agency for Enterprise and Construction, 2004c].

The policy catalogue contained proposals for the following three initiatives which could promote less seasonal variation and increase winter construction, and which the sector and the authorities are currently working to implement:

- The executive orders are unclear about the division of responsibility between construction client and contractor. A revision is therefore proposed, so that the responsibility is placed with the party carrying out the relevant work.
- Government and municipal clients are encouraged to exploit possible price gains from winter construction as a part of their tendering strategy.
- The sector must gain more knowledge about the technical, financial and procedural aspects of winter construction, and winter construction should be incorporated into basic and further training.

Analyses of piecework contracts and performance-based pay schemes

In connection with work by the Building Political Task Force [Ministry of Housing and Urban Affairs, 2000e] and in “Vækstredegørelsen 03” (Growth Report 2003) [Ministry of Economic and Business Affairs, 2003b], a number of issues were raised as to the significance of piecework contracts for productivity in the construction sector. This, in turn, gave rise to the following analyses by National Agency for Enterprise and Construction:

- Piecework Systems in the Construction Sector – The Role of Piecework Pay in Theory and in Practice, Copenhagen Business School [Kreiner, 2004],
- Performance-based Pay as an element of Value Chain Optimisation in the Construction Sector, Technical University of Denmark [Bjarnø, 2004].

The analysis by the Copenhagen Business School showed that research literature does not link pay schemes to innovation and that this issue has very little relevance to the reality and practice of the construction sector. The link between piece rates and actual pay, in practice, is very loose, and the day-to-day management of the pay issue in the construction sector is very flexible. The shift of focus to a connection between pay schemes and innovation performance is unrealistic and based on a misrepresentation of practice, because reality does not live up to “the idealised economical models”. The construction sector is characterised by long-term relationships, long time frames and interests defined by relationships. Moreover, other things besides pay are important.

The analysis by the Copenhagen Business School also concludes that the apparent logic behind the existing practice is convincing and based on the realistic approach that uncertainty and complexity are fundamental conditions of construction work. A normalisation of the construction sector towards “the idealised economical models” will therefore probably make the determination of pay rates more cumbersome and construction work less

efficient. The logic behind the existing practice in the construction sector allows for action and opportunity for influence by all parties with regard to individual, task and enterprise-dependent differences. The analysis therefore proposes developing the construction sector with a view to improving the ability to deal with pay matters in a more flexible and efficient manner under the given and far from perfect circumstances, rather than attempting to tame the uncertainty and reduce the complexity in order to introduce more rigid pay systems based on “the idealised economical models”.

The analysis by the Technical University of Denmark, which takes a production approach, expresses some surprise at the fact that piecework systems, apparently, are working satisfactorily; that construction teams are self-governing and work quicker than if they were paid on an hourly basis; that the high work rate is not detrimental to quality and health and safety; and that the piecework system is a logical pay system in terms of the sector’s project structure and sensitivity to the economic cycle. Despite these obvious benefits, piecework systems also contain the following significant pitfalls and obstacles for productivity:

- They do not encourage the employer to choose more efficient products,
- They are not based on objective measurements of the actual work effort,
- They are very detailed and demand many resources to negotiate,
- They accentuate the sector’s fragmentation and provide a basis for sub-optimisation,
- They are costly to administrate and contractors are forced to include buffers in their tenders in order to be able to pay for overtime etc,
- They do not encourage development or economising on materials and equipment.

The analysis by the Technical University of Denmark suggests examining alternative and modern pay systems and experience from other sectors. Furthermore, the analysis points out that the piecework system is a product of the structure, the culture and the production conditions of the sector, and that changing the pay system is probably not enough in itself to create the needed increase in productivity for the sector. At all events, introducing new pay systems presupposes a paradigm shift in the sector toward a common focus on process and product optimisation. Here it is important that both employers and employees support the development and understand that it is a complex task which requires parallel efforts on many fronts.

These analyses of the piecework systems and their significance for productivity were completed in 2004 and so far (2006) have not led to any actual development initiatives.

In summary:

- Most initiatives from large contractors on lean and new partnership,
- Self-governing and cross-functional construction team,
- Increasing winter construction,

- Analyses of piecework contracts: “A normalisation of the construction sector towards “the idealised economical models” will therefore probably make the construction work less efficient”.

2. 3. 4 Part 7: The industrial approach and production at the factory

Industrialisation in the form of moving production from the construction site to industrial production of still larger and more valuable building elements is drawing more and more focus. “Projekt Renovering” and “Projekt Hus” [Ministry of Housing and Urban Affairs, 2001c] pointed out that the construction sector should be seen in relation to new industrialisation and promoting a better product market. The industrial manufacturing should include the entire bathroom as a product; the design of products should be given more emphasis; more construction-site tasks should be moved to industrial production; and that there is a need for determined efforts to create a new wave of industrialisation in the construction sector.

As a part of the follow up to the Building Policy Task Force [Ministry of Housing and Urban Affairs, 2000e], cf. topic 1, in 2004 the initiative termed “*Evolution – ny industriel arkitektur*” (Evolution – New Industrial Architecture) was launched in which collaboration between the construction material industry, architects, and schools of architecture was intensified. This initiative and other public-sector initiatives have been co-financed substantially by Realdania cf. topic 3, and there has been much greater focus on prefabrication for construction and on the interaction between the building process and prefabrication. These matters are analysed e.g. in the report “*Systemleverancer i byggeriet – en udredning til arbejdsbrug*” (Prefabrication and Industrialised Production in the Construction Sector – A report for Professional Use) [Mikkelsen, 2005], which includes examples of different systems of prefabrication etc. and their categorization.

In summary:

- New wave of industrialisation?
- New industrial architecture,
- Analyse on prefabrication.

2. 4 Competences (block c)

2. 4. 1 Part 8: Lean-construction, forms of contract and collaboration

“Projekt Renovering” and “Projekt Hus” included proposals for new forms of contract and collaboration, while the network collaboration project on new forms of collaboration (“*Nye netværkssamarbejder*”), cf. topic 2, ran up to 2002 when it was transferred to the network “*Bygherrer skaber værdier*” (Clients Creating Value) and continued until 2006. This latter network initi-

ated trials and practical proposals for different forms of partnering, PPP, and value-based management.

Furthermore, various executive orders were prepared that would promote the use of these new collaboration forms. Experiments with sundry new forms of collaboration showed that many different models were being tested and that the experience of the participating players was predominantly positive. Experience also showed that in cases of difficult problems and conflict there was a tendency to fall back on old forms of contract and collaboration, and that there was a widespread need for documentation that new forms of contract and collaboration would in fact save money.

The public sector places high priority on the demand for government and subsidised construction to make greater use of the new forms of collaboration. Developments as such are primarily taking place within the framework of large contractors and clients, but it is still difficult to provide any clear documentation of financial benefits from Danish trials.

Currently, there is focus on lean construction and here developments are taking place e.g. within the private-sector association Lean Construction DK, which is anchored at the Danish Technological Institute. [www.leanconstruction.dk]. The Danish Technological Institute writes e.g. that Lean Construction DK is working to disseminate knowledge about and implement lean construction in the Danish construction sector, as well as to communicate Danish and international experience from the lean construction process. Lean Construction DK aims at all players in the building process and its members include both large and small enterprises within a number of industries and sub sectors: clients, consultants, contractors, suppliers, manufacturers, sector organisations, and training and educational institutions.

In summary:

- New forms of contracts, partnerships and collaborations,
- Various executive orders form the requirements for public activities,
- Focus on lean-construction in new private association,
- Effects on productivity and defects?

2. 4. 2 Part 9: Utilisation of information and communication technology (ICT)

Digital Construction is a current main initiative concerning ICT in Denmark and it is one of the initiatives in the government's *Konkurrenceevnepakke "Vækst med vilje"* (The Competitiveness Package – Determined Growth) and a part of the initiative "*Staten som bygherre*" (The Government as Client). The purpose of Digital Construction is to enhance efficiency in the construction sector through increased use of information and communication technology (ICT). The financial basis is an appropriation of DKK 20 mill. (2.5 mill €) by the Danish Finance Act, a contribution from Realdania of DKK 10 mill. (1.3 mill. €) and a corresponding amount of co-financing

from the players involved. Digital Construction was carried out in the period 2003 to 2006.

Firstly, the Digital Construction project provided a common foundation for standards and methods, so that all players in the construction value chain could speak the same digital language. Secondly, a number of client demands were set out in the context of the project. For instance, from January 2007, all construction data in connection with government building projects must be managed and exchanged digitally. Invitations to tender and tender submissions will be submitted electronically via the Internet. Design and planning will be executed in digital building models at different levels of detail. The players involved in specific construction projects will share and exchange data and documents on a common project web. When construction is over, they will hand over operation and maintenance data to the client along with the building. Read more on: www.detdigitalebyggeri.dk.

According to National Agency for Enterprise and Construction, Denmark together with Norway and Finland has taken the world lead in developing and implementing Building Information Models (BIMs). Norway is primarily working on developing international standards, whereas Finland has put efforts into developing actual software applications for processing BIM data. Denmark is in front with regard to public-sector requirement setting and the actual implementation of these with the employees in the sector, including developing operational standards. In the US, public-sector construction has shown a special interest in the Scandinavian development. The US Coastguard and the US General Service Administration has expressed a wish for closer collaboration with Scandinavian countries, including Denmark.

Digital Construction influences the early planning phase in the building process, industrialisation of construction, as well as costs and defects and non-acceptance.

The architectural scale model is best used to create an improved decision base for architectural and technical solutions in the early phases. This can be accomplished using a broad range of visualisation and simulation opportunities. Types of visualisation span from individual, perspective representations and photo-realistic stills and film sequences to virtual-reality representations. Simulations can clarify a number of conditions regarding the building's energy consumption, convenience for the end-users, safety aspects etc.

The object-oriented building model is a digital model of the rooms and building parts which makes it possible to integrate virtual objects from building material suppliers or from manufacturers of prefabricated modules into CAD environments. It thus creates the digital opportunities for mass-customisation in line with manufacturers of kitchens etc., and the Digital Construction project therefore supports industrialisation within the Danish construction sector.

A key challenge linked to calculating the costs and benefits from the introduction of ICT in construction is how to allocate costs and benefits to the different players. It is a characteristic of most cross-sector information and communication technologies in the construction sector that the player in-

vesting the time or the physical resources is not the one to benefit directly from this investment. This is the precise reason why the Danish government has launched the Digital Construction initiative in which the state, through its demands, makes for the necessary change in the value chain. What price the individual players in the value chain put on the new demands is therefore not given beforehand.

The demonstration projects under Digital Construction have not provided us a clear picture – on the contrary, experience from e.g. putting a price on digital supply of operating data has varied significantly. Some enterprises consider it a matter of reducing own costs or investing in the future. Other tenderers believe that it increases the price of their services.

Overall, one might say that Digital Construction has been the most important initiative within ICT in recent years. Efforts were being made to complete the programme in 2006 so that the learning phase could commence and experience be disseminated to more players in the construction sector. However, there is no doubt that a need remains for continued development in this area and implementation will span several years. Unquestionably, this topic, along with key topics such as topics 11 and 12, is therefore of interest to Denmark in the future development in the Northern Dimension.

In summary:

- “The Digital Construction” is the important development program in 2003–2006 (4 mill. €),
- Object oriented building model,
- Common standard and methods,
- Key challenge: Calculation benefits.

2. 4. 3 Part 10: Quality and defects in building, construction and management

In 1986, an extensive quality assurance reform was prepared for subsidised construction, which was realised e.g. with the establishment of the building damage funds and public requirements for documentation of quality assurance in the building process. The following 10 to 15 years offered different tightening initiatives and development initiatives that were to improve the effect of quality assurance efforts, although results in the form of reduced number of failures have not begun to show until in recent years. However, there is still a lot to be done in this area. This is evident e.g. from the most recent guidelines from National Agency for Enterprise and Construction’s “*Kvalitetssikring i byggeriet*” (Quality Assurance in Construction) [National Agency for Enterprise and Construction, 2003b] which state:

The experience of the building damage funds since 1986 is that there continues to be a substantial number of incidents of building damage linked to new construction. The reasons today are as plentiful as they were before 1986: defective basic engineering,

lacking instructions for correct assembly, flaws in construction and assembly, excessive materials minimisation, mismanaged cost-cutting, insufficient sanctions and penalties, and poor use of building technical and organisational experience. The philosophy behind quality assurance has therefore still to make its impact.

The quality assurance guidelines were followed up by another attempt at improving the quality of construction, in this case concentrating specifically on the causes of the many defects and non-acceptance. First, SBI prepared the report “*Svigt i byggeriet – økonomiske konsekvenser og muligheder for en reduktion*” (Failures in Construction – Financial consequences and how to reduce numbers) [National Agency for Enterprise and Construction, 2004c]. The report showed that the costs of remedying failures in construction amount to DKK 12 billion (1.5 billion €) annually, which is about 10% of the total production value of the sector.

The greatest contribution is from failures in the construction phase, and the reasons for a substantial number of these originate in the design and planning phase. Failures, the results of which are detected after the project has been delivered, are very visible and give rise to many problems for the client and for the users of the building.

The report asks a central question: why has the sector not been successful in its own efforts to reduce this waste? At the same time, the report points out that the complexity of the construction sector could be an important reason for the many failures. Furthermore, the report claims that a building process with few failures is a process that has good productivity, and therefore this should encourage prompt solutions, because money can be made. The report sets up the following list of obstacles.

- There is no wish to clarify costs in order to remediate failures.
- The costs and benefits of quality assurance accrue to different players.
- The costs of improving quality assurance are certain, whereas savings are seldom calculated and therefore appear less certain.

The report points at many of the same tools to reduce failures: productivity development, lean construction, and early tendering and partnering.

As a response to the report, National Agency for Enterprise and Construction in 2005 published “*Byggeriets handlingsplan mod fejl og mangler*” [National Agency for Enterprise and Construction, 2005] including eight proposals for initiatives and with contributions from all major organisations in the construction sector. The first four proposals aim at the construction process, and these have been dealt with by the organisations. The proposals include a collective agreement about fewer defects and non-acceptance, standard agreements for private customers, optimisation of the building process, and on-time delivery. The next two initiatives aim at engineer and technical education programmes, and the two final initiatives are analyses on description and clarification of causes.

It is expected to be able to measure effects of the initiatives in two years time, and the result to be halving in the number of construction defects and

non-acceptance. However, this is not in accord with actual experience so far from the quality assurance reform. The measurable effects of which did not appear until 15 years after and even today, 20 years after, the number of defects and non-acceptance in subsidised construction has been far from halved.

In addition to construction defects and non-acceptance, measuring the quality and standard of the completed building have been attempted in smaller, individual projects throughout the period. These include seventeen specific evaluations of non-profit housing, including descriptions of methods in guidelines, were carried out in the period 2000–2003 and have been described e.g. in “*Metoder til kvalitetsevaluering af alment boligbyggeri*” (Methods of evaluating the Quality of Non-profit Housing Construction [Bertelsen, 2001], “*Vejledning for byggeriets parter – Evaluering af kvalitet i boligbebyggelser*” (Guidelines for Players in the Construction sector – Evaluation of the Quality of Residential Housing) [the Ministry of Housing and Urban Affairs, 2000d], and “*Erfaringer med evaluering af standard og kvalitet*” (Experience from Evaluation of Standards and Quality) [National Agency for Enterprise and Construction, 2003a]. This was followed up in 2005 by a proposal for how to incorporate evaluations of the quality and standard of residential buildings in the key figures system for residential housing, targeted at the Building Damage Fund’s evaluations of non-profit housing [Bertelsen, 2005a].

With regard to the development of quality assurance in different parts of the sector, in the recent years we have seen a number of initiatives, which have raised the general competence and quality of Danish construction. It is tempting to say that the trend in the Danish strategy has been to link absence of defects and non-acceptance with quality in construction. Often it is only public-sector minimum requirements that are discussed, while differentiation of standards according to needs, and deviations from minimum requirements, are discussed less often.

In summary:

- Failures cost 1.5 billion € (10%),
- A new sector initiatives will hopefully halving the defect in two years,
- Old experiences from 1986–2006: Only a minor effect is seen after 15–20 years intensive public initiatives,
- Quality and standard evaluation on 17 non-profit housing in 2000–2003.

2. 4. 4 Part II: Economy, Life Cycle Costing (LCC) and sustainability

Periodically, there have been initiatives concerned with Life Cycle Costing (LCC). Such initiatives stemmed from requirements regarding government and subsidised building projects in the late 90s and include the guidelines “*Totaløkonomiske beregninger i statslig byggevirkksomhed*” (Calculation of LCC in Government Building Projects) [Ministry of Housing and Urban Affairs, 2001e]. The requirements were adjusted on an ongoing basis, but in

many cases in practice they did not meet the level of overall visions [Haugbølle, 2002]. This and other experience led to tightened requirements and to the development of ancillary tools [Haugbølle, 2002], e.g. Trambolin, cf. topic 2, which however never became widespread.

At Nordic level, under Nordic Innovation, a joint project was carried out from 2002 with Sweden, Norway and Finland. The project ended in the report “*LCC for byggverk – Nordisk hovedprosjekt – sluttrapport*” (LCC in Construction – Nordic main project – Final report) [Bjørberg, 2005]. This report provides a good overall description of the status and proposals for further work on LCC by the individual countries.

General assessments of productivity in the construction sector are normally presented with the introduction of new political initiatives. The conclusion has been the same for many years:

- The Danish construction sector has a low productivity performance compared with other countries,
- Material costs are 10–30% higher in Denmark than in neighbouring countries,
- The productivity of the Danish construction sector is considerably lower than all other sectors in Denmark.

This has been the general message for the past 20 years and at the same time it has been said that there have been no observable improvements. It therefore seems appropriate to consider the following:

- If initiatives over the past 20 years have led to no observable changes in productivity, what could be the reason?
- Have no parts of the sector showed improvements, or is it difficult to analyse individual segments, enabling us to get a more nuanced picture?
- Do many of the initiatives perhaps have the wrong innovation philosophy which does not promote the target of lower costs, or are initiatives in themselves not a motivating factor for the individual players?

Attempts have been made to break down the costs for individual segments in the sector. The Benchmark Centre for the Danish Construction Sector (BEC) has been working with this in its efforts to spread the use of key figures. Moreover, a report on figures on the productivity of the individual projects within urban regeneration in Copenhagen in the period 1987–1995 was published in 1999 [Bertelsen, 1999].

At Nordic level, under Nordic Innovation, a joint project between Denmark, Norway, Sweden, Iceland and Finland was carried out in the period 2000–2004. The results were published in the report “Productivity studies in Nordic building- and construction industry” [Ingvaldson, 2004]. This report described two approaches to productivity in the Nordic countries. There was either a contractor or a production approach, or there was a construction client or a real estate approach, which looked at the end result for both price

and quality and not just the production conditions. Experience from this work is a good basis for further work on analysing the productivity of individual segments in the construction sector.

In summary:

- Nordic joint project on LCC,
- New benchmarking centre and key figure system,
- Still no improvement in productivity!!!
- Nordic report on productivity with a contractor and a client approach.

2. 5 Research, evaluation, education and innovation (block d)

This topic is new and was not included in the proposal in the Swedish report [von Platen, 2006]. We have included this topic because the enhancement of research and user-driven innovation is currently being given much attention in Denmark. Another reason for the inclusion of this topic is that we have been asking ourselves during the preparation of this memorandum whether our initiatives in Denmark have focussed too much on technical development and new legislative requirements, and that we have been suppressing the business aspect, motivation, and more effective change processes.

With regard to the business aspect, the Building Policy Task Force [Ministry of Housing and Urban Affairs, 2000e] has provided targeted efforts to enhance research, cf. topic 1. Debate folder no. 4 from “*Projekt Hus*” about communication and innovation [Ministry of Housing and Urban Affairs, 2001d] stresses the necessity of improving innovation efforts within the construction sector, however there have been no concrete results. Up to 2006 total funding for building research has been falling, but the Danish government’s most recent declarations in 2006 promise a drastic increase in research funding and an ambition for more user-driven innovation. However, whether there actually will be increased efforts within construction is uncertain.

Looking back on the initiatives of the last 10 years, it is striking that the aspect of learning as necessary for change in the construction sector has not been given attention until recently. At the same time, it is also clear that only few ideas which could have an effect on the bottom line of enterprises and on the productivity of the sector have been followed through and applied in the market. This takes us back to the questions in topic 6 on whether we have been applying the wrong innovation philosophy when so many good initiatives and intentions have not been able to provide the desired market effect on productivity.

It is therefore not sufficient to stipulate legislative requirements, introduce new forms of collaboration, and produce many innovative development projects. We have not met our target until their effect can be established in the form of cheaper and better construction and living and working space for the end-user. The lessons to be learned, and which we highly rec-

ommend using in further development of the innovation competence of the construction sector, are:

- Have we given enough consideration to the motivation of employees and incentives for enterprises to make improvements in reality?
- Have we differentiated innovation efforts toward the individual segments, so that they experience a clear effect in their own area and not just at a general level?
- Have we given enough attention to innovation competences and the business aspect in developments and to the sector's understanding of evaluation, quality, good communication, and learning as crucial tools for development?

Reflections from the paper:

- Focus mainly on legislation and technical development.
- We have suppressed the business aspects and motivation, and no observable effects on the "bottom line" have been detected.
- Public funding has been reduced.
- In 2006 the government promise:
- Research funding will increase
- More user-driven innovation.
- Uncertain if the innovation efforts in the construction sector will increase!
- Question: Have we applied the wrong innovation philosophy when so many good initiatives and intensions have not been able to provide the desired market effect on productivity?
- Proposals for future developments:
- More improvements in reality and in motivations of employees,
- Differentiate innovation towards the individual segments,
- More intension on business aspects, innovations competences and on evaluation, quality, communication and the learning process.

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3. Finland

3. 1 Why is society interested in the functioning of the building sector?

The Finnish real estate and construction sector and its numerous actors have a significant impact on the Finnish national economy and the welfare of the Finnish people.

3. 1. 1 Real estate and infrastructure account for over 70% of national wealth

The total national wealth of Finland stands at about EUR 560 billion. More than 70% (around EUR 400 billion) of it consists of real estate and built infrastructure. The annual value of the operations of the real estate and construction sector is about EUR 50 billion or 20% of GDP. International operations account for nearly a third of that at EUR 15 billion.

3. 1. 2 The sector employs 20% of the workforce

The real estate and construction sector employs annually over 500 000 people or every fifth employed Finn. Nearly half of the employment effect comes from new construction and renovation and a third from facilities management. The construction products and building services industries employ 15%, which is the same share employed by sector services such as design, trade, transport, training, research, supervision by authorities, etc. International operations also provide work opportunities in Finland. The employment effect outside Finland is manifold.

The real estate and construction sector produces 20% of the country's tax revenue and accounts for 8% of its exports. Its trade balance is clearly positive.

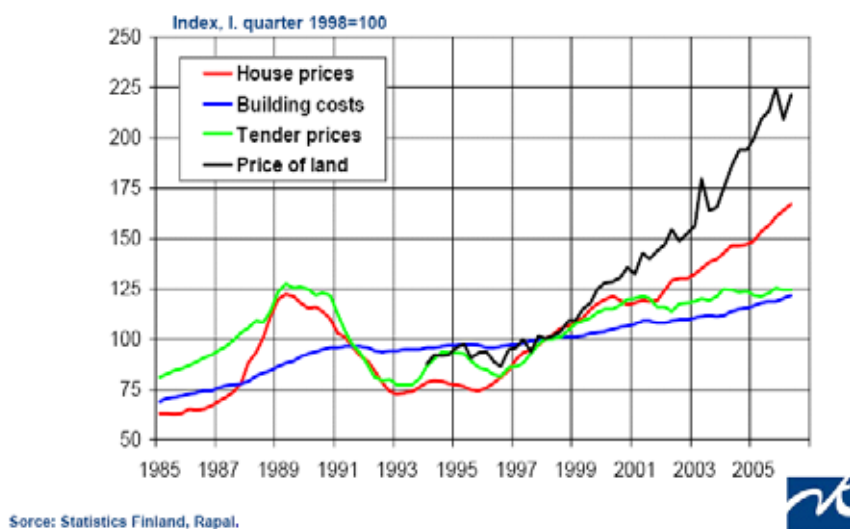
3. 1. 3 Construction has significant environmental impacts

The building stock and construction account for 40% of total energy consumption. Energy consumption during the use and occupancy of buildings is significant: 80% of the emissions are created then and 20% in the construction phase.

3. 2 There are many reasons for high cost of living in Finland

Many factors besides construction costs affect living costs: availability of financing, the competitive situation, operating and maintenance costs during occupation and the quality level desired by the client. Higher than normal investment-phase costs are acceptable if the extra investment can be expected to result in savings in energy economy during occupation.

Figure 3. 1. Price Indices of various construction costs and prices

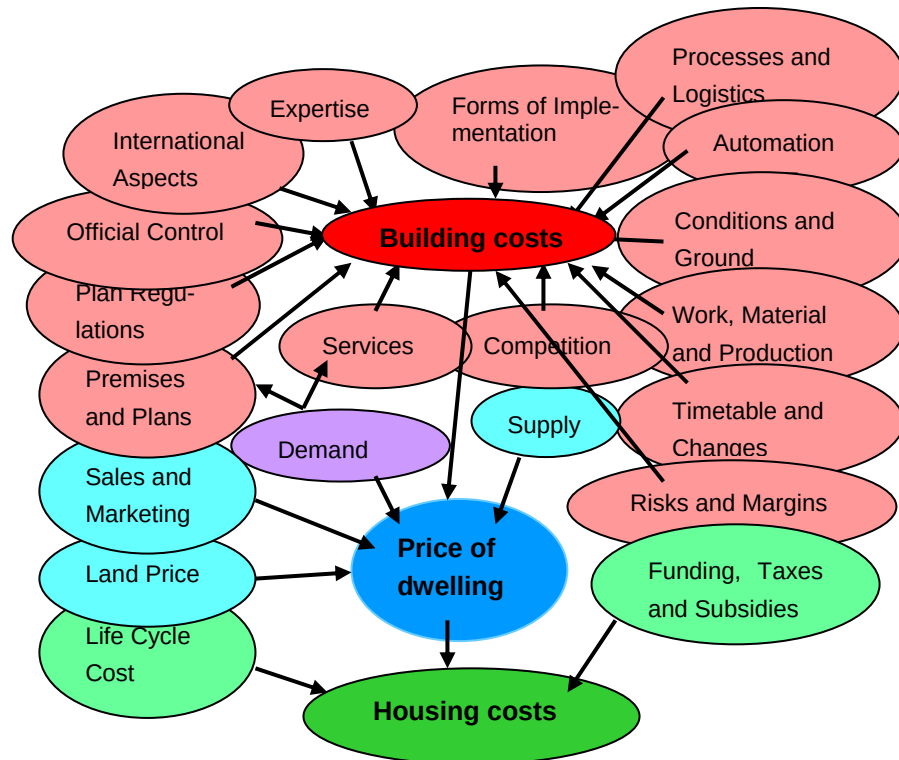


The following is a short description of the key factors behind the high cost of living in Finland (Source: Helsingin Sanomat 23. 1. 2006).

- Demand exceeds supply in growth centres,
- In times of rising prices sellers and builders are tempted to ask maximum prices,
- Low loan interests and long loan terms have introduced more money into the markets,
- Higher quality standards and stricter norms slow down construction,
- Construction costs have risen markedly. There is a shortage of e.g. site managers,
- Enough plots, i. e. building rights, are not available,
- Price of land has risen sharply,
- Planning is time-consuming due to various interest groups,
- Appeals against plans and building permits may postpone projects,
- People resist changes in their living environment,
- Too little cooperation across municipal boundaries,
- In periods of rising land prices, owners delay selling,

- Light taxation of real estate does not pressure owners to sell unbuilt plots,
- Planning is expensive for municipalities: water supply and sewerage systems, roads – maybe even day-care centres and schools – need to be built.

Figure 3. 2. Formation of building and housing costs



3. 3 Some government initiatives aimed at the building sector

The national strategies and action programmes concerning changes in housing, housing construction and management of costs in Finland are as follows:

- Housing policy programme,
- Building policy programme,
- National renovation strategy,
- Programme for promoting wood-based construction,
- Housing business cluster and housing and construction centre-of-expertise clusters,
- Raising the level of expertise: teaching, research and product development,
- Information services and their maintenance.

3. 3. 1 *Housing policy programme 2004-2006*

The goals of the housing policy programme are:

- To promote the supply of high-quality, reasonably priced housing regardless of the household's economic situation and place of
- Residence,
- To promote the attainment of a regionally balanced and stable housing market,
- To increase the supply of social housing and promote healthy housing,
- To promote the building of new residential areas considering their effect on urban structure and traffic arrangements.

The principal means for attaining the goals include housing funding and subsidy schemes, increasing the supply of plots and housing in growth centres, increasing the supply of privately funded rental housing by means of real estate investment fund schemes and more efficient maintenance and repair of the housing stock.

Development of housing funding and subsidy schemes means development of the terms and conditions of interest subsidies, guarantee output and forms of grant as well as using grants to promote housing for groups with special needs.

The supply of plots and housing in growth centres will be increased by promoting the construction of new residential areas through infrastructure grants and by complementary building in suburbs.

3. 3. 2 *Building policy programme (2003-2007)*

Quality of buildings and their surroundings must be improved. This should be achieved through life-cycle and environmental expertise and on the residents' terms. The main goals are:

- To develop the real estate investment fund scheme,
- To develop a planning procedure for shortening the time between planning and construction (shorter appeal periods, planning across municipal boundaries),
- To promote and create competition, taking into account the quality and overall economy of projects,
- To promote obstacle-free housing and living at home by those of advancing years,
- To develop life-cycle models as a new basis for implementing projects,
- To develop information management systems in order to improve the productivity of construction, real estate maintenance and the management of customer relationships and networks as well as to improve quality,
- To develop standardisation within the EU real estate and construction sector and adjacent areas,
- To develop life-cycle and environmental expertise.

3. 3. 3 *National Renovation Strategy*

The strategy will be prepared by a strategy group led by the Ministry of Environment which has members from many authorities, associations, universities and research institutes. The strategy will be completed by April 2007.

The main objectives of the renovation strategy are to develop real estate maintenance and associated services, processes and control instruments as well as to increase expertise, safeguard resources and satisfy information needs.

The focus of the development of processes and control instruments is on promoting quality assessment, highlighting project preparation, developing official control, smoother functioning markets and extensions and complementary construction and changes in occupancy.

3. 3. 4 *Wood-based construction promoting programme 2004-2010*

The housing policy-related goal of this programme is to ensure adequate, reasonably priced housing that corresponds to needs. One step towards that goal is to shift the emphasis from blocks of flats to detached housing. This means site development, complementary building, partnership projects and new funding solutions. Another step is to ensure the prerequisites for profitable production of detached housing (for contractors and private builders). This means reviewing e.g. official fire regulations, raising the level of expertise, cooperation with areas adjacent to Finland and developing services.

3. 4 Some non-governmental initiatives aimed at improving conditions in the building sector

Below some joint construction-sector programmes involving companies and the Government are described as well as some other construction-sector research programmes.

3. 4. 1 *Vision of the Finnish Real Estate and Construction Cluster 2010 and Better Housing 2010*

Internationalisation increases in pace and depth:

- Players and customers are becoming mobile and more internationally oriented which will affect market structures, service concepts and local players' daily routines,
- Harmonisation of official regulations (EU Directives, standards and domestic regulations),
- International business practices and contractual usages and risk assessments,

- Environmental and life-cycle indicators and product-model-based information management.

Services increase and become networked:

- Housing market moves from a production-oriented approach to a service-minded approach (housing business cluster),
- Users' needs, customer,
- Segments, mass tailoring receive more emphasis,
- Construction companies assume responsibility for the entire life cycle of real estate, real-estate services increase,
- The comparability of different procurement options (life-cycle vs traditional models) improves.

Information management becomes an increasingly important success factor:

- Digital network economy becomes part of all business activity,
- Real-time purchasing and supply of products and services around the world,
- The right information in the right place at the right time,
- Information and communications technology helps,
- Tailor product and service concepts for customers,
- Development of data-networked, interactive real estate business operations,
- Use of product models and product information in planning, production and maintenance,
- Mobile work by users of premises affects sector's products and services.

Energy-efficiency and eco-efficiency increase in importance:

- Solutions, service concepts and new business approaches that reduce real estate life-cycle costs and are environmentally friendly will be developed,
- Construction cost elasticity becomes acceptable at the investmentstage when additional expenditure is expected to improve the qualityof a building's life cycle,
- More use of environmental classification and environmental and life-cycle indicators.
- Business forms that support the use of renewable energy sources will be developed,
- A common view about the need for and means of developing energy efficiency will emerge.

Better Housing 2010 – A housing market operating on residents' terms:

- The new-building and renovation market will productise housing concepts and products meeting various needs,
- Planning will respond to regional demand and demand for different types of housing services,
- There will be options on the market: owner-occupied and rental dwellings and in-between forms,
- Investment in housing will be attractive and there will be a range of products and services for funding,
- The home will also be a user interface for service and communication needs,
- Data transmission facilities for residences and residential areas will be of a high standard,
- Housing subsidy schemes will genuinely and flexibly support those in need of housing.

3. 4. 2 Tekes – Finnish Funding Agency for Technology and Innovation, Building Technology Programmes

Sara technology programme 2003-2007 introduces value networking into construction. The goal is to improve international competitiveness of the construction sector by

- Improving the sector's ability to produce added value for customers,
- Generating value networks that exploit information technology on a wide scale,
- Developing methods for identifying and managing customer needs,
- Developing new products that meet new and real customer needs.

The programme aims to increase building product exports and improve the quality of buildings the productivity of construction.

Cube - The Building Services Technology Programme 2002-2006 develops premises, products and services that promote sustainable development and are based on life-cycle thinking. The goals are

- Innovations associated with the use and maintenance of properties and the updating of premises. Close interaction with related sectors such as the chemical, energy, engineering, ICT, electrical and electronics industries.
- Value added created by the application of information and communications technology (ICT) should translate into higher volumes and profitable business on the domestic and export markets.
- Energy-efficiency of properties is to be improved substantially.
- Introduction of customer-responsive life-cycle and overall economic processes.

- Application of building services technology to enable switching from one-off projects to continuously developing business activities and processes. Overall responsibility for the operational characteristics and contents of a service plus the implementation solutions to lie with the service supplier.
- Efficient networking of corporate activity at international level.

Serve technology programme 2006-2010 offers the entire real estate and construction sector a good framework for developing customer-responsive and networked service models. The goals are

- To make services more competitive and promote the creation of new, internationally successful service concepts and business models.
- To develop innovative service concepts that can be repeated and copied.
- The transformation of service markets so that space is created for new services. service concepts that transform markets will be a response, for example, to the public-sector challenge to increase productivity and improve cost-effectiveness.

Masi technology programme 2005-2010 develops modelling and simulation. Its digital product processes take into account the usability of product knowledge during the life cycle as well as the development of the operations of subcontractors and partners located in different geographical areas.

The European ICT Prize provides public recognition and visibility for innovative companies that productise new ideas into commercial products.

3. 4. 3 Product-model based data management ProIT project

The Pro IT project has been developing the entire construction process and its procedures with a building product model concept serving as a common source of information for the various parties involved in the process. The scope of the project covered modelling the product model-based process and its data exchange, compiling the design guidelines needed in product modelling, and creating product structure libraries.

The project was supported by the member companies of the Confederation of Finnish Construction Industries RT, who performed the piloting and testing with the help of real projects and products. The work was done in cooperation with Tekes (the Finnish Funding Agency for Technology and Innovation), consulting engineers and architects, construction clients, and other interest groups. Industry-wide product modelling procedures and guidelines were created as a result. The results are public, and the publications of the project can be downloaded for free.

Product model-based data management in a construction project connects the information needed for design, product manufacturing, construction, and the use and maintenance of the building. Product modelling transforms building design from traditional line-drawing to 3-D design which integrates other product information. Design is done with the help of prod-

uct structures and components. The spatial model contains information about the spaces, their location, area, and other desired characteristics. Product structures, such as walls and slabs, contain information about, for example, materials, measurements, thermal insulation, strength and environmental qualities. When the schedules are linked with product structures, the result is 4-D design.

The aim of product model-based data management is to

- Improve customer service by generating useful information to support decision-making and by visualising and comparing alternatives functionally and in terms of costs.
- Enhance and speed up design by generating more precise information and by reducing design errors, by improving the plans' compatibility and by promoting collaboration between various designers.
- Improve construction quality and productivity by generating more practically usable information for production planning, cost management and scheduling, and the manufacture and procurement of building products.
- Promote life-cycle management by improving product data management and by generating information for the building's entire life cycle, which makes it easier to consider life-cycle costs and environmental impacts in the design phase, and which can be used in many ways to support the use and maintenance of buildings.

3. 4. 4 Application of Information Technology in Mechanical, Civil and Automation Engineering (KITARA, 2005-2009)

The KITARA research programme was initiated by the Academy of Finland, the National Technology Agency Tekes, the Finnish Ministry of the Environment, the Confederation of Finnish Construction Industries and the Finnish Association of Building Owners and Construction Clients.

Its aim is to strengthen basic research expertise in the fields of mechanical, civil and automation engineering through the application of ICTs. The programme supports the development of new multidisciplinary research groups and national and international networks of research cooperation.

The KITARA programme involves 15 consortia projects. The Academy of Finland and the Ministry of the Environment granted funding for ten projects and Tekes for five projects. Eight of the projects are in the field of civil engineering, four in mechanical engineering and three in automation engineering.

The total funding of the KITARA programme amounts to EUR 8 million. The Academy of Finland's Research Council for Natural Sciences and Engineering granted EUR 5.6 million for the programme in project funding; the funding provided by the Ministry of the Environment was EUR 0.4 million and that by Tekes EUR 2 million.

The subjects of research are

- ICTs that support design, manufacture and use,
- ICTs incorporated in the project,
- Life-cycle management and its networking in companies and systems,
- ICTs that support interaction between users and building/machine and the changing use environment.

3. 4. 5 Other surveys in the 21st century include Management of housing and housing construction costs

- Social effects of construction,
- Effect of building regulations on housing construction costs,
- Making actual housing prices public,
- Monitoring of prices of dwellings and plots, Building Cost Index,
- Reports and barometers predicting the trend in construction,
- Cost calculation programmes for planning solutions, and books and information on construction costs,
- Need for housing construction 2020 (ASKARE),
- Volume of renovation activity and surveys on renovation needs,
- Life-cycle economy surveys, zero-energy building,
- Quality points/star classification for detached houses,
- Productivity of construction and real estate sector,
- Logistics, development of supply chain,
- Data bases on Construction Defects,
- Control-of-demand and decision-making tools, EcoProp product family,
- Planning tools for the new Vuores residential area.

3. 5 What impact have all the initiatives had on the costs in building ?

The productivity and quality of construction and rising housing prices are a subject of continuous discussion in Finland. Construction productivity has developed reasonably well in this country: at the average rate of industrial productivity. The development has been influenced by the shifting of site work to plants where productivity is higher, the introduction of new, more efficient and lighter construction machinery and better planning of information management, and logistics. Housing price rises in Finland have not been exceptional in international comparison.

The impact of building regulations on the costs of housing construction has also been studied. It has been strong, but new regulations have also improved the quality of dwellings and, for instance, their energy economy. Recently especially rising plot prices has received attention. Supply is low in growth centres which increases prices.

It is believed that the costs of housing construction can be influenced by the following means.

- Stability and dynamics of the residential construction environment and conditions
- reduction of cyclical and other fluctuations,
- an innovation-supporting environment and R&D, adequate supply of plots, ensuring the existence of resources and competition, opening-up of markets,
- ensuring the existence of competent employees for all phases of construction.
- Improved efficiency
- new innovations in constructability, processes, industrialisation,
- new procurement methods, re-engineering, utilisation of new technologies throughout the process,
- planning at plant and site, mass customisation.
- Improved quality of end product
- quality control, contracting, product approval,
- control of life cycle economy.

Key means of exerting influence related to actual construction:

- Increasing the clients' (owners') competence and ability to lead the building process,
- Reducing the number of defects in building construction and management,
- Choosing suitable forms of contract and eliminating non-value-adding activities during the building process,
- Focusing on early phases (planning, sketching and design) and utilizing gained experiences in the building process,
- Introducing an industrial approach (processes, logistics, procurement and purchasing),
- Promoting a life cycle cost (LCC) approach in building and management,
- Utilisation of ICT (Information and Communication Technology) during the whole planning, construction and maintenance process,
- Focusing on cost management and constructability in the planning and design phase.

3. 6 Conclusions

In Finland the interaction and cooperation between various parties/actors of the real estate and construction sector is active. The working groups of ministries include representatives of industry, commerce and research. Cooperation within the construction industry between contractors, subcontractors, consulting engineers and architects, and trade is also active.

Society must provide a framework for competition in housing construction by eliminating factors that restrict competition, by opening markets, by creating incentives for the use of new technologies, innovations and information technology, it must secure the availability of labour and education and sufficiency of building land. A key issue is the introduction of housing construction on occupants' terms. Construction is still production-oriented.

In addition to new construction, attention should be paid to bringing renovation costs under control. Nearly half of the money spent on housing construction goes to renovation, and the share is increasing.

Increasing the effectiveness of construction processes is seen as a key means of improving the quality and productivity of construction. The sector should reach a situation where costs fall as a result of higher productivity. Presently the general attitude is that annual price rises are a natural occurrence.

Dwelling prices have risen as a result of the increased purchasing power of the Finnish people which, again, is the result of low interest rates and clearly longer loan payback periods than before. The prices have risen clearly faster than the costs of housing construction. Plot prices, again, have risen much faster than dwelling prices.

The survey of the costs of construction must be broadened to cover life cycle costs. A small additional investment in the construction phase reduces life cycle costs. The survey should also look at overall living expenses. Urban sprawl causes additional costs due to more distant workplaces.

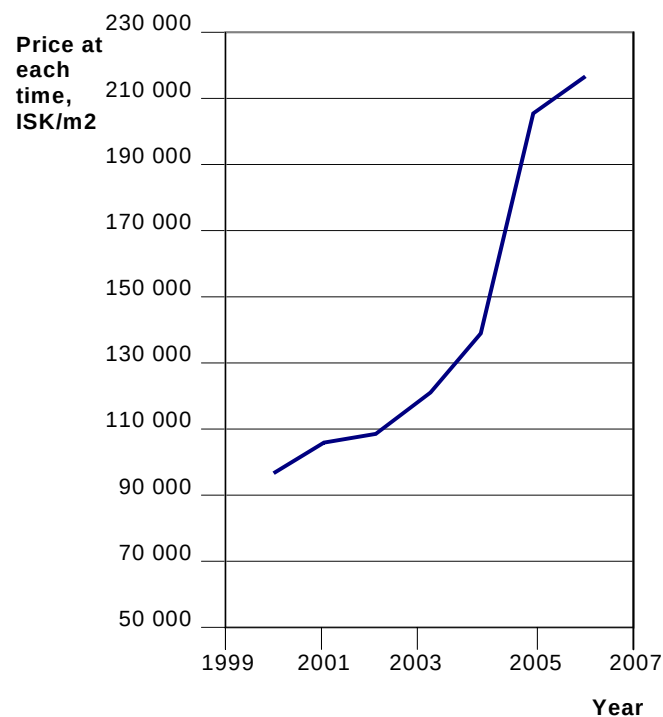
Themes that are interesting from the Finnish viewpoint are productivity, information technology applications, management by explicit knowledge, industrialisation and comparison of the development of various countries.

4. Iceland

4. 1 General discussion

Discussion on housing cost was prominent some decades ago, but has been very silent now for some time. This may be explained partly by the fact that the most usual way to own a house has been for the prospective owner to build the house, usually with some help from craftsmen. The owner thus had a pretty good control over the building cost, and of course only had to pay directly for part of the price of housing. The last ten years or so it is getting much more common for a building company to acquire lots and build houses for sale. The industry then of course claims that the productivity is good and the prices of the houses are reasonable. During the last few years though the prices of housing have risen markedly (see figure), but then it must be said that for some years before the price level had been very constant.

Figure 4. 1. The actual market price pr. m² in houses of size 150- 210 m² in July each year



Source: Fasteignamat ríkisins

It should be realized, at least this seems to be valid for Iceland, that the building construction firms will build houses for what it costs and then sell them at the price the market is willing to pay. It is not self-evident that increased productivity, cheaper materials or better solutions will lower the market price of housing, for this also a stable market and well informed buyers are required.

Now the discussion has started on the prize level of lots, especially in Reykjavik and neighborhood and of course also on the fast increasing building cost. Definitive measures to affect the building cost have though not been taken for some decades now, but discussion regarding how to ensure better quality crops up now and then.

4. 2 Work regarding building cost and quality

4. 2. 1 *Official instances and institutions*

Íbúðalánasjóður (*The State Housing Board, SHB*) started in the early sixties, and from the start on the main objectives for the SHB was to ensure that at any time funding for housing was existing and to take care of the practicalities in lending people the money. Furthermore special funding for social housing was ensured and SHB had an own technical and design division. The technical division's main work was to inform about housing and to ensure that the design was cost effective and sufficient for buildings, as at these early years the limited numbers of designers on the market were mainly occupied with serving official authorities.

SHB was the only instance that gave loans for building of housing until year 2000, and most of the time the capital cost rate was to some extent subsidized compared to the general capital cost rate on the market. The funding went to both individuals and co-operative building organizations, where the latter received better contractual conditions. In these early years SHB organized design competitions to increase variety in buildings and seek for better technical and functional solutions. Until the early seventies the funding was limited to houses of given maximum size which depended on family size of the applicant. The amount of loans furthermore had a certain roof based on estimated building cost for an economical house of the given size. The limitations on the amount of each loan were of course intended to ensure the economical aspects of housing, and certainly worked successfully but irritated many who said this hampered the individual rights of people to do what they wanted. In year 2000 the monopoly of SHB for funding of housing was abolished, now SHB and all the banks are functioning on this market and the loans bear a market cost rate.

In the current laws for SHB (*Law 1988 nr. 443*) it says that the main field of work of the State Housing Board shall be (two paragraphs of interest):

- “To ensure through loans and planning of housing that Icelanders can live in security and equality regarding housing and that funding will be used especially to increase the possibilities of people to own or hire
- “housing for living at an economically reasonable price.’
- “Work for technical innovations and other improvements in the building sector, e.g. by loans or grants in accordance with requirements in the regulations.. “

The latter paragraph cited has been used to fund many research projects that are aimed for better quality of housing, lower cost, better productivity. The projects are of various kinds; studies of the general market, building technology, surveys of existing buildings or pure material science.

- Condition of buildings and maintenance needs
- The project report gives the results of a condition survey and answers from house owners regarding maintenance done on their buildings and maintenance costs. The purpose is to help owners and consultants to plan for future maintenance.
- Quality comparison of different roofing types
- The purpose of the project is to describe the pros and cons of different roof types for use in Iceland, based on experience and technical properties.
- Quality comparison of different wall types
- Different types of walls were studied and compared based on various conditions, e.g. cost and durability.
- Building damages and building faults
- Building damages and building faults result in an unduly high total cost for the building. In the project the frequency and types of faults will be registered.
- Material science
- Various projects on quality, durability, repair ability and maintenance needs of building materials; e.g. concrete, insulation materials and glazing.

For a limited time special funding was allowed for element houses, based on believe that this was a more economical way to build than traditional on-situ constructions in Iceland. This funding was stopped (ca. 1985) when it was not possible to show the economical gain of the element housing method.

A building cost index for two types of buildings is calculated by Hagstofan (*Statistics Iceland*) each month. The index is based on very exact information on actual material-, time- and energy used for specific typical buildings that are already built. The building cost is then calculated based on actual material prices and the official wages that market has agreed on and

then added on for some estimated profit. The index is used as a reference for building cost, but doesn't show the effect of overpayments on wages nor actual profit. The method doesn't take into account the paying willingness of the market, e.g. if demand is higher than supply and this results in prices rising.

The index is shown to be an interesting measuring stick on the ratio of estimated building price and the actual market price, and is a helpful reference for prospective builders on the total situation. The problem though is that the index only is valid for a given type of building, and effects of different complexity etc. are hard to evaluate.

Fasteignamat ríkisins (*The State Real Estate Evaluation*) gathers information on new buildings (size etc) and market prices for sold buildings. Based on the market price for buildings a price index is calculated and shown on their web page.

Umhverfisstjórnuneyti (*Ministry for the Environment*) started a working group in 1996 to evaluate the subject "Quality in construction". The working group wrote a final report in 1998.

Rannsóknastofnun byggingariðnaðarins (*The Icelandic Building Research Institute, IBRI*) is expected to inform house owners and builders, as well as designers and companies, about building technology, cost aspects and other related questions. The information is given on the word wide web, personal discussions (telephone, visits or e-mail) and technical leaflets and reports.

Framkvæmdasýslan (*The State Construction Authority*) is responsible for some of the state owned buildings, both construction and maintenance, and is working for increased quality and moderate cost in construction through better work descriptions and increased quality consciousness.

4. 2. 2 Other activities

Fasteignastjórnunarfélags Íslands (*The Icelandic Facility Management Association*) works for increased exchange of information on facility cost.

A Nordic project funded by NICE, to evaluate the state of the art in the Nordic countries, exchange ideas and inform on the possibilities of *partnering and partnership* in affecting e.g. quality and cost.

A Nordic project, funded by NICE, aimed at describing and comparing the state of the art of *Life cycle cost (LCC)* in the different countries. The project finished with a report describing state of the art and some conclusions for a future network.

A Nordic project funded by NICE, evaluating *Weather Protection Systems (WPS) of Buildings* where all the Nordic countries informed on the state of the art in each country and exchanged experiences. The purpose of the project was to initiate greater interest in the use of WPS, and resulted e.g. in an excel-model to calculate the gains of using WPS.

4. 3 Some possibilities to affect building cost and quality of buildings

Referring to discussion in the beginning of this situation report from Iceland it will be evident that methods to keep building cost moderate, and increase quality, must to a great extent be based on the buyer and his actions, but also of course on how or if the market can be regulated.

Actions to affect building cost and quality therefore need to address three main aspects:

- Get the building market in a balance where fluctuations are minimized.
- Inform the prospective buyers on quality and cost aspects to make them better buyers.
- Optimize the cost-quality function for building construction.

4. 3. 1 Even out fluctuations on the market

For now fluctuations on the construction market are very great. Annual fluctuations, partly resulted by lack of total planning and foresight, give imbalance between supply and demand and tend to press the prices up. It is furthermore very difficult to keep good workers, renew instruments and ensure active working quality assurance under such situations. The profit of companies is very fluctuating and this probably results in higher demands on profits than in a more stable environment. seasonal fluctuations affect the workers on the market, qualified workers won't be sure of their working security the year round and unqualified workers are called for when the pressure on the market increases during summertime.

Less fluctuations result in

- More stable prices of constructions,
- Better qualified workers, as the use for temporary help to take off top loads will decrease, and therefore also economically more secure working conditions,
- Increased willingness to invest in the industry and thus increased productivity and research on new methods,
- Probably a generally better opinion of the building construction sector,

.. and require

- Constant supply of both building lots and money,
- Weather protection on the building site.

4. 3. 2 Better quality assurance

Quality assurance is often lacking, and the builder often does not see the need for this as he assumes that "designers and craftsmen are professionals"

and know what they are doing. Faults in constructions are though often seen and will increase the total building cost.

4. 3. 3 LCA and LCC planning

Requiring LCC and LCA for buildings already in the planning and design phases will help the builder to compare and choose between solutions. It is important to make the prospective builder to understand what the economical aspects are for all the phases; the new building, management and maintenance.

4. 3. 4 Partnering-partnership

Partnership models may help to decrease cost and increase quality in projects. This methodology though is demanding on planning- and co-ordination time and the methodology (model) is therefore mainly of interest in big projects.

4. 3. 5 Technical information

Big buyers often have own technical divisions and thus are able to evaluate quality and cost of projects but smaller buyers need help for this. In small works it will not be efficient if each and one of the builders have to buy consultations on every aspect, some general information is needed.

4. 3. 6 Building cost index

Small projects require that the builder has a good idea about costs and quality. This requires building cost index, and modifying factors adjust the index according to complexity, will make comparison between solutions possible (to compare e.g. expected price pr. m²).

4. 3. 7 Technical solutions and modules

Standardization or modularity of components should lower the building cost, but even marketing of solutions instead of singular components should facilitate a market for total solutions instead of single components only as well as standard modules for the most expensive parts, e.g. bathrooms and kitchens.

List of institutions and actors mentioned

Fasteignamat ríkisins (The State Real Estate
Evaluation), www.fmr.is
Hagstofan (Statistics Iceland),
www.hagstofa.is

Íbúðalánasjóður (The State Housing Board),
www.hff.is
Rannsóknastofnun byggingariðnaðarins
(The Icelandic Building Research Insti-
tute), www.rabygg.is

5. Latvia

5. 1 The development of the Building and Construction Industry

The Building & Construction Industry is the most rapidly growing branch of the national economy in Latvia. Some economists tend to esteem its growth as an indicator of the development of the entire national economy. The development experience of European countries suggests that an increase in construction of building and industrial sites within the national economic infrastructure is normally associated with the advancement process in the entire national economy followed by more active building activities in the field of residential and social construction. In the circumstances of rapid growth of national economy on the whole, the increment in capacities of companies active in building and construction commonly falls behind the pace of increment in demand, which results in the price rise both in separate building materials producing industries and in the entire branch of economy. If the risk of stagnation emerges, entrepreneurs tend to cut down their investments in the development and restructure their businesses to find new opportunities in being active in other branches of economy in their own country or elsewhere abroad, where less expensive resources and better market opportunities would permit so. Such turn causes the decrease in demand for building and construction products and, consequently, lesser prices for these products. To a great extent, the trend can be observed in the development of building and construction in Latvia.

For the purposes of the present review, the general tendencies in the development of building and construction in Latvia as related to price rises have been studied over the period since 1995 until 2006. It should be taken into account that during the period remarkable changes have occurred in the vary nature of development processes in building and construction, specifically, and in the national economy of this country, in general. This is exactly why both a longer and shorter periods have been taken to define the most essential factors that influence a price rise, as they can give a more accurate picture of trends in price rise and a changing nature of development as such.

5. 2 The development of building and construction in national measures

In market economy the rise in prices on a national level is closely related to the growth pace and nature in various branches of such national economy. This is also true in regard to the development of the Building & Construction Industry in Latvia and its internal rise in prices.

For the purpose of defining the nature and the tendencies in the development of the national economy in this country, the Gross Domestic Product and Value Added Tax growth figures over the period of 1995 to 2005 have been employed. The most important instantiating figures of the building and construction industry in this country are shown in Table 5. 1 in actual price values and as related to the development of the entire national economy.

Table 5. 1. Building and construction and national economy. Major development figures (in actual price values)

Index	Index/Year Breakdown (in mln LVL)					2005 as versus	
	2001	2002	2003	2004	2005	1995	2001
Building & Construction Product							
GDP, Total	432, 0	469.3	524.7	635.8	818.1	3.9	1.9
In B & C	5219.9	5758.3	6392.8	7421.4	8 937.3	3.4	1.7
In per cent (%)	262.2	289.4	320.9	387.6	488.9	3.7	1.9
Intermediate Consumption, Total	5, 0	5, 0	5, 0	5.2	5.5	1.1	1.1
In B & C	5 322.5	5 725.4	6 774.7	8 698.4	10 442.3	4.8	2, 0
In per cent (%)	536.6	637.7	858.3	1 692.4	2 178.4	13.4	4.1
VAT, Total	10.1	11.1	12.7	19.5	20.9	2. 8	2.1
In B & C	4 702.2	5 188.6	5 715.8	6 661.9	7 934.4	3, 0	1.69
In per cent (%)	286.8	290.6	320.1	386.4	499.9	4.2	1.74
	6.1	5.6	5.6	5.8	6.3	1.4	1.0

Source: CSO data and estimates by the authors

By having employed the following macro economical factors for the comparison of development in building and construction and national economy on the whole, that is: Building & Construction Product, GDP, Intermediate consumption and VAT, as well as the indices of proportion of the Building & Construction Industry in the entire national economy, we can come to a number of conclusions, such as listed below.

- The Building & Construction Product has increased by 3.9 times since 1995, while having been doubled in the course of the latest 5 years, as calculated in actual prices.
- The Building & Construction Product increment surpasses total GDP by 17.7% by the reported period. The similar tendency is retained, when you analyze the growth dynamics of GDP in Building & Construction as compared to GDP nationwide. Thanks to such swift growth dynamics, the Building & Construction proportion in the entire national economy has advanced from 5.1% to 5.5% over the reported period.
- The estimation of changes in Intermediate consumption in Building & Construction and nationwide reveals changes in consumption of resources in the production of VAT over the reported period. The growth

in the consumption of resources in the Building & Construction Industry remarkably surpasses the same index nationwide. As we see, while total Intermediate consumption has increased by 4.8 times over the reported period and by 2, 0 times as compared to 2001, the same value of the Building & Construction Industry has shown 13.4 and 4.1 times increments, respectively. This clearly indicates the fact that the amount of resources consumed within the Building & Construction Industry constantly increases in terms of their value and as calculated per one GDP unit, which suggests that the development is of extensive type. This suggestion is also supported by the proportion of the Building & Construction intermediate consumption on the total national intermediate consumption over the period. While it was only 10.1% of all the resources consumed in this country in 2001, in 2005 the Building & Construction Industry consumed a 20.9% with rapid price rise in building and construction as compared to that in other branches of the national economy.

- The Building & Construction VAT figures of 2005 are 4.2 times those in 1995, while the entire national economy produced only a 3 times increment of the index. This indicates of how the Building & Construction Industry has contributed to the development of the state economy on the whole and competitive recovery, in particular, over the reported period, at the same time revealing hardly a change since 2001 (a .74 increment) on the background of a .69 times increment nationwide. This simply means that companies active in the Building & Construction Industry have become less interested in increasing the efficiency of their businesses after the deflation that took place in the industry at the beginning of this century.
- The Building & Construction Production volume has increased by 2.8 times since 1995 and by 2.1 times since 2001 as expressed in comparative prices over the reported period. Meanwhile, the GDP has revealed 1.9 and 1.4 times increments over the period, respectively.
- The amount of resources utilized within the Building & Construction Industry in 2005, which is its intermediate consumption figure, has increased by 2.7 times as compared to 1995 and 1.6 times as compared to that in 2001. The intermediate consumption increment nationwide is remarkably lower and constitutes 1.7 and 1.4 times, respectively. Consequently, the proportion of resources consumed within the Building & Construction Industry, as compared to resources consumed nationwide, reveals the following growth dynamics: from 6.6% at the beginning of the reported period in 1995 to 10.3% at the end of the reported period in 2005.

A more rapid VAT growth is observed during the first half of the reported period – from 1995 to 2001, and shows a 2, 0 times figure, while it reduces to 1.4 times over the second half of the period. This development can be explained by the structural changes that has taken place in the Building & Construction Product.

Table 5. 2. Building and construction and national economy. Major development figures (in prices as per 2000)

Index	Index/Year Breakdown (in mln. LVL)					2005 as versus	
	2001	2002	2003	2004	2005	1995	2001
Building & Construction	410.4	432.7	471.2	607.2	871.3	2.8	2.1
Product							
GDP, Total	5 132.9	5 465.1	5 858.4	6 364.6	7 016.9	1.9	1.4
In B & C	277.6	307.7	349.9	396.6	457.9	2.7	1.6
In per cent	5.4	5.6	6, 0	6.2	6.5	1.4	1.2
Intermediate Consumption, Total	5 218.8	5 591, 0	6 015, 0	6 559, 0	7 167.2	1.7	1.4
In B & C	448.4	496.7	564.7	640.6	739.6	2.7	1.6
In per cent	8.6	8.9	9.4	9.8	10.3	1.6	1.2
VAT, Total	4 608, 0	4 911.5	5 258, 0	5 718.6	6 313.3	2, 0	1.4
In B & C	277.6	307.7	349.9	396.6	457.9	2.7	1.6
In Per Cen In per cent	6, 0	6.3	6.7	6.9	7.3	1.4	1.2

Source : CSO data and estimates by the authors

5. 2. 1 The Building & Construction Product and GDP

In the course of the analysis and estimation of the nature of development in building and construction and national economy, a study of the nature of Building & Construction Product and GDP, as well as trend research has been performed to allow finding the following.

- There is a well-marked similarity in development nature of the Building & Construction Product and GDP in Latvia: rapid growth trend, revealing a somewhat slower pace at the end of the previous century to be retained also over a couple of years after 2000. Still, starting with 2003, the Building & Construction Industry quickly gathered its rapid growth pace back.
- Comparing the growth tendencies in building and construction and national economy, on the whole, we have to conclude that the nature of VAT growth in building and construction and national economy is very similar as compared over the long term. In its turn, the growth nature of the nationwide produced VAT – which forms nearly a parabolic curve - swiftly verges to ideal parabola in this case. This gives a clear evidence of unstable nature of development, which is not only due to the overhead price rise throughout the sectors of the national economy, but which can also cause the excessive production in a branch of the national economy and more or less serious problems in the sector of finances.

5. 2. 2 Branch efficiency

The development experience of other countries gives us an evidence of the fact that each time a separate industry or the entire national economy reveals an economic growth, such growth is always accompanied by a more or less intensive rise in prices. In cases, when such economic growth is caused by the increase in a domestic demand, the price rise will be more intensive in an industry that develops at a more rapid pace. To a great extent, this is true in regard to the nature of the development of the Building & Construction Industry in this country, as it is very similarly accompanied by the rise in prices.

Although, there can be other reasons for price rise in building and construction than its rapid growth only; it could be the efficiency of operations of companies active in the industry. Higher rates of economic growth bear witness of higher profits and efficiency. This attracts new players to the building and construction market that will not be that experienced and proficient as market veterans. But the still increasing demand and its satellite rise of prices gives newcomers a possibility to operate even at lower efficiency rates. Studying the matter of resources utilization efficiency and productivity in building and construction, we have come to following conclusions.

- The resources utilization efficiency in the Building & Construction Industry has remained unchanged over the reported period. Each Latvian Lats utilized by intermediate consumption in building and construction has been covered by a 62 hundredths worth GDP. And this figure has not changed over the period from 2001 to 2005, while, as compared to 1995, it has shown only a 2% increment. Comparing it to an average return on resources nationwide, one can come to a conclusion that the Building & Construction Industry falls behind by 36.8% as per 2005 data and the figure has improved only by hardly a percent.
- The Intermediate Consumption ratio as per manufactured product has changed really slightly – by 1% only, as compared to 1995 only, while it has revealed no changes at all over the period since 2001. As per this particular index data, the Building and Construction Industry falls behind the average national index by 13.9% as per 2005 data.
- The productivity in building and construction is compared to that nationwide. The figure is defined by the number of persons employed in building and construction and the amount of manufactured products – goods and services output and GDP over a year.

Table 5. 3 Resources utilization efficiency in building and construction

Index	Index/Year Breakdown					2005 as ver- sus	
	2001	2002	2003	2004	2005	1995	2001
GDP manufactured per Intermediate Consumption unit	0.62	0.62	0.62	0.62	0.62	1, 02	1, 00
As compared to average% nationwide	- 37, 06	- 36.63	- 36.38	- 36.19	- 36.76	x	x
Output per Intermediate Con- sumption unit	1.62	1.62	1.62	1.62	1.62	1, 01	1, 00
As compared to average% nationwide	- 14, 01	- 13.79	- 13.58	- 13.51	- 13.92	x	x

Source: Calculations made by the authors

If compared to the level of productivity in building and construction and that average nationwide, it is clearly seen that the Building & Construction Industry falls behind in regard to nearly all indices. The only exclusion here is a Building & Construction GDP/employees index, which steps at a higher growth rates over the latest two years of the reported period, as compared to the average ratio nationwide. This is why the Building & Construction Manufactured GDP per employee in 2005 exceeds the similar index nationwide by 27.2%. The fact can be explained by the efforts the heads of building companies make in order to increase the labour efficiency in building and construction operations; and this happens on the background of general shortage of qualified personnel in the industry.

- Goods and services output in building and construction has increased over the reported period by 45% as per employee and 2005 data. A higher output increment per employee starts since 2001, when it reaches nearly 1.6 times rate. The highest goods and services output per employee rate is found in 2005, which is 37.2% or 9 600.
- The Building & Construction Manufactured Share of GDP as per employee in the industry has increased by 43% over the entire reported period and by 23% since 2001. The highest increment is revealed in 2002 and is 25.6%, while the Building & Construction Share in GDP as per employee in the industry has decreased over the years 2001-2005, excluding the very year of 2005. The phenomenon is due to fluctuations in number of employees in the industry during that period. The Building & Construction Product per employee has increased by 41% since 1995 and reached LVL 13 200 in 2005.

Table 5. 4 Productivity in building and construction. LVL/number of employees

Index	Index/Year breakdown					2005 as versus	
	2001	2002	2003	2004	2005	1995	2001
Output per employee in B & C	6 035.3	7 211.6	6 367.3	6 979.2	9 574.5	1.45	1.59
% versus previous years	78.8	119.5	88.3	109.6	137.2	x	x
Compared to average% nation-wide	- 40.9	-32.1	-43.1	-42.1	-26.4		
GDP per employee in B & C	4 082.4	5 128.3	4 728.4	4 558.6	5 031.9	1.43	1.23
% versus previous years	87.4	125.6	92.2	96.4	110.4	x	x
Compared to average% nation-wide	-25.8	14.9	-16.2	1.7	27.2		
B & C Product per employee	10676.8	13407.2	12360,0	11920.9	13159.2	1.41	1.23
% versus previous years	87.4	125.6	92.2	96.4	110.4	x	x
Compared to average% nation-wide	-14.8	3.3	-9.4	-18.9	-17.4		

Source: Calculations made by the authors

- The total GDP (nationwide) per employee goes up with minor fluctuation cycles, while Building & Construction reveals distinct fluctuations that are due to external factors. We suggest that this is a clear evidence of the influence the following events have on the development of the national economy.
- The bank crisis of 1995 that results in a lesser demand for a building and construction product in 1996, while building companies are in no haste to dismiss their employees.
- The Russian crisis in the second half of 1998 has initially decreased the output rates in building and construction - when only 300 new employees have been hired in 1999 as compared to 2 000 new employees during the previous year – by 6.6 times.
- The fall of prices caused by the Russian crisis that has started in 2000, continued all through to 2003.
- The decrease in numbers of employees in the Building & Construction Industry by 1 500 persons or 21% over the period from 2000 up to 2002.

It was only in 2004, when the numbers of employees went up again by 200 persons or 3.6%.

The above mentioned description of events enable us to conclude that the Building & Construction Industry is very sensitive to external “blows”, which leave a negative impact on the efficiency of productivity in the field and promote no lower prices for building and construction products.

5. 2. 3 Building & Construction Product – Price rise

The price rise for the Building & Construction Product is analyzed as based on the data published by the Central Statistic Offices of the Republic of Latvia in regard to price rise in the Building & Construction Industry, in general, and as per building sites, in particular. The data available on price rise in regard to products manufactured within the Building & Construction Industry defines the choice of the period under review that is, starting with 1998 and up to 2005. Within this period of time the reported year is different, that is why for the purposes of being able to calculative comparative prices, the 2000 values of sites rendered in the study have been recalculated into their 1995 equivalents. In the course of studies the following has been found.

The total rise of price for the Building & Construction Manufactured Product (completed building and construction projects) reveals more than 41% increment since 1995. The highest price rise (153.1%) is for buried pipeline mains and infrastructure projects, which is 158.6%.

But a different picture is revealed, when the analysis is carried out as since 1998 and 2001. There is a fact that claims our attention, namely: The prices for building and construction products in the field of education and health care have been retained at the same level as in 1998 and even decreased by nearly 5% as compared to 2001. Also in this case the customers have been the state and municipal authorities. It is also possible that this is related to an accurate implementation of normative acts regarding state purchase orders and choice of applicants. Low prices for these types of projects are also influenced by relatively high competition among the vendors in regard to the acquisition of rights to participate in a school or health care institution construction project.

The highest price rise over the latest 5 years has been observed in regard to the construction of buried pipeline mains (21.4%), and office buildings (18.1%), leaving transport infrastructure projects on the third place with 17.2%. Normally, building enterprises are very skeptical about undertaking private residential projects in a form of family houses. Still, the price rise for this type of projects over the latest 5 years period slightly exceeds an 8% borderline.

A more clear view of the picture will be available, when price rise is calculated as per 2000 level prices. As per LR CSO data for the latest 5 years period, no essential price rise has occurred in the industry. The actual rise

has started only in 2004. And to a great extent, it has dealt with the construction of already mentioned type of pipelines, where rise is nearly 13%.

Table 5. 5 Annual price rise for building and construction projects

Index	Annual rise as per 2000 prices				
	2001	2002	2003	2004	2005
All projects	- 5, 0	- 2.9	- 1.3	6.4	11.4
Industrial buildings	- 6.5	- 4, 0	- 1.1	5.9	10.3
Transport infrastructure	- 4.2	- 3.6	- 1.7	6, 0	16.6
Family houses	- 2.2	0	2, 0	6.3	8.9
Pipelines	- 10.6	- 0.2	- 6.2	12.8	15, 0
Education buildings	- 6.8	- 7.8	- 0.4	5.7	- 1.8
Office buildings	- 2.3	- 1.1	2.1	5.4	10.9

Source: LR CSO

Again, when studying *annual price rise for building and construction projects*, one is able to come to a conclusion that, following the 3 year long deflation in all sectors of the industry, it was only in 2004 that building companies managed to pursue their customer to pay more. The most successful here were the builders of buried pipeline mains. This sector developed rapid rates of price rising not only in 2004, but also in 2005 (15%). Transport infrastructure builders were the first one in price rising in 2005 with their 16.6% rate.

The lowest price rise rate for building family houses is only 8.8%. Education and health care projects behaviour still contradicts to the general situation on the market, which reveals a price rise, in general. But, in spite of that, the prices for construction of schools and hospitals have decreased nearly by 2% in 2005.

The results of study of price rise in regard to industrial projects supply evidence on an uncertain nature of price rise processes, which are mostly affected by external factors that lie beyond the framework of the Building & Construction Industry. The most important of them is the domestic demand, created mostly by the state and municipal authorities.

For the purposes of the present study, public projects have been included in the analysis in forms of family houses, office buildings, education and health care buildings; the price rise tendencies in this sector are rendered over the 1998 – 2005 period. The results of the study clear state that no common price rise tendency is observed within the sector as each type of projects develops according to its own laws. This means that the formation of costs and values throughout the sector is highly dependent on external factors, which are very difficult to identify, and it is also influenced, to a lesser extent, by internal factors and macro economical factors of the development of the national economy, on the whole.

As per results of the study, building companies should turn to construction of office buildings, because it is precisely this type of projects that is expected to develop the highest rise in prices, which, to a great extent, is

directed on gaining extra profits by using favourable conditions rather, to recovery of high prices for resources. Thanks to the rational behaviour principle that governs any market economy, it will be exactly what will happen in future: Building companies will turn to construction of office buildings in their expectations for bigger profits than that possible, when working for other types of public projects. And this should be considered as the most effective and most possible means of decreasing the rise of prices in this particular segment of the Building & Construction Industry.

The evaluation of the price rise situation in the sector of education and health care buildings allows us to conclude that the situation here is more predictable as compared to the price rise situation in the sector of industrial building projects. The most predictable rise of value and costs is revealed in the field of construction of family houses and office buildings. To a lesser extent, it applies also to the construction of education and health care buildings. Still, in the latter case, the behaviour of the customer – state and municipal authorities – in regard to the planning of such projects should be very much taken into account in the long run. It is in the long run, that due planning procedures within the state social infrastructure can decrease in this particular sector of building operations the uncertainty and leaps that cause sudden price fluctuations in building and construction.

5. 2. 4 Costs of building resources

In circumstances of such rapid growth of the Building & Construction Industry, the price rise is influenced not only by a growing demand on the market, but also *higher costs of building resources*. The major building resources are: Labour, building materials and capital assets at building companies' disposal.

The period of 2001- 2006 reveals the following features.

Table 5. 6. Prices for building materials (Quarterly)

Year	Price rise quarterly in%				Annual result
	I	II	III	IV	
2001	-2.7	-1.9	-0.2	-0.9	-8.4
2002	-0.7	-1.5	-0.4	-0.7	-3.4
2003	-0.8	-1.8	-0.2	2.2	-3.2
2004	2.1	2.3	2.1	0.8	6.5
2005	5.3	1.6	0.7	0.9	9.6
2006	2.4	2.9	x	x	x
Over the reported period	5.6	1.6	2, 0	2.3	1.1

Source: LR CSO data and calculations done by the authors

Building materials costs have decreased. The biggest fall of prices here is observed in 2003, which exactly has been a stagnation and deflation period

in the Building & Construction Industry. It is definitely related to the deflation of 2001 and 2002, when prices for building materials have decreased by nearly 8% and 3%, respectively. But in 2004 prices for building materials started to grow progressively, while having not reached the level of 2000 by 7.8%. The first two quarters of 2006 feature this progressive rise of prices for building materials also.

The labour costs rise at a much higher rate than that for building materials. The labour costs increased by 24.3% since 2001. The highest rise of labour costs is observed in 2005 and 2004, while in 2002 wages in building and construction went down a bit as compared to 2000.

Table 5. 7. Building & Construction labour costs (Quarterly)

Year	Cost rise quarterly in%				Annual result
	I	II	III	IV	
2001	-3.7	-1.8	0.8	-4.3	0.8
2002	-0.3	1.8	2.3	-2.5	-1.8
2003	-0.3	3.6	0.5	3.7	3.3
2004	-4.9	5.7	3.4	4.4	5.9
2005	-4.1	10.8	1.6	17.2	16.1
2006	-0.3	25.1	x	x	x
Over the reported period	-13.6	45.2	8.6	18.5	24.3

Source: LR CSO data and calculations made by the authors

The capital assets price rise tendency in building and construction has been remarkably more stable as compared to that in respect of labour and building materials costs. Thus, capital assets prices have risen by 26.7% over the reported period. The highest rate is related to 2005, which is 13.8% and is a bit lower than labour costs rate in that year.

Table 5. 8. Building and construction capital assets costs (Quarterly)

Year	Price rise quarterly in%				Annual result
	I	II	III	IV	
2001	2.1	0.2	-1, 0	-0.4	2.6
2002	-0.3	-0.2	0.8	-0.7	-1, 0
2003	1.1	1.7	-0.6	0, 0	2, 0
2004	3.7	4.7	2.8	1.6	9.3
2005	5.8	2.2	3.4	1.5	13.8
2006	5.2	6.6	x	x	x
Over the reported period	17.6	15.2	5.4	2, 0	26.7

Source: LR CSO data and calculations made by the authors

It is worth pointing out here that capital assets price rise since 2003 has never been a negative value. This is a proof of the situation, when there is a

certain shortage in capital assets in the industry. The most desperate year was 2005, when the volume of building and construction projects in this country stepped a sudden and rapid rate up.

And in the coming years, the issue of using more building equipment and technologies will become the most topical as the national economy in this country continues to loose its labour resources. All this means that *the further rise of prices in building and construction will be predominantly associated with higher wages and capital assets costs to be included in building and construction projects estimates.*

5. 3 Building Policy initiatives in cost cutting

5. 3. 1 State initiatives

It would be worth bearing in mind that the Building & Construction Industry has suffered sudden and harsh changes during the nineties of the previous century as the transition from a stated-planned economy to a market economy took place: The original volume of works shrunk and stagnation set in, followed, though, by the recent and energetic rise in the volume of building and construction operations.

As the situation in the industry changes, there is an increasing demand for better administrative capacities that can be achieved by working out and implementing of a building policy in related bodies and institutions and improving the building and construction supervision system, as well as paying much better attention to the promotion of the entire Building & Construction Industry as a more competitive one, including the increase of its productivity and cost cutting. For this purpose, it is necessary to improve the normative basis for building and construction projects by bringing it in accordance with modern economic and technological demands, bring administrative impediments to a minimum and develop new initiatives for further development.

These are some of the government guidelines regarding the Building & Construction Industry for the period of 2007-2010.

- Development of a new, contemporary Latvian Building Code, improved National Standards in building and construction and an enhanced system of supervision.
- Reduction of administrative impediments in the industry, improving, in parallel, the monitoring of quality and observation of environmental norms.
- An access to all building norms, municipal development regulations and database of issued Building Permits secured for all the participants in the industry.
- Promotion of energy saving, socially safe and health and environment friendly building and construction, etc.

To reach these goals, it is planned to develop Basic Formulations and Building and Construction Program for the 2009 – 2014 period, improve the system of supervision of building and construction operations and secure all energy-saving norms by January 2009.

In accordance to the Building act, the Ministry of Economics is the one responsible for the Building & Construction Industry; it is this Ministry that carries out all supervision and coordination in the industry nationwide. The Ministry is also responsible for the development and implementation of a single State Policy in Building and Construction. The competence of the Ministry in the field is defined by the Building Act and includes the working out of the Building and Construction Development Strategy and Programs, preparation of legal suggestions to improve the normative basis for the Industry, development of draft regulating acts, consideration of claims on actions by state and municipal authorities and/or their officers, procurement of state supervision of projects, as well as the maintenance of the national Register of Building and Construction Businesses, assignation of supervision powers, as well as other duties and responsibilities stipulated by the relevant normative acts.

The Latvian Building Council, as initiated by the Cabinet of Ministers, acts as the highest advising body in accordance to the Article 5 of the Building Act. The Building Council has been formed by the Cabinet of Ministers as a consulting and advising body, the decisions of which should be taken as recommended by public authorities and organizations, scientific and professional institutions, as well as business companies and associations. The goal the Council is reaching by their activities is the promotion of state, municipal and other kinds of institutions involvement in regulation and coordination of the development of building, architecture and building materials industry in accordance to the economic policy of national programs.

The Building Council consists of representatives of 7 Ministries and non-state organizations, such as the Association of Architects of Latvia, Latvian Builders Association, Association of Road Builders of Latvia, Union of Latvian Engineers for Heating, Gas and Water Technologies, Latvian Association for Engineering Consulting, Association of Building Materials Manufacturers of Latvia, Builders Trade Union of Latvia, etc.

The major challenges of the Building Council are

- Work out suggestions on the concept and strategy of the future development of the Building & Construction Industry,
- Value the Building Long-Term Development Program, as well as the legislative acts as to their concurrence and compliance to the concept of development in the Industry,
- Consider suggestions on how the legislative basis for the Industry can be improved,
- Develop suggestions regarding the strategy for training qualified professionals for the Industry (e.g., architects, planners, engineers, technicians and qualified labour),

- Consider suggestions about building and construction project of national importance and provide Statements in regard to design, construction and financing of such projects.

The Members of the Building Council have supported the issue of price rise in the industry as very important and arranged for its rendering at its multiple sessions. They have also considered the issue of increasing costs of the state or municipal authorities financed long-term projects. Currently, there are two workgroups active in the Council: One workgroup is preparing suggestions on the implementation of Building Policy regarding the alignment of the current institutional structure, while the other is busy with preparing proposals for improving professional training and education in the field.

The next period of their activities should be dedicated to the issue of developing the Labour force and Skill Conversion Schemes for unemployed to enable them to take part in the industry, as well as to the promotion of healthy competition environment.

The Ministry of Economy Strategy for 2007 – 2009 sets the goal of the Building Program as its development into a competitive industry and procures for the following initiatives.

Among new policy initiatives that can put a hold on the rise of costs in the industry, a special attention is to be paid to the establishment of the Building and Construction Information System and implementation of Energy Saving Promotion Program, coordinated Energy Auditing and Supervision Procedure.

Procurement of access to information in building and construction

In order to improve the quality of supervision and monitoring in construction nationwide, provide for building companies' and public awareness of current events and procedures in the Industry and considerably simplify all administration related processes, as well as promoting of employing new technologies, it is being procured for the establishment of a single National Building and Construction Information System. The system will store information regarding the entire building and construction procedure, starting with a design (application for a project) up to the commissioning of a completed project. Besides, the system will also supply information on normative acts, standards, municipal regulative documentation, including plot perspective and detailed layouts, Register of Building and Architect Practice Licenses, Register of Building and Construction Businesses, tender and auction info, etc.

Currently, the circulation of information regarding the administrative issues in the industry is provided among state and municipal authorities and players on the building and construction market and mostly locally. The bulk of information supplied by building authorities is available only as printed paperwork and the range of its users is limited.

The establishment and up keeping of the Building and Construction Information System will result in cutting down of illegal building operations and procedures; the very process will be more transparent and state and

municipal bodies will be able to obtain all necessary data to fulfill their tasks in implementing the national building policy in building and construction. It will also contribute to a friendlier of business and investment environment and reduce the number of mandatory administrative procedures.

The establishment of the Building and Construction Information System will also promote the application of IT and telecommunication technologies in the industry.

The Ministry of Economics and building and construction supervising bodies will benefit:

- Access to actual, trustful and operational data on a current situation in the Industry,
- Easier control and monitoring,
- Real possibility of operational implementation of amendments to normative acts.

Building / Municipal authorities will benefit:

- Access to operational data on projects and persons involved in the Industry,
- Higher quality of services provided by municipal authorities,
- Step forward the creation of One-Stop Agency.

Entrepreneurs will benefit:

- Access to actual information about perspective building and construction projects,
- Easier statistics reporting procedures, as a whole range of data in the system will be supplied already in a processed format, as well as they will be able to submit certain mandatory reports in an electronic format.

The society will benefit:

- Easy and operational tool to monitor processes in the Industry,
- Possibility to publicly control building and construction that will reduce illegal operations and procedures in the Industry.

The establishment of the Building and Construction Information System will reduce the time spent on the approval of building documentation, while information exchange between the state and municipal authorities is going to decrease illegal employment and stimulate tax payments.

The establishment of the Building and Construction Information System will foster the cooperation between the state and municipal powers, control of the industry, as well as provide a possibility for the public to follow the processes nationwide and ensure equal competition grounds for all.

Implementation of State Supported Energy Saving Program and Coordinated Energy Auditing, Supervision Procedure

It should be pointed out that the issue of saving energy resources has been addressed in Latvia long before the Energy Performance in Buildings Directive has been adopted as a part of the Latvian Housing Policy concept of June 30, 1996, having been set as one of the goals of the national economy. The goal has been kept in mind all during the development of the Building Policy and improvement of the normative basis, as well as while putting in practice joint projects with Denmark, Netherlands, and Germany and promoting the results of pilot projects, organizing seminars and publishing both theoretical and practical literature on how to make buildings more energy efficient.

One of the priority issues in the Housing Policy Concept is “the revitalization of the Building & Construction Industry, paying special attention to the renovation and modernization of the available residential fund, increasing the percentage of resource-saving designs and technologies, and efficient energy productions and applications”; and as one of national economy goals in housing development the following has been mentioned: “.. to increase the percentage of energy-saving designs in reconstruction projects, including insulation of building bearings, and implement energy-saving construction types in new buildings”.

The National Strategy for Efficient Energy Performance that has been developed in regard to the period up to 2010 is going to deal with definition of energy saving requirements and the control of the fulfillment in buildings and structures.

To comply with the Building Act, the Cabinet of Ministers has issued Regulations 495 d. November 27, 2001 “Regulations on Latvian Building Norm LBN 002-01 “Heat Engineering for Building Bearings”. The Building Norm defines the Heat Engineering design procedure and its goal is to reduce energy consumption in buildings by increasing the energy usage efficiency by making provisions for energy-saving elements both in the design and construction that would limit the emission of carbon dioxide.

The Methodological Control of State and Municipal Purchases in Construction and Promotion of Healthy Competition Business Environment

A new Law on Public Purchases has come into effect in April 2006 as an essential improvement of public purchases procedures in the field of construction. In order to ensure a successful implementation of the Law, the Ministry of economic has developed further CM Regulations LBN 501-06 “Building Costs Estimation Procedure”. The Regulations will be published in compliance to Part 4 Article 2 of the Building Act and Part 5 article 9 of the Law on Public Purchases. This Building norm will be binding in regard to the estimation of building costs in projects governed by the Law on Public Purchases or Law “On Purchases For Public Service Providers”. This particular Latvian Building norm defines the procedure of calculating all kinds of building costs at the stage of determination of contract prices, including costs of all kinds of structures with its adjacent territories, if any,

auxiliary buildings, structures and facilities, technological equipment and utility engineering, particular building and/or construction operations, including tools and equipment hire and special operations, as well as the procedure of defining such contract value of a construction project and Estimate Forms.

5. 3. 2 Non-State initiatives

Besides the fact that non-state organizations are involved in the Latvian Building Council activities, they are doing much more to improve the situation in the Industry. As an example, we will mention a project that resulted in the production of the *Construction Pricing Catalogue (Būvniecības izcenojumu katalogs (BIK-2005))*. The *BIK* provides actual pricing information on more than 2500 building and construction operations and tools & equipment hire costs, as well as prices for necessary building materials and labour costs. The *BIK* 2005 can be easily used to prepare estimates, tender quotes, as well as quotes references to be assessed by industry experts. The compliance of catalogue suggested prices to those current on the market is ensured by the contribution of professional industry engineers that took part in the compilation in close cooperation with manufacturers of building materials, wholesalers and industry practitioners.

The *BIK* has been developed as based on the studies of the building and construction market completed by the Association of Builders of Latvia and on the contract signed with Ministry of Finance. The LLC “MV Project” professionals have been involved in building and construction market activities since 1993 and have a good knowledge of the formation of price and building technology; they have been compiled the Catalogue since 2002 already. The basic estimates principles have been employed for the determining of construction prices.

The first part of the *BIK* Catalogue suggests of twenty-seven types of building and construction operations, embracing internal general building works and specialist operations. The *BIK* has been compiled in accordance to the requirements of the Latvian Draft Building norm LBN 501-05 “Building Costs Calculation Regulations” (*the current LBN 501-06 “Building Costs Estimation Procedure”*).

They plan to publish the Catalogue on an annual basis – as they do it already in Italy, USA, Lithuania, Russia, Great Britain and other countries – to reflect price fluctuations in the industry. We predict that construction pricing will go up by 7-10% annually as the result of Latvia joining the EC. Based on the evaluation of an actual current situation, all material, fuel and tools pricing will be amended accordingly: especially it refers to labour costs. Each year the *BIK* will be supplemented with new items: building operations, where new materials, technologies, tools are used and the present list of types of construction operation will be extended as well. They are planning to publish the Catalogue in full in a CD software format at the end of 2006. An electronic version of the Construction Pricing Catalogue is also available under the “eBIK 2006” title.

5. 4 Conclusion

Starting with 2003 the Building & Construction Industry in Latvia stepped up a rapid growth rate. The Building & Construction Product increment exceeds GDP increment nationwide. At the same time, the efficiency of use of resources has remained unchanged and even falls behind, if compared to the average return on resources nationwide. The same applies to the level of productivity. Taking into account the growing shortage of qualified labour in the Industry and higher levels of wages, building companies will be forced to start paying attention to the optimization of resources and improvement of their productivity figures. All previously completed studies bring a clear evidence of high sensitivity of the Industry against external “blows” (banking crisis, Russian crisis of 1998, 2000, etc) that would leave their definite negative impact on the efficiency of processes in building and construction and promote no lower prices for building and construction products. No essential rise of prices has occurred in the Industry over the recent 5 years. Some actual price rising has begun only in 2004. The major tendencies at this point are lower prices for building materials, higher labour and capital assets costs.

The very development of the Industry makes it necessary to essentially reconsider the current legal basis for building and construction operations and define its development tendencies and dispositions for the upcoming 10 years. Hence, the Ministry of Economics is planning to develop new Formulations and Programs for the Industry, setting the priority as making it more competitive.

To ensure the duration of the Building & Construction Industry and a better competition environment, a whole range of measures have been planned, specifically: Establishment of Building and Construction Information System, restructuring of supervision system in the Industry, procurement of higher quality requirements, implementation of energy saving systems, measures to secure qualified labour force flow to the Industry, etc.

The major activity result by the industry representatives is the publishing of the Construction Pricing Catalogue that will be a helpful tool for all players on the building and construction market, both customers and contractors, as well as state and municipal authorities in their public purchases procedures.

6. Lithuania

6. 1 Some basic facts about Lithuanian housing sector

Lithuania has 3.5 million inhabitants with 1 356 000 dwellings and 1 461 000 households. 37% of the dwellings are in private houses and 60% in private apartments. 26% of the dwellings are built before 1960 and 9% after 1990. The housing shortage accounts for 7%, while 2% in average in Western and Northern Europe. Lithuania has 365 dwellings per 1 000 inhabitants, while the above countries have 450 dwellings, thus the useful floor space area per capita accounts for 22.1 sqm and 30 sqm respectively. Most of the housing stock is in poor condition with lack of proper management. Main problems are connected to inefficient heating systems and engineering equipment as well as bad quality windows, roofs and seals between wall panels.

In Lithuania, housing construction declined significantly compared to the situation in 1990 when 22 100 dwellings were constructed, while in 2002 only 4 500 new dwellings were produced and in 2006 6 800. The annual construction of new housing accounts for 0.3% of the total housing stock, and the annual turnover on the market accounts for 2.7% of the existing housing stock, while the average EU indicators are 1.5% and 3.5% respectively.

The reduced construction scope within the above period resulted from a fall in direct public funding, and the private sector did not compensate for such a decline. This resulted from the reduced income of the population, high expenditure for the new infrastructure, the limited supply of plots for construction, and the unresolved issues in relation to the restoration of ownership rights to land. Studies assessed the construction of new housing as being insufficient due to high prices and poor variety.

6. 2 Lithuanian Housing Strategy

For the housing sector, competence of the Government of the Republic of Lithuania is dispersed horizontally across 7 ministries as follows: technical and physical management of the housing stock is assigned to the Ministry of Environment, funding of the housing programs is managed by the Ministry of Finance, the Ministry of Social Security and Labour is authorised to provide heating, hot and cold water subsidies to low-income families, issues related to energy use are decided by the Ministry of Economy, the Ministry of Agriculture manages land matters, the Ministry of Justice is responsible for the real estate register, the Ministry of the Interior formulates and implements regional development policy, ensures coordination of the state and

local government interests, and establishes legal and economic provisions for the functioning of the local communities.

Though the main institution formulating the housing policy is the Ministry of Environment, it does not manage funds allocated to the housing programs and the housing policy implementation agencies. Both the Public Institution Central Project Management Agency and the Private Company Insurance of Housing Loans are directly or indirectly accountable to the Ministry of Finance.

As no common information system exists it is difficult to analyse the housing construction situation and to adopt political decisions in due time based on objective information.

The counties possess state-owned land and are responsible for its rational management and use. The local governments manage land transferred to them for the use, administer provision of social housing, perform supervision of the use of construction works, issue licences for construction and demolition. Neither the counties or local governments have enough institutional and financial resources to carry out these functions.

The Lithuanian housing sector is mainly regulated by 6 laws:

- The Civil Code of the Republic of Lithuania (from 2000),
- The Law on Home Owners' Associations of Multi-Apartment Buildings,
- The Law on State Support to Acquire or Rent Housing of the Republic of Lithuania,
- The Law on the Restoration of the Ownership Rights to the Existing Real Property of the Citizens of the Republic of Lithuania (from 1997),
- The Law on Land of the Republic of Lithuania (from 1994) and
- The Law on Construction of the Republic of Lithuania (from 1996 and 2001).

6. 2. 1 Goals of the Housing Strategy

First goal is to expand the housing choices to all social groups of the population. It is necessary to expand the housing product variety to ensure the housing choices to households (families) with different income levels and mobility of the population due to the changing labour market.

It is necessary to construct more new dwellings so that average and high income households could acquire or rent better dwellings and to increase the annual construction scope from the existing 6 800 dwellings to 8 000 dwellings in 2010, and 12 000-15 000 dwellings in 2020. In aiming to reduce construction costs, measures will be implemented for reduction in land acquisition and infrastructure development as well as to ensure construction competitiveness and transparency.

Second goal is to ensure efficient use, maintenance, renovation and modernization of existing housing, as well as efficient energy use. The condition of the existing housing stock will be improved, with its value being preserved and increased where possible. The dwellings will be adapted to the new needs of households and the social segregation will be mitigated.

Prior to 2020 it is necessary to modernize based on the economic feasibility principle of heating systems in existing multi-apartment buildings, to renovate and insulate roof structures, to change or replace windows and entrance doors, to remove joint defects of panel walls and increase thermal resistance of external walls as well as to reduce heat energy costs per unit of useful floor space up to 30%.

Third goal is to strengthen capacity of the housing sector parties to participate in the housing market, aiming for the establishment of a sustainable housing sector management system on the national, local government and community levels and their interaction mechanisms. It is also important to ensure protection of consumer rights and to facilitate public communication, continuous training and education of the housing sector stakeholders.

6. 2. 2 Development of new housing construction

The demand of new dwellings is established by new households (young families, etc.), the internal migration and immigration processes as well as average and high-income households seeking to acquire and rent better dwellings. In aiming for construction of new dwellings, management of land and urban infrastructure should be improved and competitiveness and transparency of the construction market should be ensured, leading to reduction of construction costs. Also, it is necessary to improve the quality control of construction. Legal provisions facilitating residential construction involving cooperated funds of the population should be improved based on the establishment of cooperative construction associations or companies (non-profit organizations).

This priority goal, i. e. development of new housing construction, includes the following objectives:

- To improve land and infrastructure management
- In aiming for implementation of this objective, it is necessary to prepare a feasibility study regarding land and infrastructure management improvement. It is necessary to establish the most appropriate funding and use methods of infrastructure development in areas to be built up, and to better use urban land. The prepared measures will facilitate a reduction in construction costs, enliven new housing construction and sales market, and provide better housing choices.
- To strengthen the control of territorial planning and construction
- Measures for implementation of this objective will be envisaged, having analysed the application of legal acts regulating territorial planning, issuance of licences, commissioning of construction works, and also having analysed the objective information and opinion of the market parties.

- To improve the legal provisions for the construction of residential buildings using cooperated funds of individuals
- Currently the individuals who want to construct residential buildings using cooperated funds establish construction associations of residential buildings, the activities of which are not regulated. These associations re established based on the Sample Articles of Association of a Construction Association of a Residential Building approved by Government Resolution of 23 April 1993. The activities of such associations should be regulated more clearly in order to ensure their edibility and transparency. Based on EU experiences, it is necessary to regulate the establishment and activities of the construction associations (cooperatives) of residential buildings.

6. 3 Housing prices and reasons why they are rising in Lithuania

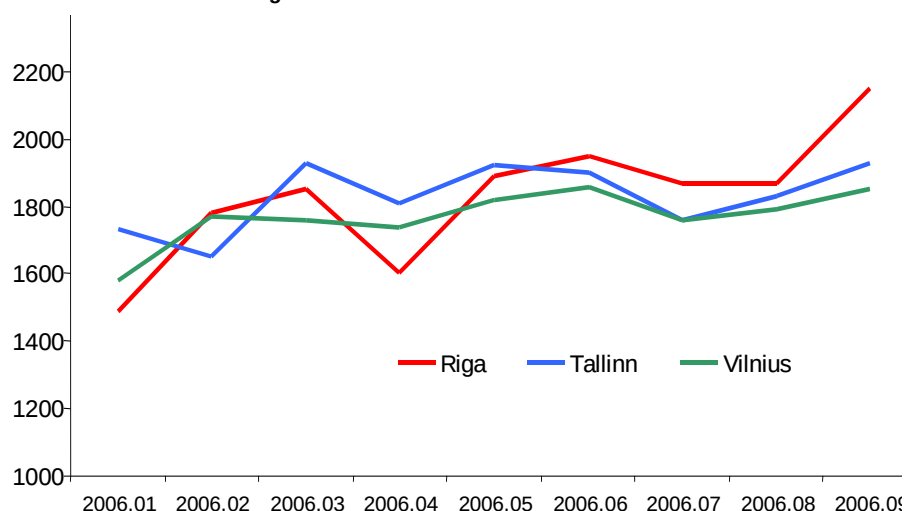
Real estate prices have slowed down somewhat in many European countries in 2006. Lithuania is among those. Over the last three years, Lithuania was a land of opportunities for developers, investors and speculators. Having begun in 2003, the fever of real estate price increases continued until the summer of 2006 with prices rocketing by 35-50 per cent annually. Speculators, who invested in dwellings of new construction in prestigious locations, are believed to have received investment returns of up to 100 per cent within a period just shorter than one year. In 2006 real estate prices climbed by 15 per cent. It is good that it has finally calmed down, because there was a threat that market might overheat and shake up the entire national economy.

After jumping 15% in Quarter 1 2006, residential prices levelled off for the remainder of the year. The fast rises in 2005 and Quarter 1 2006 were fuelled by easy credit from banks, and speculators taking advantage of developers offering units for only 10% pre-payments, with 90% due on delivery. This developer-financed leverage allowed developers to push prices higher. Now speculators are unwinding those positions by selling into the market as delivery of the units (and the 90% payment) nears.

After Quarter 2, 2006, only the higher end luxury apartments saw a further price increase of 5-10%, while prices for mass-market units remained stable.

Prices of older apartments remained stable, but less liquid apartments located in poorer suburbs or older houses became 5–10% cheaper. No major changes on the dwelling market are expected, but since the prices of new apartments continue to remain stable and the supply and demand for such dwelling increases, it is probable that the gap between the prices of old and new dwellings will increase.

Figure 6. 1 Development of average apartment prices (\$ per square meter) in the capitals of the Baltic countries during 2006



At the end of 2006, a standard two-room apartment (of approximately 50 sqm) in an older apartment building located in a bedroom community costs 55 000–75 000 EUR. The same size new apartment fully finished costs 65 000–95 000 EUR. The price range of new apartments in the city of Vilnius is rather broad. In dormitory districts the prices of partially finished apartments range from 1 050 to 2 000 EUR/sqm, in prestigious districts (Antakalnis, Žvėrynas, Valakampiai) they cost 1 800–3 500 EUR/sqm, and in the centre and the Old Town they cost up to 5 500 EUR/sqm. The average price of decorating one square metre is 200–300 EUR.

Individual houses (of 150–250 sqm with 5–10 acre land plots) located in new housing quarters with full infrastructure in Vilnius district (at a distance of 14–20 km from the city centre) are sold shell (without interior fit-out) and cost from 170 000 to 290 000 EUR. Full final fitout generally costs 200 EUR/sqm more.

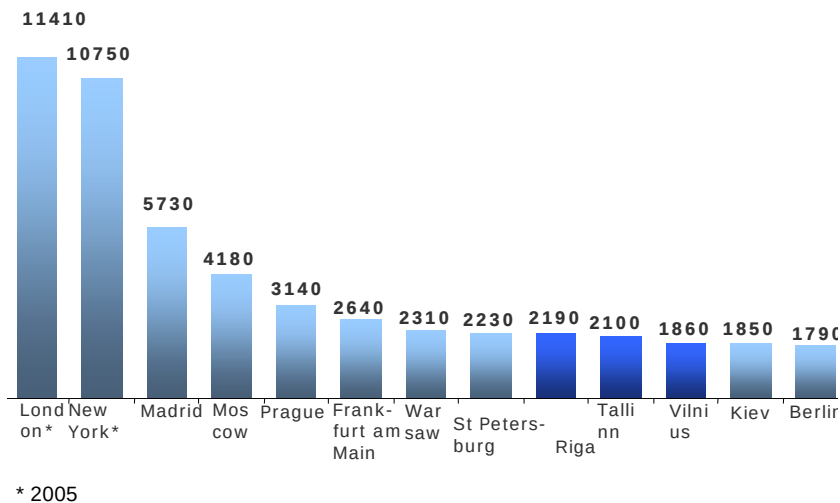
The same type of partially finished house located within city limits (in the suburbs or in residential districts) on the average costs from 300 000 to 450 000 EUR. The prices of individual houses in prestigious city districts range from 600 000 to 2 000 000 EUR; a considerable share of the house price is represented by the high price of land plots in these districts.

Although the prices for housing in Lithuania still look quite attractive for foreigners, they are pretty close to those in the large European megapolis. Back in 2004 the prices of new housing in Vilnius, the capital in Lithuania, ranged from LTL 3 450 to LTL 5 865 per square meter; a year later they jumped to LTL 7 500–15 000.

Foreigners are sufficiently active investors in Lithuanian real estate. The more prudent investment funds came to Lithuania half a year before the official day of Lithuania's membership in the EU, 1 May 2004, but the real wave of interest followed after that and slowed down only approximately

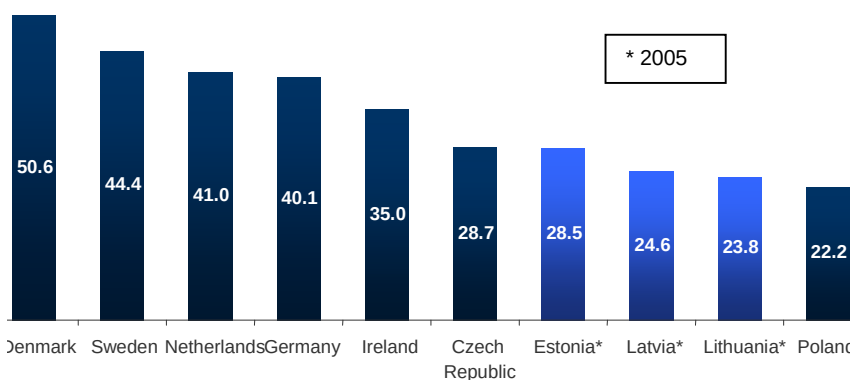
half a year ago. Yet, this slowdown owes to the shortage of products compared to the number of eager investors.

Figure 6. 2 Average apartment prices in October 2006 (\$ per square meter) in some major cities



The demand for housing is anticipated to be high, as more and more people in Lithuania will seek to improve their living conditions. The sale results of new apartments remain fairly good. At the end of the year 95% of all apartments constructed in Vilnius in 2006 were already sold. Buyers are choosing new dwellings more carefully, and because a rapid growth in prices is not expected in the future, the purchase of a dwelling is becoming more rational; more time is devoted to the purchase process than before.

Figure 6. 3 Housing stock in square meter per capita in some European countries 2003

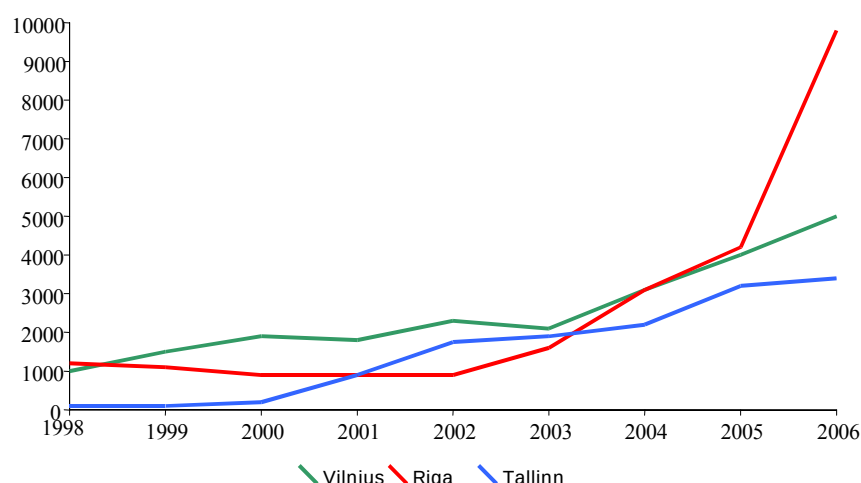


Although the income of residents is increasing more and more rapidly each year, the increase in housing prices over the past few years was even more rapid. The housing affordability index (taking into consideration only official data) has therefore been decreasing for the last few years. This prompts residents who wish to reside in new dwellings to purchase smaller dwell-

ings. Thus, one-room and two-room apartments (of 40-50 sqm) or compact individual houses or attached houses of 100-200 sqm are currently the most popular. It is probably that within the next few years a similar trend will remain.

In 2006 more than 4 900 new apartments were constructed in the city of Vilnius. This is 25% more than were constructed in 2005 (3 850 units). The majority of apartments were built in the suburbs and this represents up to 84% of all the apartments constructed in the city of Vilnius (most apartments were built in the districts of Žirmūnai, Pašilaičiai and Fabijoniškės). The share of apartments constructed in the Old Town and the centre amounted to only 7% from the entire supply, and this is due to complex development procedures in these areas. The average area of a newly constructed apartment is around 62 sqm, and for the several past years this figure has only decreased. This is because the demand for smaller-sized and average-sized apartments is the highest on the market.

Figure 6. 4 Completed residential units in the capitals of the Baltic countries 1998-2006



There are permits issued to build over 7 000 new apartments in Vilnius in 2007, but not all will be built taking into account the lack of construction resources. It is estimated slightly more than 6 500 apartments will be constructed in 2007 in Vilnius. The geographical distribution of apartments in Vilnius remains the same; once the largest projects are implemented, the majority of apartments will be constructed in Pašilaičiai, Žirmūnai, Pilaitė and Verkiiai.

The market for individual houses continues to grow at a rapid pace. Both the number of those building houses themselves as well as those building houses for sale in individual housing quarters is increasing. In 2006 in the city of Vilnius and nearby, around 260 individual houses located in different housing quarters were constructed for sale, and plans are that in 2007 the supply of such houses will increase to 400–500 units.

6. 4 Construction cost indices

Statistics Lithuania informs that construction prices over the previous year (December 2006 against December 2005) grew by 10.6% (in December 2005 against December 2004, they rose by 8.7%). Over the year the most significant increase in prices (by 12.4%) was observed for the construction of residential buildings.

The strongest influence on the total construction input price index (CIPi) was made by a 19.8% increase in prices for earnings and overheads. The price index was also influenced by a 9.1% increase in prices for hourly labour costs on operation of construction machines and mechanisms and 5.6% for construction materials and products.

In the group of construction materials and products, the most visible increase in prices was observed for different kinds of concrete and mortar (8.1%), metal products (8, 0%), electrical engineering materials (7.9%) and concrete and ferro-concrete products (6.8%).

Table 6. 1 Changes in construction costs (%) by type of construction

Construction units	Specific weight against total construction volume	December 2006 versus	
		November 2006	December 2005
All constructions	100, 0	1.5	10.6
Residential buildings	25.5	1.8	12.4
Non-residential buildings	44.3	1.3	9.8
Civil engineering units	30.2	1.4	10.2

The indices of construction works, building and labour input show that construction scale is rising up and construction prices grow as well.

Table 6. 2 Indices of costs for construction works and building respectively compared to quarterly average of 2000 (%)

Index	Indices versus quarterly average of 2000				
	2002	2003	2004	2005	2006
Construction works	156.3	209.4	219, 0	245.3	290.7
Building	151, 0	208.1	216.5	226.2	305.7

Analyzing those data and the situation in the construction sector, Lithuania has to deal with another problem, the shortage of both construction specialists and workers. Traditionally, Lithuanians have been distinguished by construction quality, which is definitely superior to that in Central and Eastern Europe. But we are now short of workers, and the shortage is painful. To be more precise, we lack good workers who would work for a salary that

allows the developer to operate at a profit. There is a niche in Lithuania that could attract foreign companies.

Table 6. 3 Indices of labour input indicators compared to quarterly average of 2000 (%)

Indicator	Indices versus quarterly average 2000		
	2004	2005	2006
Persons employed	131.6	137.1	149.1
Hours worked	151.8	154.9	157.9
Wages and salaries	191.7	242.2	291.8

6. 5 Conclusions

The Lithuanian government has for the moment no special programme on how to reduce construction costs though those are high and still rising. The issue of high construction costs creates political problems as it has implications on costs for social housing as well as on taxation policies. Construction for social housing purposes is supported by means of reduced VAT to protect vulnerable groups on the housing market from high construction costs. The Lithuanian government should therefore welcome a cooperation across the borders between countries in the Northern Dimension region in order to broaden the experience and newfound knowledge on how to reduce housing construction costs.

7. Norway

7. 1 Why is society interested in how the building sector works?

In Norway the building and construction (B&C) sector employs approximately 15% of the labour force. This equals the sector in most of the Northern Dimension region. The B&C industry in Norway is producing approximately 10% of the GNP and the sector is important for the national economy. It provides vital infrastructure (roads, railroads, harbours, airfields, technical infrastructures etc.) and buildings for national and local administrative public organs (office buildings, schoolhouses, hospitals, etc), as well as maintenance of all these vital parts of a modern society.

Through its development and delivery of plants, buildings for production and administration, local infrastructure etc., as well as the continuing modification works and maintenance, the building and construction sector is a crucial partner for the most other industries in the country. Last, but not least, the building sector is the supplier of homes, 20–30. 000 each year. The sector is continuously involved in the growth and development of the society, and the well being and safety of individuals, neighbourhoods and communities. The performance of the sector has consequences for the economy of the individual household, industries and public services. Cost-effectiveness in the building and construction sector is therefore of great importance for the Norwegian society.

Norway is a geographically long and narrow country with a highly differentiated topography and climate. In this respect the local presence of an effective building and construction industry, being able to serve society, industry and private households at rather short notice, is in a longer term crucial for the existence of many smaller community in the outskirts. It is likewise a necessity for the growth and day-to-day activities in the regional centres and cities.

Approximately 80% of homes in Norway are owned by the families living in them. This is more than in most other industrialised countries, even compared to other Nordic countries. Norwegians invest their money in large living area and high living quarter quality. Thus it makes homes a dominant “savings account”. Through tax reduction on the housing loans, the society subsidizes this investment. (The motivation was initially to stimulate people to invest in their own homes and by this contribute to a reduction in the shortage of homes, which was a national “headache” in the period 1945–1975). The shortage of homes in general has gradually changed into an individual, continuously demand of higher quality of the buildings/houses/apartments. This may in itself be a reasons for the government to pay interest in the building cost phenomena and especially to understand

the rather strong increase of the building costs that have taken place during the last two decades.

In a situation with intensive demand in the housing market, which Norway has experienced during the last ten years, *prices* of houses/flats have increased severe. National authorities need to understand more of the building cost “mechanism” (how cost affects prices - or visa-versa) to frame and take care of a suitable overall policy for the B&C sector.

The development and sale/trade in housing in Norway is dominated by private companies. Their activity, when it comes to the design and production of the houses and flats, is performed under the Norwegian regulations – especially *the Planning and Building Act*.

The act lines up functional/principal requirements to the buildings, leaving the responsibility of design and production of the buildings in conformance with the functional requirements to the developers/vendors. Even if the majority of the parties in the sector are running serious businesses, it may happen that a building or a flat not is in accordance with the principal demands off the Act. In worst case it might happened that the professional operations is driven by short term profit maximizing motives with the final buyer as suffering part. To avoid such negative effects, the authorities need to build solid understanding of how the industry, which is subjected to low degree of competition from outside the regions or country, are operating with respect to prices, quality and costs.

The former Norwegian Prime Minister, Gro Harlem Brundtland, introduced the word *sustainability* in environmental perspective. Sustainable construction is a challenge for the B&C sector in Norway: Like in other industrial countries, the construction industry produces products that are consuming approximately 40% of the energy in the nation. A similar share of the total generation of waste comes from the building processes. The authorities need to understand why this industry has such a strong impact on the environment and to stimulate – through research campaigns and legislation – all parties in the sector to go for sustainable solutions in the final products, as well as in the processes at the sites. To be familiar with the building cost aspect with respect to sustainability is vital for the authorities with respect to regulation and stimulating efforts in the B&C industry.

7. 2 Main initiatives aimed at control of the building cost

During the last 30–40 years different initiatives have been taken to avoid building costs to increase in an unacceptable degree. In general, the building costs index (BCI) has moved along with the consumption price index (CPI). One may say that building cost development has been under control. - However, it can be questioned if the full effect of rationalisation in the industry has been fully realised as lowering of the building cost in the same period.

In 1983 the authorities, through the national research funding institution¹, initiated the program *Better housing to a lower cost* (“Bedre Boliger Billigere – BBB”). It invited developers/owners, planners, industry and R&D-institutions to carry out R&D activities on how “Housing of good quality” could be provided within acceptable cost frames. The general opinion is that the program and all the connected innovative projects gave slightly higher housing quality for the same amount of money in the following decade. The problem in this respect is that it is difficult to measure/quantify if this kind of initiatives gives the expected achievements.

Many other initiatives with ambitions on technology development, improvement of building quality and control of building cost growth were launched in the next years, of which the following R&D-programs were the most noticeable.

- Development of New Products and Prototype Buildings (Produktutvikling og forsøksbygg) – 1989-93
- Development of Systems and Technology in Building and Construction Industry (System- og teknologiutvikling i bygge- og anleggsnæringen) – 1990-94
- Norbuild – 1993-98
- Norrock, Norwood, Norinstall – 1995-98
- Interaction in the Building Process (Samspill i byggeprosessen) – 1997-99.

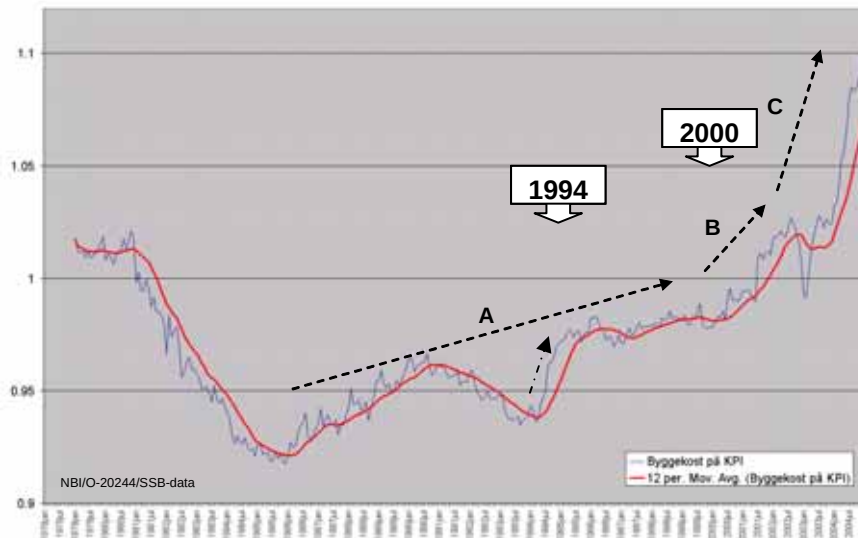
In the period 1985-2000 different technical improvements have been incorporated in the revised/updated *Planning and Building Act*. The general opinion seems to be that such actions are affecting building costs in “wrong” direction. However, in a longer term it might as well cause consciousness and system improvement activities in the industry with cost moderation as (part of the) result.

The efforts mentioned above are “water under the bridge”. Studying the change of the ratio BCI/CPI (the building costs index divided by the consumption price index); we observe an interesting change about year 2000. Through the long period 1970-2000 the ratio has fluctuated with rather long wavelengths from slightly above 1, 0 to slightly below, i. e. the increasing of the building cost index moves along with the increasing in the consumption price index. But this pattern seems to have changed in 2001. The ratio moves and away from the equality level (1. 0) in an almost vertical path and unlike what have been observed ever before. (In fact, there were a “pre-warning” in 1994-95, but for some reason the development “slowed down to normal” in the next five year period).see the figure below, where the development from 1978 to 2003 is shown.

This “new building cost development scenario” seems to be not only typical for Norway. Many European countries are reporting a similar development.

¹ At the time it was done by another body than the today’s Research Council of Norway

Figure 7. 1. Development of the ratio BCI/CPI (the building costs index divided by the consumption price index) in Norway 1978-2003



With respect to the R&D improvement initiatives in the B&C sector tradition in Norway has been *cooperation* between the Government/Ministries/national offices and the industry. To understand the seemingly new situation with rapidly increase of building costs, and try to steer this development in a “smoother” direction, two major programs are launched in recent time. The initiatives are different in nature, one with a strong *innovative* approach and the other with a *scientific* approach.

- The Building Cost Program (“Byggekostnadsprogrammet”), 2005 – 2009
- Productivity in Building and Construction Industry (“Produktivitet i bygge- og anleggsbransjen”) – The Research Council of Norway 2001-2006.

In addition, the parties have cooperated on a third major program – the BIT Program (Innovation Norway 2000-) – for a while, which presumably also will have a moderating effect on the building costs growth.

Furthermore, there are other ongoing, major and minor activities in the sector, which also have impact on building costs. The new/ongoing revision of the plan and building act must be mentioned. The Climate-2000 program is a major R&D program studying the effects of changes in global climate and how this effects the build environment in Norway. Change in building costs are undoubtedly part of this set of problems. At the University in Trondheim (NTNU) a dominant research project is addressing major national real property investments on behalf of the Ministry of Finance with focus on cost effectiveness and (necessary) early phase decisions and actions of the owner².

² www.concept.ntnu.no

It has been carried out many smaller projects and studies throughout the country, often with improvement of quality and methods/technology as goal. To some extent many of these will have some impact on building costs.

This document will mainly address the two initiatives outlined above. Directly and specifically they both aim to increase the understanding of the building cost influencing factors and how to control the growth of this important parameter.

7. 2. 1 The Building Cost Program (BCP)

In November, 2004 the Norwegian government (*Ministry of Local Government and Regional Development*) and the Building and construction industry, represented by *The Council of Building, Construction and Real Estate Businesses* (BAE-rådet), signed the letter of intent for the five year long program *Increased affordable homes - through cost focusing innovation* ("Flere rimelige og kostnadseffektive boliger"). The program had its first operative year in 2005, and has established the following 35 projects (*author's translation*).

- Two pre-projects concerning education of builders,
- Quality Assurance in small and medium size companies in the industry,
- How to avoid faults in design,
- Building costs and client satisfaction in perspective of the final user of homes,
- Industrialization and specialization in housing,
- Registration of faults and defects during production,
- National standards for facility management and maintenance,
- The road to correct development, design and production of buildings,
- Use of IFC standards in building sector – a buildingSMART project,
- Value for money – Better quality and effectiveness through increased customer competence and better planning,
- The internet portal for Improving the Competence of Housing Customers,
- Remove the hindrances for effective transaction in building projects!
- Indicator for monitoring the number of female leaders in the industry,
- Indicator for monitoring the development of productivity in industry,
- Indicator for monitoring the development conflicts in the industry,
- Corporate learning,
- Zero faults – a campaign,
- Water following the wrong path – a challenge to the industry,
- Expand the network for improved cooperation and data flow in B&C industry,
- Making research reports more easily available The hand over process –a guide line to customer satisfaction,
- Planning and managing of design,

- Innovation and competence development in use of ICT in project administration,
- Key figures, tools and methods in calculating life cycle costs of buildings,
- Risk assessments aiming to reduce the volume of building defects in electrical and other technical deliverances in housing,
- The Knowledge Circle, a mentoring programme,
- Guidelines for correct competition with examples of descriptions, in housing,
- National data base for quality in buildings,
- Life cycle costs as part of the fundament for decision in early stage of building projects,
- Building Competence, Supplementary education for craftsmen,
- European Construction Technology Platform, ECTP –Norwegian branch; NCTP,
- Norwegian Wood, Early phase advices for enhanced housing qualities,
- Correct performed in the first place.

The program management has specified its strategy. This includes a set of key indicators that shall be used to measure the degree of success for the program as a whole, as well as for each of the projects. These are:

- More competent customers/users/owners
- Number of complains to the Norwegian Consumer Council shall be reduced with 25%,
- Survey projects are planned to examine the increased competence at the customer level.
- Increased productivity
- Building defects shall be reduced 50%,
- Productivity shall be increased with 10%,
- Use of IFC-based systemizing concept (SMART building) shall be used by professional builders /developers).
- Improved management, with more significant response definition at all levels
- Number of conflicts shall be reduces with 30%,
- Number of female managers shall be increased with 30%.

The program is in an early stage and consequently no results are presented so far. But during the coming year, 2007, the first reports will be presented, hopefully indicating that the expected results are achievable within a reasonable/defined horizon of time.

7. 2. 2 The Norwegian productivity project

In 2001 the industry (The Federation of Norwegian Construction Industries) and the Research Council of Norway established the five year long project “Productivity in building and construction”, with the Norwegian Building

Research Institute (NBI) as the leading researching partner. The main goal has been to develop *a tool for scientific benchmarking* of building projects with respect to efficiency, as well as to identify Best Practice. The project is based on cooperation between research institutions and 38 Norwegian contracting companies.

The project gave main attention to production of blocks of flats, anticipating that a tool for benchmarking this type of building product, if successfully developed, can be modified for testing other products of the industry as well.

An investigation has been carried out, covering 122 completed residential projects. Based on a questionnaire, the project manager for each of the projects has provided detailed information about:

- Usage of resources,
- Quantities and qualities of the product,
- Environment conditions/limitations,
- Managerial aspects.

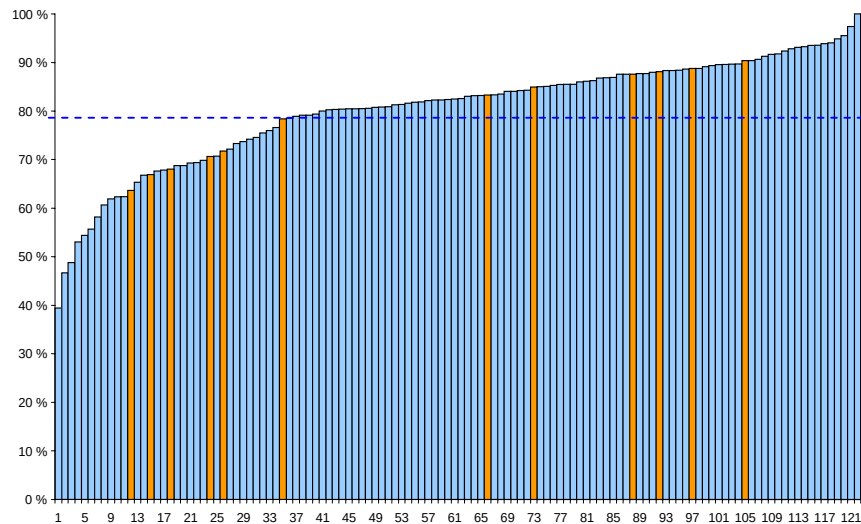
The benchmarking (Step 1) is carried out with use of Data Envelopment Analysis (DEA) and shows that *the most efficient projects* have produced the same amount of the product “Blocks of flats with a certain quality and area disposal” *as the least efficient ones*, but to *half the price (!)*, see the graph below.

In step 2 a multivariate regression analysis is conducted to identify “Best Practice” with respect to effective production of blocks of flats. The research project has identified 14 parameters that are statistically significant correlate with efficiency with a confidence interval of 5% - and 42 other parameters are *close to* statistically significant correlation. The main report from *the productivity project* will be issued in January 2007.

In 2001-03 a Nordic project was executed, aiming to do benchmarking of building projects across national borders, see the report “Productivity studies in Nordic building and construction industry”.³ The required tool did not yet exist at the moment. The project documented State of the Art in the field of productivity/efficiency and building costs in housing for each of the five countries. Today is the tool operative, and it gives the opportunity to carry out parallel efficiency studies in each country and comparing studies (benchmarking) across national borders in any region, as long as the industries/contractors are willing to participate and provide the necessary data.

³ NBI – Project report no. 377 – 2004.

Figure 7. 2. Bias corrected distribution of cost efficiency score in 122 building projects, type block of flats with total production costs of 1.2 billion €. Average efficient score for the sample is 79%. Consequently there is an average improvement potential of 21% corresponding to a cost reduction of 250 million €. Yellow columns show the projects from one certain company, indicating rather low consistence in performance.



Source: NBI 2006

7. 2. 3 The BIT program (BIT-programmet 2000 -)

This is a market-oriented program for business development, based on technology initiated processes and technology and business platforms for open international standards. The aim of the BIT program is to develop programs for internationalisation for the group of participating companies for each involved business sector. The B&C sector, represented by the trade organisation for housing, is part of this concentration through the *BIT Building focus*. The BIT Building program has evolved to be one of the two financial sources, and the BCP the other, for broad Norwegian concentration on the IFC/IFD/IDM development work under the *buildingSMART umbrella*, of which the project *Use of IFC standards in building sector*, is the one with the most visible achievements at this moment. The project is working on conceptual structure for IFD Library (BARBi). It has evolved into a major national project with strong international cooperating activities for development of an object library for the building construction industry. The IFD Library will be compatible with IFC (Industry Foundation Classes) and can be used as a powerful plug in for IFC's to get more detailed information in and out of your construction design.

7. 3 Other initiatives for the purpose of improving conditions in the building sector

In Norway, there are other projects than the above described, that indirect relate to the building cost and the understanding of how the building costs are affected by strategic or operative actions. This is projects with other main focuses than the building cost as such. However, all efforts aiming to improve building products, production processes or value for the users of the houses/homes also tends to influence the building cost in one direction or the other. Some examples are:

- The Norwegian State Housing Bank (Husbanken)
- Sustainable housing at ordinary cost
- Life Cycle costs in housing
- Sustainable heating in housing
- Environmental assessment of buildings
- ECO-products
- ECONO – developing ecologic wooden houses
- NORone – in-house production of electricity
- National Office of Building Technology and Administration (Statens bygningstekniske etat)
- Universal design (Universell utforming)
- The Norwegian Federation of Co-operative Housing Associations (NBBL) in cooperation with “The Federation of Real Property for hire” (FNE) and “Norwegian Building and Real Property Federation” (NBEF)
- Focusing the owner’s position in the building project (Byggherren i fokus)

7. 4 What importance have the initiatives had for the building cost trend?

Lots of earlier realised initiatives have certainly influenced the development of the building cost. It is, however, not known how strong the influence has been – and in which direction. For many R&D initiatives it has been an ambition to reduce building cost growth, though not emphasized in the project names or scopes of work.

With reference to the headlines in the Swedish document, following comments should be added to the information already given.

7. 4. 1 Enhancing the clients/owners’ competence and ability to lead the building process

As listed above, the *Building Cost Program (BCP)* has *more competent customers* as one of its three main topics. For the time being, the program has at least four projects addressing this subject, with following abstracts.

Building costs and client satisfaction in perspective of the final user of homes

The project is a survey of how the category “First time user/owners of new homes/flats” experience quality of their premises. The survey shall be carried out twice, the first time in the beginning, and the second in the end of the lifetime of the BCP. The project will study possible change in customer satisfaction over the BCP lifetime, and the correlation between satisfaction, price and certain developer policies, aiming to increase quality of the premises from the owner/user’s point of view.

Value for money – Better quality and effectiveness through increased customer competence and better planning

The project will produce

- A guideline for housing with focus on basic qualities to moderate costs
- A report with information about what is the most crucial with respect to acceptable quality/standard in moderate costing housing projects.

At the present state in the project, the case studies are carried out. They indicate that a very good quality is achievable even to very low building cost. The previous indication is that co-operative housing associations are more successful on this matter than the private developers are. It is not yet possible to predict general improvement in how to carry out a “high quality to moderate cost” building process. However, the findings point out *the contracting models/-strategies* as interesting issues. This is the 2007 scope of work for the project.

The web site for Improving the Competence of Housing Customers

This project is lead by the Norwegian Consumer Council (Forbrukerrådet). With the project this public and neutral institution will give customers relevant information about housing on the web and in a not commercial way. The aim is to enhance the customer competence as buyers of homes. The strategy is to present facts and guidelines of technical, juridical and economic character in an easy accessible way.

At end of August 2006, the project reports following progress. Production of information with respect to housing, titled:

- The building process, step by step,
- Economy,
- Register of notions,
- Legal rights of the customers,
- Templates for contracts,
- How to complaint,
- Ways of solving conflicts,
- Verdicts concerning housing issues.

The goal is to open the web portal on the International Consumers Day, March, 15th 2007.

Correct performed in the first place

The project has as main philosophy that *the capacity of the owner* is crucial when the aim is to improve building quality and prevent building cost to increase out of proportions. Based on the Total Quality Management (TQM) ideas, the project will develop:

- Consciousness about building defects, building costs and quality among all parties in the building process. Owner operated tools for reaching improvements on these topics will be part of this development.
- Education concepts for quality in the building process, and incentives for “right in the first place”.
- Tools that promotes communication, effectiveness and quality in a holistic setting.
- A common platform of understanding the process and the quality of the product.
- Consciousness with respect to the owner’s role as top management of the project and leading party of the quality achievement work.

This rather huge and ambitious project will be in process from 2006 to 2009 in five steps, of which the three first will be reported per summer 2007.

Some completed and ongoing projects with other financial sources

During the last ten years, the clients/owners role has been studied with respect to cost-effectiveness in the following projects (among others):

- Focusing the owner’s position in the building project/ “Tool for the owner’s project management” (2002/03; The Norwegian Federation of Co-operative Housing Associations – NBBL - and allied).
- “Managing building projects in co-operative housing associations” (NBBL, see NBI-project report no 306, 2001).
- “Cost management in building projects in co-operative housing associations” (NBBL, see NBI-project report no 318, 2001).

The submitted Swedish documentation presents collected information about *production costs*. It contains detailed information about building costs, grouped in:

- Contractor costs
- Site costs
- Fees
- Consulting costs
- General land development cost
- Financial costs and
- Value added taxes

Cost figures at this level are not in general available in the Norwegian R&D sector. The productivity project uses information of the type *contractor's cost* in the benchmarking and detailed figures ("sub-level costs") in the regression analysis. However, the main philosophy of this project is that comparing *square metre costs* of the contractors gives less accurate ranking than the comparing of *efficiency scores* does. For this reason, the contractor's cost is not reported, while the efficiency scores are, see the efficiency diagram above.

7. 4. 2 Reducing the number of defects in production and operation of buildings

As listed above, the *BCP* has *increased productivity* as one of its three main topics. For the time being, there are at least seven projects *addressing faults and defects* as part of the cost reduction topic, with the following abstracts:

Quality Assurance for small and medium size companies in the industry

This project has development of a quality and environmental management systems as its scope of work, including suitable guidelines/handbooks with digital connections to the system documentation. The systems will be introduced to the different trades and offered for incorporation in the existing company systems. Schedule report of August 2006 informs about some constraints in the early phase, but the project keeps still December 2007 as final datum for its work.

How to prevent faults in design and specification

This major project will identify the reasons for faults in the production specifications (drawings, descriptions etc.) developed in the design and specification process. Furthermore, through analysis of the findings, the project will define "Best Practise" in design planning and execution.

In August 2006 the project reports following progress: Mapping of frequent faults and number of each type is done. Through grouping the faults in relevant categories, interesting information of the basic sources of the faults have been revealed.

The project is about to clarify if there are correlations between the amount of faults in design/ specification and how the building project is managed, i. e. organized, planned, coordinated and controlled. Through dissemination of the information in the B&C sector, the project believes that the industry will adapt the knowledge and adjust own practice – and thus reduce the part of the building cost caused by faults design and specifications.

Registration of faults and defects during production

The project's goal is development of a hand held computer device ("palm computer") for effective registration of faults/defects on site during building production. The aim is to identify which types of faults are frequent and

what the cost of rework and remedy is. The project also wants to understand the causes of unwanted incidences, and propose change in procedures with improvement as goal. "Correct performance in the first place" is the ambitions, and in this way reduce extra building costs caused by rework and corrections.

The project will be completed in 2006, and has reported by August that the tool is in operation and that the intended goals are about to be achieved. In addition the project has produced added value for the organisation in which it is developed/tested/used in form of improved specifications/drawings and management of the operations.

The road to correct development, design and production of buildings

The goal for the project is to improve quality in building projects, and with the definite goal of reducing the measured amount of building faults and defects *to the half over a period of ten years*.

The project is divided into five sub-projects:

- Collect information about how different Danish initiatives have organized their works to measure and systematically "attack" the volume of faults and defects in building production,
- Conduct measurement of building faults and defects twice a year, based on a common classification developed within the project,
- Assure quality of building projects, based on a verification system developed by the project,
- Establishing a web operating tool, based on Norwegians standards and the classification and verification system developed by the project,
- Modify the attitude on quality among the companies and individuals in the industry in direction of improved quality, through workshops and seminars throughout the lifetime of the project.

Schedule report by August 2006 says following:

- Systemized experience feed back to the operators is not achieved yet.
Conclusion: Change of behaviour takes long time, even if the argument is improved quality and reduction in building costs.
- Words and phrases in the industry with respect to quality is not equally used and interpreted in the industry.
- The hand over/take over procedures are different from company to company.
- The Norwegian Consumer Council is frequently approached by individual home buyers with complaints of all types. The institution does not have a classification that makes statistical testing possible.
- The main office and the building project have deviating understanding of faults and defects.
- The industry is interested in quality improvement.

This ambitious project will proceed through 2007 and present its final report in January 2008.

Water following the wrong path – a challenge to the industry

Abrupt flow of water due to damaged technical installations etc. causes two types of costs:

- Compensation to the insurance company customers for the destroy of belongings in general,
- Costs of repair of the installations and the damaged buildings.

Registered amounts of compensation and estimated costs of repair give a total “water damage costs” per year of about 3 billion NOK. Some of these damages are caused by faults in the products, wrong design or wrong installation/assembly. Another part is caused by wear and tear, ageing or lack of maintenance. The project’s goal is to reduce the cost of remedying such types of costs with 2.5% per year over the five year of the BCP.

Schedule report by August 2006 confirms the pre-phase of the project to be completed. The participating companies are prepared and positive, probably because:

- Water damages are a problem to the trade as a whole, due to high insurance premium,
- The trade organisation needs the experience earned by the professionals (companies and individuals).

The project will proceed through 2007 and 2008.

Risk assessment aiming to reduce the volume of building defects in electrical and other technical deliverances in housing

Unions of technical contractors and a consultant company, has presented the project idea, which is to reduce building faults and defects by risk management. The goal is to reduce the amount of faults and defects in the projects that are served with risk assessment/management of the method planned to be developed of the project.

The project will develop an easy operable tool for risk assessment in electric and other technical installations in housing. The tool will be ICT-based and prepared for communication within the IFC format.

The schedule report pr. August 2006 informs that data collection is conducted and a first version of the *eRISK* model is developed, based on a qualitative, five step concept.

Information has been focused, both inside the trades and to the B&C professional environment in general. The project will proceed during 2007 and then report.

National database for quality in buildings

This project aims to create the ability to keep building defects in Norway under continuously surveillance. Analysis of collected information is expected to serve the many parties in the sector with facts about faults and defects in buildings. The project consists of two parts:

- Standardisation, i. e. develop digital registration templates for registration of imperfections at the moment of hand over/take over,
- Development of the data base, i. e. systemize information about faults and defects and organize the information in a way that makes analysis and reporting feasible.

The project will relate to tree different sources of information:

- Take over registrations in a group of companies,
- The reports from the inspections carried out by SINTEF Byggforsk (NBI),
- The results from the project “The road to correct development, design and production of buildings” see project above.

The schedule report by August 2006 shows that the standardisation activity is in progress. Though, it will take its time, since there are strict formalities involved, since this is a question of revision/updating/modification of an existing national standard (NS 3434).

The development of the data base has started with a study of feasible structure based on works carried out in an earlier stage, mainly by NBI, see mentioned project below.

The project started in June 2006 and will proceed through 2007 and until October 2008, reporting at the end of 2008.

Some completed and ongoing projects with other financial sources

During the 55 years long existence of the Norwegian Building Research Institute, the institution has had prevention of faults and defects in buildings as a core activity – and by this “value for money” as underlying ambition. The assembly of “Correct solution sheet”-(Byggforskserien/Byggdetaljbladene) has been a crucial guideline for companies of all trades and magnitudes within the construction sector. In the building to the professionals in the industry. A large part of the knowledge is based on experience achieved under inspections of damaged buildings or components.

In 1992, as part of the argument for the revision of the Planning and Building Act, the Government needed an estimate of the building defects. This focus on building defects, together with the findings in the research work, seems to have brought new consciousness about how much building defects really cost the parties in the industry, see *NBI Project report 163 (1994), Building defect in Norway – A survey of costs of repair, and comparison with documentation from other countries.*

In the following years, new R&D activities on the building defect issue were reported:

- Building defects – Basis for systematic measurement, NBI project report 308 (2001),
- Changes in building quality; A quantitative registration of building defects, NBI project report 356 (2003),
- The effect on building defects caused by incorrect design, NBI project report 375 and 376 (2004),
- Changes in building quality; Final report, NBI project report 379 (2004).

Building defects could be defined as defects *induced* during the development, design and production phase (“process caused defects”), and *revealed* during the lifetime of the project, i. e. from hand-over to the demolition. The first investigation (NBI 163) reported that mending such defects causes costs equal to 5% of the annual, accumulated production cost of buildings in Norway. In addition, the investigation indicated that the repair *during* production phase, i. e. before hand-over, represents an amount of about the same magnitude. (The last estimate coincides with the results from a study at Chalmers University of Technology; see CTH, rapport 49/2002). Thus, the mending costs caused during the months/years of planning, design and production equals in total approximately 10% of the annual, accumulated production cost of buildings.⁴

7. 4. 3 Choosing suitable forms of contract and eliminating non-value-adding activities

As listed above, the BCP has improved management, with more significant response definition at all levels, as one of its three main topics. For the time being, there is one project addressing better cooperation and avoidance of none-value-adding activities within this field in the BCP, see the abstract below.

Guidelines for correct competition (in housing) with examples of descriptions

The project is based on the fact that all building projects have a specification/description as their basic document, and the postulate is that the quality of this document is vital with respect to the success of the project. Vague and insufficient project documents are often followed by change orders and imperfections in the product. The negative effects have not only an economical aspect. It may also affect the time schedule in a negative way – and consequently generate conflicts.

⁴ On top of this amount one should add the mending costs caused by incidents during the lifetime of the building, like fire, natural disasters, unauthorized use etc.

Standard for project documents can improve the described scenario. The project will develop a guide for establishing suitable basic documents, including examples of the different types of the actual documents.

The project is a minor one of the BCP projects, and will be completed during December 2006.

Some completed and ongoing projects with other financial sources

During the last ten years better cooperation and avoidance of none-value-adding activities has been addressed in some projects, of which should be mentioned the following:

- In 2003 the parties in Norwegian building and construction industry has agreed on a new juridical standard (template and guideline) for contracts between owner and contractor regarding B&C projects. This basic document and its derivatives (similar documents for contract between main contractor and sub-contractors, contracts for turn-key works etc) are emphasizing the authority and responsibility of the parties within building projects. The work of Standard Norway, which is a continuous process of revisions of existing standards and establishing of new ones, is of great importance when it comes to correct and effective accomplishment of building projects. - Even more important is the implementation of the juridical principles through educative activities in the industry. see sub-chapter I below.
- In 1995/97 the Planning and building Act was revised, including new directives regarding responsibility in building projects. This gave strong attention to the responsibility of the parties in the projects, presumably to the benefit of the process and the products.⁵
- The program “Focusing the owner’s position [...]”, contained a project named Contract strategy and choose of methods in procurement (Metoder for anskaffelses- og kontraktstrategi), which aims to improve the quality of contracts – and consequently keep building costs under control.

7. 4. 4 Focusing on early phases and bringing experiences back into the building process

The BCP has more competent customers (a) and improved management and enhanced responsibility at all levels (b), as two of its main topics. Under the early phase umbrella at least two BCP projects are launched, see below. The experience learning challenges are addressed in a sub chapter at the bottom of this main chapter.

⁵ During the years 2000 – 2004 an evaluation of the effect of this rather profound revision were carried out. Learning from the evaluation and additional experience has led to another, ongoing revision. Distinctness with respect to responsibility is also addressed in this upcoming version. (It is difficult to monitor the effect of legislation and disputable if the last revision of the Planning and Building Act has fostered an improved quality of the products of the industry).

Planning and managing of design

This project is based on the idea that there is no suitable tool for planning of the design and specification process. The reason of such lack is the *iterative* character of the design and specification process, making ordinary planning tools inappropriate. Thus, the aim is to develop methods/tools for management of the design and specification activities, based on improved use of ICT and object based/IFD based design. The goal is to improve the building process in total, i. e. for the architect and consultants to deliver specifications and drawing without missing or wrong information and in complete consistency with the clients brief.

The project started august 2006 and will proceed through 2007 and part of 2008. Report will be submitted in the end of 2008.

Norwegian Wood, Early phase advices for enhanced housing quality

The project is addressing one specific topic, called Norwegian Wood, in connection to the Norwegian representative for the 2008 European Cultural Heritage, the city of Stavanger. The ambition of the Norwegian Wood project is to study new ways in use of wood as material in buildings from the perspectives of sustainability, energy efficiency and flexibility. The building cost project (BCP) will develop early phase guidelines for quality assurance in two cases in the Norwegian Wood program. In addition the project will carry out a cost-efficiency study of 5 -10 actions on sustainability. The project was opened in June 2006 and will proceed until September 2008.

Some completed and ongoing projects with other financial sources

In the last years, *early phase* topics have been addressed in some R&D projects focusing the owner's position in the building project:

- In these days, the NBI report 404 "Environment for learning – A guideline for school owners", is published. This report gives advices on how to act in the early phase to identify, qualify and quantify all functional and environmental needs and forward this into design and production, and by this assure performance in full accordance with the stated needs.
- In 2002-2004 Norwegian companies from the B&C industry participated in the international project "Environment and Logistic integrated in Project Management", a project funded under the European Commission under the Competitive and Sustainable growth Programme (1998-2002). The project gave as result a quality system model with examples of procedures and templates for all steps in project execution, and with special attention to the early phase activities.

7. 4. 5 *Introducing an industrial approach (processes, logistics, procurement and purchasing)*

The Building cost Program (BCP) has *increased productivity* as one of its main topics. Under this headline is the project *Industrialization and specialization in housing* naturally located.

Industrialization and specialization in housing

The project involves parties with different roles in the industry (producers of components, contractors, owners, architects, etc. with industrial housing as part of their business concepts.

The report of August 2006 is telling that industry pays high interest in industrial housing, each group and company in its own way. The leading motives are:

- Reduction of the building costs,
- Adaptation to the diminishing of the labour force resource,
- Improved quality.

During 2006 the project has established good relations to companies involved in actual industrialized housing projects and will be a facilitating party in exchange of experience among these, as well as secretariat for dissemination of common experience to the sector as a whole. The project will continue through 2007 and then submit its final report.

Some completed and ongoing projects with other financial sources

The productivity project is addressing the prefabrication topic through the question “Is production on site or off site the most efficient?” – During a workshop in October in the Industrialization project, this separate subject was discussed, based on the findings in the productivity project.

In short, the conclusion is that in the sample of 122 blocks of flats projects there is no statistical significant preference. However, the data tends to tell that “the good choice” is one of the two extreme solutions, i. e. either as much on-site production as possible or as much off-site production as possible. These two principles give the highest cost efficiency for projects of equal quality etc. The more mix of on- and off-site production, the lower cost efficiency. In the choice of the two preferred principles there are, however, different supplementary effects that should be taken into account when decision on the degree of prefabrication is to be decided, like delay in hand-over, building defects, etc.

It should be emphasized that this is one, single investigation on a limited sample of one certain type of buildings. Many similar tests have to be carried out before a complete understanding of this topic is established – if ever. As new samples are established, the model should be improved to handle details like the experience of each contractor on the actual industrial concepts, i. e. effect of repeatedly operations, should be taken into account, like many other aspects of the production.

7. 4. 6 Stimulating a life cycle cost (LCC) approach and sustainability in building construction

The BCP has launched at least three projects of this type, see abstracts below. Which of the three main BCP topics these projects - and possible others with the focus on LCC or sustainability - are part of, is disputable.

National standards for facility management and maintenance

This is a major project within the BCP, lasting from “the first day until the last” of the program. Its ambition is to increase the effectiveness and improve the quality of management and maintenance of the products delivered by the B&C industry. The suggested method is standardisation, preferably connected to national and/or international standards. Thus, the project aims to increase the attention to life cycle costs (LCC) and life cycle analysis (LCA) in the development and execution of new, and the management, maintenance and modification of existent, B&C products.

Users of buildings and planners of the same buildings do not “communicate on the same frequencies”. Consequently users/owners are in lack of suitable information with respect to use, maintenance and modifications, and planners are in lack of qualified information about the same topics before starting their work. The project will try to develop function based specifications for facilities in the operating phase, i. e. the “lifetime” of the premises. As part of this effort the LCC and LCA will be included, trying to make these important aspects standard procedures in most all B&C projects.

Key figures, tools and methods in calculating life cycle costs of buildings

The goal of this project is to provide for good investment analysis, taking into account the life cycle costs of the premises. The project is co-operating with the BCP project below (for all practical reasons, the two projects gradually seem to merge into one).

The project intends to:

- Conduct a survey of existing national and international standards for life cycle costs,
- Collect best practice in Norway on the subject LCC,
- Standardize, systemize and organize LCC data to make them communicate with the IFC,
- Propose a standard for storing LCC information within the IFC framework, based on the already executed work in this field,
- Perform information activities in the sector about the importance of LCC,
- Develop an educational concept regarding the importance of LCC.

The effect of the project is expected to be increased client competence and more efficient facility management. Furthermore, the consciousness of LCC in the early phase building projects is expected to be increased.

The project is proceeding through 2007 and will deliver a final report in January 2008.

Life cycle costs as part of the fundament for decision in early stage of building projects

The project is a minor one among the BCP projects. It will be completed in 2006 and reported in January 2007. The idea is to assure the LCC focus in the early phase, and in this manner avoid extra costs due to change orders during production. The project will co-operate closely with the project mentioned above.

The August 2006 schedule report has following highlights:

- State of the Art is not as good as expected, i. e. that LCC is not taken into account in the early phase in as many projects as one should expect. The profession of LCC calculations and analysis is still young and imperfect.
- The consulting companies are lacking capacity with respect to LCC. This forces the owners to take care of this aspect of the design and specification themselves.

Some completed and ongoing projects with other financial sources

During the last ten years there has been much attention on the subject of sustainability in building and construction. LCC has also had some attention, but not as much as the sustainability issue.

In 1998 the Government launched the five year long program “Eco-build” (Økobygg), aiming to make buildings and the building process continuously more “green”. Many R&D projects have been executed. Improved solutions have been tested and implemented on permanent basis.⁶

There are some interesting R&D projects addressing sustainability in building projects, both with respect to *products* and *process*, also in a building cost perspective. Some are listed under the headlines “*Other initiatives [...]*”/The Norwegian State Housing Bank above.

A central part of the sustainability challenge is the reduction in use of energy in buildings. This topic is even more actually today, with reference to the EC Directive of energy. New (and probably existing) buildings in Norway are facing requirements of energy-efficient solutions, which for the moment seems to bring the building cost upwards. Solutions with less cost increasing effect is a prioritized R&D topic, see the mentioned examples.

We must assume that the ongoing and coming research and innovation will bring the production costs of energy-efficient houses downwards. Even if so, the real good argument for investing in such solutions, also as individuals, shows up when we observe the investment in light of the functional

⁶ It must be mentioned that statistical tests regarding the ecological aspect in the Productivity project (2. II) shows with significance that decision about an ecological building process brings the building cost upward - and the efficiency score downward. But again, this is one sample regarding blocks of flats. We anticipate for example office buildings with huge climate installations, suspended ceilings etc. to give other findings – when such tests are carried out.

time (“life time”) of the house – and the reduction in operational costs that is a consequence of the energy saving investment. Similar observations may be relevant for other sustainability initiatives too. During the last years there are developed a few projects based on the sustainability and life cycle time principles:

- LCC and long term decisions is a project based on Norwegian Standard 3454 Life Cycle Costs for building and ISO 15686 Service Life Planning with the aim to prepare the basis for a LCC-tool for design, production and maintenance work. (NBI and Multiconsult A/S – 2006),
- Life cycle costs for housing - State of the Art (NBI – 2004),
- Instructions for quantitative classification of environmental degradation loads onto structure (NBI - 2004).

7. 4. 7 Utilization of ICT (Information and Communication Technology)

The Building Cost Program (BCP) has *increased productivity* as one of its main topics. Under this headline is the aim expressed in the following sentence: *Use of IFC-based systemizing concept (SMART building) shall be used by professional builders /developers.* One of the major projects in the BCP is of this type, and so are at least two others.

IFD Library for buildingSMART (BARBi)

The initiative has evolved into a major national project with strong international cooperating activities for development of a reference library for the building construction industry. The IFD Library will be compatible with IFC (Industry Foundation Classes) and can be used as a powerful plug in for IFC's to get more detailed information in and out of your construction design.

The vision for the project is to improve the professional communication in each step of the building process, especially the planning and design phase, but also in the procurement and production phase (change orders!) and in the lifetime of the building. Less faults, less defects, higher productivity and better control of the building costs is expected to be the benefit of this strong initiative. A large part of the project is related to computer programming and it contains some challenges related to computer science.⁷

The project is a major initiative to implement data technology in building industry. The project has following goals:

- Fill an IFC/IFD based technology platform with the minimum amount of reference data, knowledge and information, to make it operational – and thus become an instrument for reduction of building costs,
- Having an service organisation operative for crucial parts of the platform,

⁷ More information, see <http://www.ifd-library.com/>

- Having achieved common understanding in the dominant institutions in the industry about need and strategy for changed operational business processes,
- Having identified and quantified, by pilot studies, improvements in project economy by use of the platform and adjustments in professional behaviour.

The schedule report by August 2006 emphasizes that the project is State of Art with respect to ICT based cooperation in the building process in an international perspective.

The Norwegian and the Dutch has agreed to merge their solutions and cooperate in developing the international IFD library. The professional authorities in USA, Canada Australia have agreed to join the Dutch-Norwegian cooperation.

The standardisation for designing of building objects is ongoing with development of a prototype, namely a wall object (The knowledge system section).

Discussion with parties in the industry is in process to clarify the legal consequences of the new way of cooperate in building projects (The business processes section).

Remove the hindrances for effective transactions in building processes!

This project is established to reduce building costs through suitable and effective use of ICT. The idea is to reduce the transaction costs, especially the sub type concerning transaction between humans and computers.

The phrase “Remove the hindrances for effective transactions in building processes!” means:

- How can we reduce the hindrances caused by imperfect human interrelations when the challenge is to exchange information in projects on an electronic platform?
- Why does implementation of new technology take long time?
- What can be done to increase use of modern technology and achieve measurable results?
- How keep the focus on improved processes and interactions between man and computer?
- How can the potential users be motivated?
- How can we on permanent basis establish environments that encourage the use of the computer hardware and software – and the human capacity?
- How can we survey the development and check/measure if goals are achieved?

The project will continue through 2007 and then report the results of the many important questions. Interaction with other projects in the BCP, is announced.

Expand the network for improved cooperation and data flow in B&C industry

The network for improved cooperation and data flow in B&C industry is an existing network of 24 contracting companies, consultants, public institutions, computer software companies etc., aiming to improve communication in infrastructure project based on exchanging experience about planning based on 3D-visualization.

The project will try to include the building industry in the “computer-focused”, cooperative climate already achieved in the existing network.

The project will accomplish its activities, mainly workshops, during 2006 and report in the beginning of 2007.

Some completed and ongoing projects with other financial sources

The use of ICT in the B&C industry has increased enormously since the introduction of the new technology in 1965-75. To day the B&C industry, like the society as a whole, is pervaded with the products, programs and services of the computer industry. From a cautious beginning, i. e. computer based accounts and calculations in the companies; the ICT technology has expanded to include most all types of activities - even on the building sites.

Some research projects have followed the development, but most efforts have been put into *innovation*, i. e. how can the ICT ease the different operations in B&C companies of the industry.

In the Norwegian B&C sector priority has been given to electronic specification of building projects, especially in the tendering phase. The original paper version of the product from Standard Norway, “3420 – Specifying description for the construction work”, has been continuously developed both with respect to substance and medium. The later versions have, together with suitable calculation programs and data assisted construction programs, been an inevitable tool for the parties involved in tendering process – and as such with obvious impact on the building costs.

7. 4. 8 Educational programs and initiatives for individuals and companies

This chapter is added to the seven chapters in the Swedish model document, as educational aspects are an important part of the policy of the Building Cost Program. At least eight projects with education as main goal are launched by now.

Two pre-projects concerning education of builders

These pre-projects are addressing the development of an existing training program for builders and master builders into a more formally educational concept. The pre-projects are completed and is proceeding in a main project (see below).

Corporate learning

The project is established by the BCP administration/board, and not by any interesting parties in the sector. The intention is to line out principles for

making companies in the B&C industry modern, knowledge based units with improved capacity in collecting and utilization of theoretical and empirical professional information.

Zero faults – a campaign

The intention of this project is to organize and conduct an information campaign throughout the country in the end of the BCP period (2008 – 2010), based on the experience and advice from all the completed BCP projects, especially with attention to faults and defects and how to prevent this cost increasing problem of the sector.

Making research reports more easily available

This project will identify/localize and systemize existing knowledge of the B&C sector and present the basic documents and popularized abstracts on a website established for the purpose.

The schedule report by August 2006 informs about a challenging start due to huge number of R&D reports in the sector.

The project will proceed in 2007, 2008 and 2009.

The hand over process – a guide line to customer satisfaction

The project will produce a guideline for cooperation between parties in the housing process, aiming to reduce building defects, based on the experience from the hand over (take over) process in a set of case projects. The report will present experience on the field in four Nordic countries, and to the national standards with respect to the change of possession process. Different topics will be addressed:

- Are the standards for hand over/take over different in the four countries, and can such differences explain different amount of building defects?
- How are the take over processes planned, conducted and followed up in the four countries?
- How are problems in the take over process affecting the developer's economy?
- Is the take over process in housing different from the process in office building projects, especially with respect to the technical installations?

The project will report in February 2007.

Innovation and competence development in use of ICT in project administration

The project is proposed by a group of subcontractors and the ambition of the project is to keep their project cost under control by increased use of ICT in their internal operations and co-operations with other parties in the projects.

The core activity is to develop educational programs for improved project management in sub-contracting companies, including both theoretical aspects and practical operations of ICT programs. The concept for the edu-

cational program is a modular based concept, also suitable as part of formal education in the different trades of the industry.

The project will include a concept for implementation of the ITC assisted project management systems in companies, including all phases of a building project, i. e. planning, design/specification, production and preparation for service life assistance.

The schedule report of August 2006 tells that the educational program is established for test in a pilot of 6 companies. The BCP project is a three year long project, reporting its final results in January 2009.

The Knowledge Circle, a mentoring programme

The project, with the sub title “Role models, inspiration and network for better leaders and better quality in building industry”, has reduction of building faults and defects as its goal. The strategy is to encourage *female* professionals to take managing positions in the building sector. This is one of the sub-goals for the BCP, see main topic “Improved management, with more significant response definition at all levels’.

The project will develop female leaders through a mentor program, based on existing competence and concepts. The aim is to build a group of 20 mentors with 20 candidates, and prepare, conduct and follow the process for first organized meeting to the moment when mentors are educated and candidates ready for taking leading positions in B&C sector.

The project will be in process in 2006 and 2007. The august 2006 schedule report informs about positive response from the sector, companies and individual, but the “20 + 20”group is still not completely established. The project needs co-financing and this is the main topic for the moment.

Building Competence, Supplementary education for craftsmen

The project, also called “Competence in building, focusing productivity and less hustle and bustle”, is based on the idea of systematic post-education/additional education of company staffs. The education aims to keep a standard that makes the trained candidates qualified for receiving credits in the general/national educational structure.

The project has planned to complete the work in June 2008, and the schedule report by August 2006 informs that there are three ongoing, main activities:

- Organising the educational concept,
- Defining the content of the education and achieve acceptance by the educational authorities with respect to generality of the training credits,
- Establishing an internet based modular concept and a pilot projects on the issue “Improved productivity by less hustle and bustle”.

Some completed and ongoing projects with other financial sources

Experience learning/Corporate learning is the underlying main ambition of the Norwegian productivity project.

In the sector there are continuously some ongoing projects addressing *experience learning*, of which most have been incorporated in practical types of quality improvement projects with reference to the “ISO 9001” during the period 1980 – 2000. To list all these would be a neck-breaking operation, but one should anticipate that the project listed above will identify and establish contact with those of relevance for their own work.

7. 4. 9 Other projects

The set of main chapters suggested by the Swedish report (“template”) does not suite all the BPC projects, even when adding the main chapter I above. Consequently there has to be another one for a few odd projects.

Indicators for performance of the industry

These three projects are established for the purpose of monitoring the effect of initiatives like the BCP on the industry. The aim is to develop suitable and easy to operate indicators for the future on the following topics:

- Change in number of female leaders,
- Development of productivity,
- Change of conflicts.

The intention is to carry out a measurement on the three topics in the beginning of the BCP (2006) and when the program is fulfilled (2010).

European Technology Platform, ECTP – the Norwegian branch, NCTP

This project will establish, organize and manage the Norwegian Construction Technology Platform as part of the European Construction Technology Platform – ECTP, which is the European building and construction industry’s way of improving its position with respect to the 7th frame program for R&D in the EU.

The project aims to increase the Norwegian B&C industry’s participation in the European R&D activities, and ease the Norwegian industry’s access to R&D project abroad, as well as to encourage international participation in R&D project initiatives in Norway.

The project will be reported by the end of 2006.

7. 5 Conclusion

The B&C industry is a rather diversified subject. It spans from the one person architect or craftsmanship company to the huge contractors with thousands of employees. The projects vary from small refurbishment jobs to planning, design and production of plants, hospitals, highways and airports with budgets of multi billion NOK. Like the companies themselves, the trades and different professions are organised in quite many different oper-

ating models with their individual ambitions and opinions of “the right way”.

Under the umbrella “R&D in the B&C sector” much qualified R&D work has been conducted during the years, undoubtedly with effect on the building cost development. Changing conditions call for continuous activities of that type of work. Much attention has been on technological development and quality improvement, based on the impression that the initiative has a positive effect in general. With the observed continuing growth in building costs, and the apprehension of this to be a stronger and more permanent challenge, the need of a more systematic, cost moderating focusing seems necessary. From this point of view the initiative within the Nordic Dimension seems due.

We hope that the information in this document shows that the Norwegian Government and the building and construction industry has addressed the challenge of increasing building costs, and prices in the housing market, in a constructive way. We hope that the programs and projects will inspire other parties in the Nordic Dimension to close cooperation on these issues. We believe that the joint efforts in the region gradually can improve the understanding of building costs and pricing – to the benefit of households, the authorities and the industry itself.

8. Poland

8. 1 Introduction

High level of prices, low competition and highly localised markets, now characterizing the construction market in the Scandinavian countries, are not main characteristic phenomenas of the construction sector in Poland today. The construction industry in Poland is on a completely different stage of development than in the high developed Scandinavian countries.

Resultant from transformation of the Polish economy in 1990-2000 deep changes of the economic structure occurred as well as a decline in volume of production and employment. Circumstances of enterprise activities have been generally changed from centrally managed to market oriented. Methods used for project and investment management in construction companies have also changed as a result of transformation of the economy towards to be market oriented.

In 1994, new investment tax allowances for enterprises were introduced, broadening the range of allowances and lowering VAT for building materials and some building services. Those tax allowances contributed advantageously to the volume of construction. A substantial reform of the economy, including a tax reform, provided an inspiration and a starting point for a redesign of a state intervention system in the housing sector.

The Polish construction market has then been characterised by low prices and very high competition, as a result from a deep recession in 2001-2003. The Polish construction industry is also different to the construction industry in the Nordic region due to the number and structure of construction companies (more than 90% are small companies employing less than 10 persons).

The Polish accession to EU in May 2004 and – caused by that – increasing housing demand in 2006 has now ended the “golden” period of cheap construction in Poland. In 2006, a rapid growth of ground prices and costs of construction labour and building materials have been observed.

We expect that in 2007 and in nextcoming years, increasing construction costs will be a serious problem for further development of the construction market in Poland, especially in the rapidly growing areas of the main cities in Poland.

Therefore, an exchange of experience and new-found knowledge between the countries in question is important in order to reduce the construction costs and building prices. To our opinion, this is important for the possibilities to decelerate the increasing housing construction costs in Poland, caused by a “price shock” in 2006.

We also agree that a larger and more transparent market will offer more opportunities for new processes and forms of cooperation, new tools and

methods for utilisation of information and communication technology (ICT), and new materials and design solutions. This will in turn boost productivity in the building sector and promote understanding and greater fulfilment of the needs of users and society in buildings and the built environment. Furthermore, it will promote the development of a more sustainable construction and building sector and improve innovation uptake in the sector.

8. 2 Why is society interested in how the building sector works?

Accession of Poland to EU, breaking the stagnation in the economy, creating investments growth and construction demand financed by the accession funds, have caused an increase in the significance of the construction sector as well as in the interest of society in conditions and effectiveness of activities in the sector. The needs involved with adjustment of Poland to the average level of the EU countries in regard to satisfying social and infrastructural demands are really big. Those require big expenses for construction due to the delay in development of the country in the range of availability of dwellings, public and private service buildings and infrastructure objects (roads, railroads, harbours, airports, technical infrastructures etc.).

The accession has created an opportunity for a real and quick satisfaction of those needs, thanks to the financial means given to new members from the EU structural funds.

The construction industry, as contractor for residential buildings, buildings for national and local administrative public institutions (office buildings, schoolhouses, hospitals etc) and infrastructure (roads, railroads, harbours, airports, technical infrastructures etc.) as well as maintenance of all those vital parts of a modern society, plays a very important role in achieving above mentioned goals.

The performance of the construction sector has consequences for the economy of individual households as well as for industries and public services.

However, the position of the construction sector in Poland during 15 years of transformation has been significantly lowered. This has been demonstrated by:

- Deep downfall of the share of the construction sector employment in total labour force from 7.5% in 1990 down to 5.8% in 2000 and 5.3% in 2005,
- Deep downfall of the share of the construction sector gross value added in gross domestic product – GDP, from 9.2% in 1990 down to 6.9% in 2000 and 5.3% in 2005.

As a consequence of the transformation in 1990-2000 and the recession in construction in 2001-2003, the production potential of the construction sec-

tor in Poland has been almost halved (measured by downfall of employment in the construction industry). The construction sector is also negatively affected by changes in legal regulations, particularly those connected to taxes. Those changes disturb normal functioning of the market, evolve irrational behaviour of investors and make strategic planning in construction companies difficult.

Symptoms of destabilisation of production processes in the construction sector and in the industries producing for that sector, observed in the 2004, were caused by a significant change of taxes for construction materials and services – a threefold increase of VAT rate, from 7% to 22%. This led to a chaos on the construction market and affected in an extremely negative way the economy of construction investments in 2004. The results will be visible also in nextcoming years. During the crisis about 200 000 employees in construction companies lost their jobs, i. e. almost 20%, while the downfall of construction production reached almost 25%.

At present, the situation on the Polish labour market is worsening by extensive migration of high-skilled staff to the EU member states in western Europe, mainly to Great Britain, Ireland and Spain. This phenomenon affects well-organised domestic construction companies significantly, while the construction sector in Poland have to carry out large infrastructural and social adjusting programmes in nextcoming years. The lack of skilled staff will be negative for the possibilities to develop the construction industry, which will cause a significant increase of costs and prices in construction and limit the possibilities to use available financial means from the structural funds of EU granted to Poland.

Growing demand for construction work will collide with lack of possibilities to fulfil the domestic construction potential. The consequences will be increasing costs, and particularly prices of investments, which will also negatively affect real achievements.

In a situation of growing demand on the building market, experienced in Poland during the last two years, increasing prices of houses and flats have been severe.

Due to high disproportion between the price of usable space in produced apartments and average salary in Poland the capability of households to finance housing by themselves are very limited. Only wealthy people are able to build houses from their own resources. Therefore, national authorities need to understand more of the building cost “mechanism” (how cost affects prices - or vice versa) to develop and to take care of a suitable overall policy for the construction sector. The role and significance of construction in satisfying social and development needs of the country makes the cost-effectiveness of the sector very important to the Polish society.

8.3 Governmental initiatives addressed to the construction sector

During the transition period, the government initiatives addressed to the construction industry were focused on development of legal, organisational, economical and fiscal conditions for adjustment of the industry to a market-oriented economy. Institutional and legal solutions implemented in the years 1990-2000 have provided a basis necessary for construction and housing market operations in Poland.

Developing and maintaining market mechanisms for construction activity were aimed at ensuring the free choice and purchase of construction services. Costs and prices should be dependent on the competition of the construction market.

Monitoring the level and changes of costs and prices in the construction sector was generally abandoned on the private-economy market. Some exceptions from that rule took place when public works were going to be contracted, financed by public resources. Practically all considerations have been paid to creation of conditions for rational funding of construction projects, instead of level and changes in costs and prices. By political and social reasons, government initiatives have been focused on observation of construction prices only in regard to costs of building, repair and maintenance of flats.

During that period:

- Decision making and capital hegemony of the state in the area of housing construction, finance and operations was eliminated. Competency to conduct housing policy for local communities was vested into administrative districts (in Polish - gmina). Most housing assets belonging to the state treasury and state-owned enterprises were given to the districts (communalization).
- State budget funds were systematically substituted with local community or private funds. Dwellings were more perceived as an investment.
- Formal monopoly of housing cooperatives was removed, permitting most people options for becoming an owner/ tenant.
- Restrictions in the area of private unit ownership were repealed and rules of common property management were defined.
- Administrative allocation of units was minimized, a rent reform and rules for tenant protection were initiated, allowing communal owners to set rents.

In early 1990's initiatives were also taken to stimulate housing and building demand, using different economic and financial tools like reducing VAT rate to down to 0%/7% for:

- Specified building materials and products,
- Architectural and designing services,

- Sale of building and repairing works, involved with housing construction and its infrastructure.

Housing relieves referring to income tax were also introduced for natural and legal persons, involved with expenses for building of own houses and dwellings as well as expenses for repairing of houses and dwellings. Natural and legal persons could get tax relieves for building of multi-family houses for rent as well.

During the transition period there were no government initiatives aimed at control and reduction of building costs. The possibilities of such actions were limited by changes and liquidation of government authorities responsible for the construction industry. By the end of 1996 the Ministry of Construction was dissolved, and housing and construction issues were covered by the Ministry of Internal Affairs and Administration. The Ministry of Construction and Regional Development was then established in 2000, but once again dissolved at the end of 2001, and replaced by the Office for Housing and Cities Development, since 2003 governed by the Ministry of Infrastructure.

At present, housing and construction issues again belong to the Ministry of Construction, established in the beginning of 2006.

8. 4 Main government initiatives aimed at control of the building costs

During the last 10 years the government has taken many legal and regulatory steps involved with the construction sector, influencing both directly and indirectly costs and prices in construction. The initiatives have had effects more or less on such aspects, like price tendencies, organization, environment, quality, competition, training and research.

Governmental actions for ensuring a rational and honest spending of public financial means and lowering of costs in construction can be divided into several categories:

- Those connected to transformation of Polish economy towards market-oriented economy and connected to adjustment of Polish regulations and standards to suitable EU regulations,
- Development of principles for calculation and evaluation of project qualified to be financed by Public Procurements,
- Those connected to carrying out governmental housing programme supported by public means,
- Tax relieves connected to residential construction, separately new a repairing one.

8. 4. 1 *Transformation of Polish building and construction sector*

After 1990, when a general change in the management system and in functioning of economy and construction took place not only changes in the Constitution Act were required, but also in basic laws regulating the Polish real estate market and construction services contraction. After 5 years of preparations, *the Construction Law* was established in 1995 introducing new requirements according to the duties and competence of the building process participants.

The Construction Law was thought to be a basis for achieving following aims:

- Adjustment of construction regulations to a new legal status in range of the investment and construction process, based on market mechanisms and freedom of economic activity, as well as to the rules of market economy and autonomy of local communities,
- Re-structuring the act, by limiting the range of acting aspects to only technical regulations and instructions,
- Equalizing rights and duties for all participants in the building process, regardless sector of the economy,
- Strengthening the protection of public interest in the construction process by sharpening the responsibility of participants for performed tasks:
- restoring construction professional rights obtained by examination,
- specifying basic duties and rights of persons acting independently in construction,
- enlarging the range of inspection activity of construction supervision units and developing the conditions for their effective operations.
- Simplification in the way of acting in all stages of the construction process, particularly limitation of bureaucratic requirements for projects,
- Adjustment of the legal and institutional system of Polish economy to rules of market economy and autonomy of the local communities.

In 1995 *the Act on Spatial Planning* was also established, changing the way and rules of spatial planning. The Spatial Planning Act introduced new requirements according to:

- Range and methods of acting in case of destination of areas for given aims and establishing rules of their use, accepting sustainable development as a basis for those actions,
- Rules and mode of harmonising the interests of citizens, local communities and the state in the above issues.

A general rule in the legal act is the right of every person – limited by legal regulations and rules of social co-existence – to use a legally possessed area, and to protect own interest in case of using areas possessed by other persons or organisational units.

From the point of view of a potential investor, two elements of the Act on Spatial Planning are essential. The first element is the regulations involved with establishing destination and rules for using an area by creation of administrative district laws. The second one is the regulations involved with rules and forms of dealing with individual issues by administrative decisions on conditions for using building plots.

8. 4. 2 Development of principles for calculation and evaluation of projects qualified to be financed by Public Procurement

The Acts on Public Procurements of 1994 give more duties to participants in the building process when construction works contracted are using public funds. Detailed conditions of tenders have been précised in the Acts.

In 2004, in connection to the need of adjustment of Polish law to EU directives, it was necessary for proper spending of EU financial support (first of all those from the structural and cohesion funds), to introduce *the Act on Public Procurement*, replacing the many-times amended act of 1994. An important aim of its introduction was de-centralisation of the public procurement system and counteracting to corruption.

The New Act has fully harmonised Polish regulations with EU law, strengthened the rules of procurement, made the regulations more systematic and précised the definitions. Procedures of ordering have been strongly connected to the value of the order's subject.

The Act introduces also several new solutions, among others:

- Internet auction for common available procurement of value not more than 60 thousand euro,
- Institution of "evidently low price" for limiting dumping actions,
- Right of ordering to analyse the offers from the point of view of their influence on the local labour market.

For determination of payments for construction works, new legal regulations have been introduced in range of price calculation in construction instead of earlier regulations on cost calculation. The orders have dealt with methods for investor's calculation of construction prices, used in public procurement, and in other calculations, i. e. outside public procurement and contractor's calculations (offering, additional and subcontractor's).

In orders the calculation formulas have been specified for the price (value) of works, describing two ways of calculation: Detailing method and simplified method. Dependent on the type of calculation and source of financing, described methods are obligatory or may be freely chosen.

During nextcoming years, further adjustments of methods and basis for price calculations in construction will be made to the needs in range of determination of payments for construction works ordered within the framework of public procurement.

The basic changes, enabling free establishment of prices, have been introduced by the Order of the Minister of Regional Development and Construction of 13 July 2001 on methods for cost calculation of building objects and work. The Order specified methods for cost calculation of building objects and works, uniform for all economic units. It is used when a contractor prepares price calculation for building objects and works on demand of a client.

Introduced changes, in relation to previously valid, are as follows:

- Simplification of rules for cost calculations,
- Removing “official normative base” as a basis for calculations,
- Adjustment to rules given in the order of Ministry of Internal Affairs and Administration of 26 February 1999 on methods and basis for making the investor’s cost calculation,
- Removing several detailed and previously valid regulations and replacing them by the client’s specification (assumptions for cost calculation) and agreement between contractor and client (input data for cost calculation).

Above mentioned regulations were however valid only for a short period, as since 12 December 2001 *the Act of Prices*, which was the basis for the Order of Minister of Regional Development and Construction of 13 July 2001, is no longer effective.

Until now no other legal regulations have been issued on methods for price calculation for all economic units. Choice of ways, methods and normative basis for cost calculation in construction is completely free.

Regulations on methods for cost calculation of work subject to public procurement are still valid. Last ones were introduced on 18 May 2004 by the Minister of Infrastructure as regulations on methods and basis for making the investor’s cost calculation, calculation of costs for planned design work and for planned construction work.

When evaluating the influence of procedures for public procurement on the price level in construction, their positive role in limitation of construction costs should be stressed.

Because of above described changes in legal regulations regarding methods of cost calculation for building objects and works ordered under the rules of public procurement, their influence on reduction of construction costs has been different:

- Less influence in 1995-2001. During that period multi-parametric criteria for evaluation of offers and bureaucratic regulations regarding

methods of cost calculation (based on factorial and partially historic normatives of costs) limited the possibility of choosing the cheapest one from comparable contractors.

- More influence after 2001. During that period the criteria of evaluation of offers were changed (removing of non-economic parameters). Ways and methods and normative basis for cost calculation in construction were also changed and now costs and prices can be offered considering real costs and price levels on the construction market at a given moment.

Observations of level and range of offered prices for construction works, ordered under the rules of public procurement, show that differences between highest and lowest prices often have exceeded 50%.

Analysis of carried out tenders show that chosen offers proposed prices 20-30% lower as compared to the official cost calculation (based on the factorial and official normatives of costs) made by the orderers⁸.

8. 4. 3 Government initiatives supporting low-cost housing construction for less wealthy households

The legal regulations on TBS (Social Housing Associations) financial support are the most important government initiative, making public subsidies dependent on low costs and prices. The Act of 20 October 1995 supports development of social housing. Since 1996 the National Apartment Fund (KFM) located at the Bank of Domestic Economy has granted preference loans to finance certain investment undertakings in buildings, like:

- Construction of apartment houses or social sections of such buildings,
- Reconstruction, development, superstructure, redecoration or modernisation of apartment houses or social sections of such buildings,
- Reconstruction, development, superstructure, redecoration and modernisation of buildings adapted for apartment houses.

A loan from KFM may be used only to cover costs of completing residential parts of a building. Commercial premises (shops, offices, services) and garages and non-residential spaces used by the investor, which do not serve residents directly, may not be financed from resources coming from the loan.

It is also worth to remember that undertakings financed by a loan must follow requirements resulting from the Resolution of Minister of Finances from 12 June, 1997:

⁸ The author was for 10 years an arbiter at the Public Procurements Office

- The cost of construction per square meter usable space should not exceed a province index taking into consideration factors increasing this cost like city size, structure of apartment categories and other extraordinary difficulties.
- Construction in progress must meet standards regarding minimal space of apartments and their technical equipment. It means that apartments may not be of substandard type and should be equipped with so called white fittings.
- Constructed apartments must meet heating standards in effect.

Preference loans are granted to Social Housing Associations for construction of tenement apartments and to housing associations for construction of apartments, which will be of residential status or will be let out. KFM also grants loans to communities for completion of technical infrastructure, accompanying housing. For a TBS a loan for investment in housing undertakings will be most important.

Preference of this loan lies in an attractive, single digit interest rate and in a long repayment period. Preference loans for completion of housing undertakings have become more attractive since amendment to the Act allowed for increase of share of a KFM loan in financing investment costs up to 70%. In this way the necessary participation of a TBS decreased to 30%.

According to the legal regulations on TBS, financing by a KFM loan is possible only if the cost per square meter usable space does not exceed the province index. This regulation has been acting for 10 years, and from that perspective it can be evaluated positively as a factor of lowering construction costs and limitation of prices of dwellings financed by public means.

However, that solution is criticized by investors and construction companies, pointing at underrating of province indexes by local authorities, interested in their low level, since those indexes are the basis for calculation of housing allowances to be paid by administrative district budgets to citizens. A too low index of construction cost per square meter usable space, according to investors' opinion, makes it difficult to find contractors, and according to construction companies' opinion makes contracts not profitable.

The new government initiative of financial support for purchasing own flats by households is based on good experiences of TBS with limitations regarding to flat prices.

The Act on financial support for purchasing own flats by households from 2006 provides covering a part of interest rates from a housing credit by subsidizing means. A borrower will select among offers from banks, having contracts with the Bank of National Household, serving the programme. The subsidy will cover about half the credit rates, calculated according to the market credit interest. Thanks to the subsidy, the credits

normally bearing interest of 6% will be by 3 per cent points cheaper. The subsidy will be offered for 8 years.

Above described offer is addressed to families (marriages or persons alone upbringing children) without own dwelling. A credit with a subsidy will be available for purchasing a flat, becoming the owner of a co-operative flat or building up a one-family house. A flat can not be bigger than 50 sqm and a house not bigger than 100 sqm. In both cases the state will not subsidize a credit financing more than 50% of the usable space. Interest rate for exceeding space will be based on normal market rate. Also, the price of a flat will be limited. It cannot be higher than the average price from previous year in the given voivodeship (county) or capital of the voivodeship, depending on location of the dwelling.

When evaluating the influence of above described government initiatives, supporting low-cost housing construction, on reduction of building costs in housing construction as a whole, it should be noted:

- On the one hand, its limited range, since within the framework of TBS less than 5% of dwellings is built up in Poland,
- On the other hand, it is an important example showing that it is possible to built up flats and houses with low costs meeting standards regarding normal space of apartments, their technical equipment and heating.

8. 4. 4 *Fiscal system*

Besides the market mechanism, movement of prices in construction has been strongly affected by methods and instruments used for economic and financial policy of the state, consisting, among others, of:

- Income tax from natural persons,
- Goods and services tax (VAT) instead of turnover tax.

Particularly important for the construction sector were (introduced in 1992) relieves of income tax involved with housing investments, and introduced in 1994, tax investment relieves for economic units.

In 1998, corrections in methods for calculation of relieves for natural persons were implemented. The basis of calculation of tax has also been changed (into less favourable for taxpayers).

The official introduction in the 1990's of relieves of income taxes for natural and legal persons involved with housing investments and repairs as well as investment relieves for economic units were important factors decreasing costs for construction or purchasing flats and for their repair for Polish taxpayers.

Removing investment tax relief in the beginning of present decade has caused increasing costs of construction of new dwellings (started after

2001) by 19%, and removing the repairing relief since 2006 has increased respectively the costs of repair works.

Tax relieves were a kind of indirect government subsidy for households which increased construction demand. Therefore, in the years of dynamic growth of started investments, relieves were a factor of increasing costs and prices in construction. After removing the relieves, in conditions of *the* economic stagnation in 2002-2003, decreasing prices have been observed in construction.

A similar role of a factor strongly decelerating growth of prices for building materials and works was played by a significant change of the level of taxes for construction materials and services with a threefold increase of VAT rate, from 7% to 22%, which caused rapid growth of gross prices by 15% since May 2004, but has frozen the net prices in construction for nextcoming 2 years.

Tax relieves, in a form of lowering income tax for taxpayers engaged in construction of houses for themselves or for let out or for repairing of houses, were a factor of growth of construction demand in 1993-2003 and thus have led rather to an increase of construction costs.

A quicker increase of building costs and prices was clearly visible at the end of a year and in periods of announced changes and when those tax relieves should be removed. At that time, taxpayers who wanted to use relieves, have intensively purchased building materials, products and services, and thus caused an increase of building costs and prices.

Removing tax relieves and increasing previously lowered rate of VAT for building materials have caused a decrease in the tendency of investors to build. An increase of fiscal costs for construction has acted in the opposite way, lowering building costs and prices.

8. 5 What importance have the initiatives had for the building cost trend?

As we have seen so far in this description of Polish initiatives for renewing the building sector, the underlying ambition has been to reduce building costs and property management costs while maintaining, or preferably improving, the quality of what is built. The methods of stopping the growth of the costs in construction, noted in Poland, can be categorised as follows.

- Enhancing the clients/owners' competence and ability to lead the building process,
- Reducing the number of defects in building construction and management,
- Choosing suitable forms of contract,

- Focusing on early phases and bringing experiences back into the building process,
- Eliminating non-value-adding activities during the building process,
- Stimulating a life cycle cost (LCC) approach and sustainability in building construction and management.

8. 5. 1 Enhancing the clients/owners' competence and ability to lead the building process.

In Poland, where half of housing construction is based on a “own-work” system, many clients/owners have got quite good knowledge in range of organisation, contraction and costs of housing construction. Social and economical changes during the last 15 years have forced social and professional activities among large groups of citizens, who have had to actively look for a job, change work place and run their own businesses. As a result, this activity of Poles, based on decisions with financial calculations, has taught Polish clients/owners to constantly compare and to make economical choices, so important when carrying out construction projects.

Complexity of construction production and stringent legal and technical requirements involved need constant watching on changes and learning about new technologies, as well as about progress in range of logistics and using new building materials and products.

Within the last 20 years, the accelerated development of private residential construction made for own needs and for sale or let by individual developers, has caused big demand of knowledge and information for enhancing the owners' competence and ability to lead the building process.

Some initiatives in this range are as follows:

- Establishing of specialised publishers and publications dissipating basic economic and technical knowledge in construction. Since middle of 1980's a specialised publication called “Murator” has been issued,
- Increasing market activity of producers of building materials and products, demonstrating applications and price calculations of offered products,
- Educational activities of construction associations and unions of construction employers in range of skills, knowledge and experience,
- Courses and training organised by universities of technology/faculties of construction, architectonical institutions etc.,
- Information and analyses of prices made by construction experts, presented in specialised journals and conferences,
- Registration of price levels for building materials necessary for building up model buildings. Such information is presented several

times a year by the association of construction material wholesalers (PSD – the Polish Construction Warehouses).

8. 5. 2 Reducing the number of defects in building construction and management

A construction catastrophe in January 2006 when a market hall in Katowice collapsed and 65 people were killed, reminded in drastic way the whole society of construction designers, contractors and managers of buildings about their responsibility for safety of buildings.

As investors look for savings in every stage of the building process, used solutions in range of designing, technology and materials may lead to above described dangers. Looking for savings at building sites leads to tolerating design defects, using materials and products of lower quality, as well as employing low-skilled and unexperienced contractors and sub-contractors.

The Chief Inspector of Construction Supervision counteracts those negative phenomena. He undertakes the actions involved with safety of buildings and control of used products.

Actions focused on safety of building objects

The control by the Chief Inspector of Construction Supervision and local control units will be intensified. The aim of controls is to check how owners and managers meet requirements of the Construction Law.

The subjects of controls are in particular:

- Buildings, in which a large number of people will gather (e.g. public show and sport halls, railway stations etc.),
- Other objects creating potential danger (e.g. non-used objects, buildings in poor technical conditions, not repaired, anti-flood objects etc.),
- Construction work that can cause danger for health during periods of low temperature.

Because of those controls, there is a necessity of evaluation of actions undertaken by construction supervision units. For that aim, the Chief Inspector of Construction Supervision has established a Group for safety of construction work and use of construction objects.

Actions focused on elimination of building products without legal permits for sale

- Increasing educational activities addressed to producers, sellers and purchasers of building products (including persons with legal self-dependency in construction). The activity will be demonstrated by:

- organisation of training and ensuring availability of information on rules of introduction of building products into the domestic and the European market, as well as availability of results of carried out controls,
- ensuring access of construction supervision units, via web sites, to texts of all Technical Approvals issued in Poland,
- publications in technical journals of information on introduction of building products and their control, and a National List of Non-accepted Building Products.
- Improvement of the control procedure of building products introduced into the market, by:
 - more intensive control of the procedure for single acceptance of using building products,
 - continuation of activity towards unanimous interpretation of legal regulations by all construction supervision units,
 - co-operation of construction supervision units (in range of elimination from the market of products not satisfying the requirements of the Construction Law) with producers' associations, financing tests of such products by notified laboratories in the framework of so called "control purchase",
 - improvement of execution of sanctions involved with introduction of building products into the market with violation of the Construction Law and other regulations.
- Problems of changes in the Construction Law with regard to:
- the need of strengthening and enlargement of the control of building products on site, including better co-operation of construction supervision units with other units and institutions participating in the building process and final acceptance of the object, e.g. the Fire Brigade,
- introduction in documentation of the building process the duty of listing use parameters of applied products,
- possibility of certification of contracting services, that would cause ensuring of use of suitable building products during the building process.

8. 5. 3 Choosing suitable forms of contract

According to Polish construction practice, construction contracts until 1994 were subject to special legal regulations, so called OWRI. Those regulations have sanctioned the contractor's market in construction. As a result of changes in the Polish Civil Code made in 1992, issues generally involved with construction contracts are regulated by the Civil Code.

In range of public procurement, conditions of contracting by public authorities are specified in the Act on Public Procurement, introduced in January, 1995. It has limited contracts with building contractors to order-

ing construction work only in the system of “general contractor and sub-contractors”.

Those regulations did not contain a full catalogue of possible actions and contracts in construction, and thus they eliminated from the system of the public procurement contracts of turnkey type, from the stage of design to finishing a completed investment, ordering construction designs, etc. As a result of discussions and a number of remarks, in consecutive amendments of the Act on Public Procurement new regulations have been introduced, enlarging the range of construction contracts by consortium contracts, turnkey type contracts, etc.

Simultaneously, there was – according to the Polish Civil Code – a possibility of using special procedures for contracting construction work carried out in range of the programmes PHARE, ISPA and SAPARD, according to requirements of EU and based on foreign patterns, e.g. FIDIC and World Bank.

For the aim of adjustment of Polish regulations on public procurement to legislative rules of the European Community, a new public procurement act was established in January, 2004 under the name of Law on Public Procurement. It respects and secures the full harmony between the EC and Polish legal rules.

8. 5. 4 Focusing on early phases and bringing experiences back into the building process

Big and rapid changes in range of organisation and management of enterprises and investment processes in construction, technologies of construction work and organisation of a construction site have created demand for training in that range.

Connected initiatives have been undertaken by many construction societies, co-operating with the main domestic technical universities. One important action in that range is development of training materials by the Institute of Engineering of Building and Investment Processes of Warsaw University of Technology the framework of European “Leonardo da Vinci” Programme. Those are, among others:

- “Development of new types of studies and courses in the field of management in construction for engineers according to requirements of the European Union”,
- “Model of professional qualification structure and new methods of promotion, certification and mutual recognition of managerial skills in construction industry according to the European Union requirements”,
- “Improvement of linguistic skills of Polish and Portuguese construction managers and engineers - recognition of needs and preparation of courses in Construction English Language”.

8. 5. 5 Eliminating non-value-adding activities during the building process

During the transformation period, i. e. within last 15 years, there were no significant government initiatives aiming at eliminating non-value-adding activities during the building process. The technological development of the construction industry was subject to evolution ruled by market demand.

In the beginning of the transformation period the industrial construction using heavy panels and multi-block technologies has been replaced by the value-adding activities during the building process.

This was the result of decreasing construction investments in Poland in 1990's and negative opinions caused by defects of the pre-cast technologies used in 1980's. Those were mainly low quality pre-cast concrete elements of walls and floors, improper assembling systems (corrosion hazard), lack of designing flexibility and big weight requiring use of heavy equipment.

This affected negatively the economy of housing investments, significantly lower than in previous years, contracted by small- and medium-sized construction companies preferring traditional technologies of building.

These changes in methods used to build housing are results of many factors, among which the following should be noted:

- The process of rationalizing building costs,
- Organizational and ownership changes in construction enterprises, leading to closing-down or retooling many enterprises (the so-called "building factories"),
- De-monopolization of investment in housing construction causing growth in number and kind of builders and turn away from constructing large housing estates,
- Increased role of investors in choosing construction technology (and thus in influencing construction costs and future use of such flats).

The most important aspect of developing masonry technologies was relatively low labour cost in Polish construction, which in conditions of very sharp competition on the construction market has enabled using even very labour consuming technologies. Of course, from the point of view of value-adding activities during the building process this was in favour, but from the point of view of effectiveness of construction investments using traditional technology it has a lot of disadvantages, consisting mainly of too slow erection of buildings and high consumption of materials and elements.

Because of technical characteristics of traditional building materials and possibilities of their use for erection of rather small building objects, using those solutions were common until the year 2000.

At present, the share of private construction in family housing is decreasing, and growing demand for dwellings in the cities is observed. In this situation the share of multi-family housing construction is still bigger. Traditional technologies are abandoned and replaced by more efficient monolith constructions. Those technologies are preferred by developers, since they give better profitability in the sector. Better profitability means more resources for both enhancing quality and investments in skills and product development. This leads to even lower construction costs and lower property management costs.

Spreading of monolith constructions was caused by marketing and training activities of companies offering formworks on the Polish market, among others Peri, Doka, Noe and Bauma.

The share of industrial construction is very small and due to this fact the problem of eliminating non-value-adding activities during the building process is not present in Poland yet.

8. 5. 6 Stimulating a life cycle cost (LCC) approach and sustainability in building construction and management

After a period of taking into consideration only direct costs and prices of buildings, since the end of the 1990's still more attention is paid to *Life Cycle Cost (LCC)*, when selecting technical and material solutions for designed buildings. This is a consequence of searching for lowering construction costs not only in time of physical erection phase, but also during further exploitation of buildings. This is also a result of better understanding the idea of sustainability in building construction and management by the society of investors and contractors.

Yet on 20 November, 1998, the Parliament accepted *the Act on Supporting the Thermo-modernisation Actions*. The Act is a realisation of the aims formulated in the "Assumptions of a state policy in range of rationalisation of energy use in the communal sector", as well as one element of the government programme for softening the consequences of making energy prices free.

The programme of supporting thermo-modernisation actions is based on economic rules in range of preparing the action, its evaluation from the point of view of optimisation of a cost/benefit ratio and the way of financing the actions.

The act regulates:

- Rules of supporting thermo-modernisation actions undertaken for:
- saving of energy delivered to buildings for heating (also heating of water),
- reduction of energy losses in local heating networks and local energy sources,
- total or partial change of conventional energy sources into non-conventional ones, including renewable sources.
- Rules of creation of the Thermo-modernisation Fund and the use of its financial means.

For the aim of encouraging owners and managers of buildings to actions in range of thermo-modernisation, the Thermo-modernisation Fund has been established, with the task to support those projects by offering credits with a special 25% “thermo-insulation premium”, returned to the borrower after completion of investment.

Such initiatives are also demonstrated by considering cost of exploitation as one of cost criterias in the procedure of selection of offer for public procurement.

That criterion is used in situation, when the subject of order is designing and carrying out construction work within one contract, as well as when the subject of order is carrying out construction works on the basis of design documentation of the client, and the client is accepting offers with certain variants regarding to his specification. The rule should be evaluation of so-called “drawn cost”, taking into consideration costs of exploitation of the object (for example, comparison of exploitation and conservation cost of a steel and reinforced concrete bridge) within its life cycle.

When considering the possibilities of dissipation of a sustainable construction, directed towards space, architecture, construction and material solutions friendly for environment, it is worth defining the status and financial conditions of developing a sustainable construction in Poland.

Creating conditions and implementation of programmes for developing sustainable constructions causes many questions and reflections, among others:

- Should programmes for sustainable construction be implemented simultaneously in the whole range of construction industry, or in selected areas and objects?
- Will introduction of more restrictive construction standards and regulations limitate investments and repairing jobs due to increasing costs? What will be the social impact of a delay in satisfying current social needs, which would be an obvious effect of such limitations?

- Does a civilisation delay – lower saturation by building objects in Poland – create a chance of avoiding mistakes made by highly developed countries, which have developed construction in a way that was harmful for the environment and now have to carry out expensive re-vitalisation actions?
- What are the possibilities to finance programmes of sustainable construction? Are those countries able to propagate construction of this kind in the whole area of construction production, or only in selected segments or objects?
- What should be the standard for sustainable construction according to categories of objects and buildings?
- What are necessary expenses for financing sustainable construction, e.g. the costs of housing construction with a specified standard?
- Can Poland afford implementation of a strategy for sustainable development in the construction industry and possibly:
 - in the entire field of the construction industry,
 - in selected areas,
 - in some types of objects?

Implementation of rules for sustainable construction significantly restricts the liberty of investors in realisation of construction projects, imposing them suitable requirements and orders. This will limit the role and possibilities to realise cheap construction which is an issue that cannot be omitted! It is worth to consider, whether construction realised in a “self-made” way should be limited, as keeping to the rules of sustainable construction can hardly be controlled in such a type of activity. Another option is leaving this area out of control and counting on effects of an indirect action – teaching and persuing.

8. 6 Conclusions

It can be found out from an overview of Polish experiences, that no direct government initiatives, aimed at reduction of construction costs, have been undertaken. Changes of prices in construction have been regulated only by market mechanisms, mainly by increase or decrease of demand.

Liberalisation of the economy and initially high rate of inflation has made it difficult not only to observe construction prices, but also their economic interpretation. Thus, during more than 12 years (1990-2002) changes and level of construction costs were dependent on inflation in Polish economy. The consequence was not any interest in reduction of those costs, but in deceleration of the rate of their increase.

Main role in that range was played by a restrictive monetary policy carried out by the National Bank of Poland. The policy has led to limita-

tion of inflation rate year by year, and thus affecting the rate of growth of construction costs in Poland.

Tax relieves, in form of lowering income tax for taxpayers engaged in construction of houses for themselves or for let or repairing houses, were the factor of growth of construction demand in 1993-2003 and thus have led rather to increase of construction costs.

Influence of government initiatives, supporting low-cost housing construction, on reduction of building costs was limited only to housing projects financed or subsidised by public means.

Relatively more influence from government initiatives had the introduction of free choice of methods for cost calculation for building objects and works ordered by public procurement.

Analysers and construction society feared that removing of tax relieves, involved with housing construction, and increase of VAT rate for building materials would cause a rapid growth of costs and prices in Polish construction. Quite opposite to those fears expected growth has not been observed.

Similarly, also fears that introduction of new materials, technologies and standards of energy saving would cause rapid growth of costs and prices of built up flats, have not been fulfilled. The evidence is the example of TBS construction – flats and houses can be built up with low building costs, meeting standards regarding normal space of apartments, their technical equipment and heating standards.

The increasing tendency of construction costs have been tampered by strong competition on the Polish construction market, fully open for transfer of building products and services. The recession in 2001-2003 has also strongly stimulated the growth of productivity in Polish construction.

In consequence, the Polish construction market in the period of accession to EU has been characterised by low price level and very high competition. It is worth to make it clear, that one of the main factors making it possible to lower and tamper the growth of construction costs, was in that period strong competition on the labour market and a big share of the construction work performed in the so-called “grey zone”, with competitive prices regarding to legitimate works. According to our estimation, at the end of 2004 every third construction worker (including many specialists) was registered as unemployed person.

Accession of Poland to EU in May 2004 has brought a gradual increase of building demand with simultaneous downfall of industry capacity, caused by extensive migration of high-skilled building staff to the EU member states. Thus, the “golden period” of cheap construction in Poland has been ended.

Rapid growth of ground prices and costs of construction labour and building materials has been noted in 2006.

We expect that in 2007, and for sure in nextcoming years, increasing level of costs will be a very serious problem for further development of construction in Poland, especially in rapidly growing areas of the main cities in Poland.

Appreciating the significance of labour force capacity for reduction of increasing construction costs, Poland has fully opened its labour market for all EU countries, including the new member states Romania and Bulgaria. The government is also planning to ease the employment of the construction workers from outside of EU (Ukraine, Belarus, etc.).

Non-governmental bodies, like Union of the Polish Construction Employers, undertake educational actions for increasing resources of skilled construction workers, by carrying out the professional courses for bricklayers, roofers, etc.

Experiences from dozens of years of deep changes on the Polish construction market show that a basic factor of decreasing building costs and limiting the growth of prices of building services and objects is to ensure competitiveness of the construction industry.

Growth of competition in construction is caused by:

- Increasing resources of skilled workers,
- Increasing number of construction units, and particularly development of small, specialist, subcontracting companies,
- Increasing availability and development of new construction technologies,
- Increasing number of producers and suppliers of building products and materials,
- Increasing flow of commercial and technical information,
- Removing bureaucratic barriers accompanying the performance of construction investments,
- Transparency of procedures and criteria of choice made in the framework of public procurements,
- Opening of national local markets to international competition.

9. Sweden

9. 1 Why is society interested in how the building sector works?

The building sector in a broad sense provides employment for 10–15% of the population in the countries in the Northern Dimension region. In Sweden, the building sector is the second biggest industry in the country after the healthcare sector. It is a sector of great importance for the national economy in more than one way. Besides creating jobs for individuals, it produces products such as homes, offices and public buildings that have a great impact on household budgets, corporate overheads and the cost-effectiveness of public services. Since the state subsidizes housing investments and pays rent allowances to individuals, it desires to have a greater understanding of the reasons for the cost increases in the building sector. Design aspects of buildings such as a practical floor plan, a good indoor environment and suitable material choices can also contribute to efficient use of the built structures and low long-term costs for households and businesses.

The building sector differs somewhat from other branches of industry, such as the engineering industry, in that it is heavily oriented towards the domestic market. This means that, so far, it has little exposure to international competition. In most cases, what is produced in a given country is also consumed there. The risk of oligopolistic situations is imminent and requires oversight by the consumer and competition authorities.

The building sector has a great impact on the environment. Approximately 40% of all energy use in Sweden goes to heating of residential and commercial premises. Nearly 40% of all waste comes from buildings. The design and siting of buildings and planning of our communities can lead to the creation of communities where public transport is difficult to provide, generating heavy motor vehicle traffic. In this way the building sector has a great direct and indirect impact on the environment.

The building sector influences wage formation among both building consultants and construction workers, despite the fact that productivity is not impressive, according to representatives of other branches of industry.

All in all there are many obvious reasons why society – in particular the national government – would do well to keep a close eye on the building sector.

9. 2 Some government initiatives aimed at the building sector

As will be described below, the Swedish state has in recent years found it urgent to make the building sector aware, by means of different initiatives, that they do not intend to sit idly by and watch costs continue to skyrocket while improprieties are coming to light at an accelerating pace. The Government's action in the form of these different initiatives can be regarded as both reactive and proactive. The initiatives have had more or less impact on such aspects as cost trend, organization, environment, quality, competition, training and research. The main initiatives that are dealt with in this overview are:

- The Building Costs Delegation (*Från byggsekt till byggsektor*, "From Building Sect to Building Sector", SOU 2000:44),
- The Building/Living Dialogue,
- The National Board of Housing, Building and Planning's Forum for Building Costs,
- The Building Commission (*Skärpning gubbar*, "Look sharp, boys! – About Competition, Quality and Competence in the Building Sector", SOU 2002:115),
- Special Building Coordinator (Swedish Construction Committee).

The greatest attention will be given in the following text to the National Board of Housing, Building and Planning's Forum for Building Costs, since it is the initiative that has had the greatest resources at its disposal and has used them to support pilot projects and other government initiatives.

9. 2. 1 *The Building Costs Delegation*

In 1996 the Government, via the Ministry of Industry, issued terms of reference for a government committee whose purpose was, together with the actors in the building sector, to analyze the sector and actively find ways to reduce building costs and thereby also housing costs. The committee adopted as its name the Building Costs Delegation. It produced a bulky final report with many appendices (*Från byggsekt till byggsektor*, "From Building Sect to Building Sector", SOU 2000:44). The Delegation's report showed that the building sector must find solutions to break up inefficient organizational structures, cultures and traditions in order to improve competition. The Delegation also found that state and local authorities have a responsibility to issue rules for building and for the state housing subsidies aimed at shifting from a supply-driven to a demand-driven market. In its report the Delegation took a close look at such issues as building methods, procurement and the application of the Public Pro-

curement Act, basic training and in-service training for the professions in the sector, inadequate competition, etc. The report presented calculations showing that construction defects, material waste and poor planning in a normal eight-storey building caused costs equivalent to the cost of erecting one whole storey in the building.

The industry, which was initially represented in the Delegation, withdrew from the Delegation when it was discovered at an early stage that it would be subject to massive criticism. Industry representatives said that *“if it had been possible to build at lower costs and if it had been possible to be more efficient, the industry would already have done this”*. The industry claimed that productivity in the building sector, measured as net income per hour worked, had improved in the mid-1990s. However, the same favourable result was not obtained if productivity was measured as usable floor area per hour worked. The explanation was that during the period 1995-2000 it was possible to sell expensive cooperative apartments at high profit in the inner-city areas of the big cities.

The Delegation contacted a number of former representatives of building companies at the management level who testified to behaviours that cast an unfavourable light on wholesalers, such as hidden discounts. The Building Costs Delegation received heavy criticism from the building sector. The Government realized after the controversial report had been circulated for comment that there was reason to pursue certain matters further and seek more evidence for some of the allegations made in the report.

9. 2. 2 *The Building/Living Dialogue*

While the building industry and the Building Costs Delegation were found to be at loggerheads, representatives of the building and housing sector had put their heads together with the Government, via the Ministry of Sustainable Development, in an intensive dialogue concerning the future environmental impact of the building sector: *The Building/Living Dialogue*. How, they asked, would the built environment be managed, built and planned in a generation (20–25 years)? How would building materials unsuitable for the environment be phased out? What is the nature of the sustainable energy systems for the building sector? How can state and local authorities promote environmentally sound building via lower taxes, fees and rates? These were examples of questions that were taken up in the dialogue. Nearly forty leading companies in the building and housing sector were represented in the dialogue by persons who had their companies' mandate to negotiate with the Government. As a result of the dialogue, a Letter of Intent was signed by both parties – by the Minister of the Environment for the Government and each company's managing director – regarding a number of environmental objectives

which were closely allied to the national environmental objectives established by the Riksdag (the Swedish Parliament).

However, it emerged from the dialogue that most persons active in the building sector know too little about the environment and how their own industry affects it. During the period 2005–2007, the state is therefore sponsoring in-service training on environmental issues related to the building sector for construction workers, property managers and consultants in the so-called “design stage”. This is an example of a commitment made by the Government towards the industry. Representatives of some of the companies comprise teaching teams in the training. The state is investing approximately SEK 3 million per year over a period of three years in this in-service training. The companies who are participating in the dialogue have a common registered logotype which only these companies may use together with their corporate names. The Building/Living Dialogue is a way for the Swedish Government to implement a part of the Agenda for the 21st Century (Agenda 21) that was adopted by the UN Conference on Environment and Development in Rio de Janeiro in 1992. Agenda 21 stated that states should steer the environmental work in the right direction not only by means of legislation and enforcement systems but also by awareness and assumption of responsibility on the part of industry.

9. 2. 3 The National Board of Housing, Building and Planning's Forum for Building Costs – BKF

When, in an initiative by the assistant Minister for Finance (also the Housing Minister), the Swedish Government decided to establish a Forum for Building Costs via the National Board of Housing, Building and Planning in 2001, the previously mentioned report from the Building Costs Delegation, *Från byggsekt till byggsektor*, (“From Building Sect to Building Sector”, SOU 2000:44), had just been circulated for comment and received both praise and criticism from the various public and private reviewing bodies. Among other things, the Delegation proposed that the state should create a body to look further into the lines of inquiry opened up by the Delegation.

The National Board of Housing, Building and Planning recruited an all-round knowledgeable project manager to BKF with experience from building, property management, procurement and the state building and housing bureaucracy. The resources allocated to BKF, SEK 5 million, were to be used to procure expertise that did not exist within the authority. After one year, when the Government had seen that BKF was working as intended, BKF was given a special appropriation of SEK 20 million per year to contribute to pilot projects that were supposed to demonstrate ways of building multi-family dwellings at lower costs and in a more efficient manner and thereby set the standard for the industry. BKF

was given fairly free hands to manage these pilot project funds. The money has often been used to “buy insight” into what has previously been regarded as internal corporate matters or to get an opportunity to conduct an impartial evaluation of ambitious projects. The funds were not supposed to be used for experimental building. For its work from 2001 and four years ahead, BKF got the following programmes approved by the Government. BKF stated that its objective was that communication aimed at the building sector should be so intensive that it would deliberately have to defend itself.

BKF will follow up the work of the Building Costs Delegation

The principal task assigned to the Forum for Building Costs by the Government when it was established in 2001 was to continue working with some of the notions left behind by the Building Costs Delegation. The Government wanted BKF to act as an idea and knowledge bank for owners, municipalities, authorities, contractors and other actors in the building sector.

Goals

An ambitious future goal was that BKF’s website should be a natural first choice for anyone seeking knowledge of the building process, building costs and good examples. The results of completed pilot projects, good examples and various calculation tools and the like will be presented on the website in an educational and readily accessible manner.

Seminars will be held regarding the pilot projects which BKF supports and participates in and BKF’s experience from industrialized construction in order to provide greater knowledge of opportunities in the building sector to owners and contractors in particular, but also to municipal decision-makers and officials. BKF’s knowledge sources consisted primarily of the pilot projects that were carried out.

Products

The products created by BKF to meet the Government’s wishes are:

- An informative website integrated in the National Board of Housing, Building and Planning’s website,
- Reports with special editions for the nationwide daily press and other publications,
- At least two of its own conferences or seminars per year,
- Participation in external seminars and conferences as speakers or debaters,
- Articles and op-ed pieces in the daily and trade press.

BKF will evaluate construction projects, building processes, etc.

In the wording of its assignment to the National Board of Housing, Building and Planning to establish the Forum for Building Costs, the Govern-

ment pointed out the difficulties of comparing apparently similar projects. Industry statistics and government statistics could not be used in comparisons. BKF was adamant about the importance of *differentiating between cost and price*. Elementary area terms are not used in a uniform manner. The Government wants BKF to address these problems and act as an experience centre that can help to ensure that construction projects are evaluated in a professional manner and that experience can be fed back to municipalities, housing companies, users, builders and other stakeholders.

Goals

BKF will develop tools that make it simple to evaluate construction projects and building processes and to make comparisons between similar projects at different times and stages in the process. The evaluations will be based on standardized factors and parameters.

Products

Simple and practically applicable evaluation tools that will enable planners, designers, housing companies, users, builders and various public bodies to weigh and compare price against quality in all the phases of a construction project in a generally accepted and objective manner and to simulate the long-range effects of alternative choices and approaches. The tool should be computer-based and preferably build further on one or more tools that already exist on the market or in the world of R&D.

BKF will act as a knowledge transferor and developer of training programmes

The Forum for Building Costs should be able to contribute to improving communication between the building sector, research centres and enterprises for the purpose of better popularizing and exploiting advances in research and technology to stimulate competition and contribute to higher efficiency and lower costs in building and living. In this context, BKF's project manager said something provocative

Right now the building sector doesn't need more building research, but rather more behavioural research to explain why the construction industry doesn't make use of all the research results that have been reported.

Goals

BKF will, in cooperation with research bodies in the sector, find forms for knowledge transfer and experience feedback so that relevant knowledge from research and development in planning, design, procurement, building and property management is made so readily accessible that it cannot be overlooked by anyone in the building sector from construction workers to administrators and members of management.

By contact with the sector, BKF will identify problems and opportunities in the light of government rules and the like, and suggest ways to eliminate the problems and exploit the opportunities, while also ascertaining special research and development needs in all phases of the building and property management processes.

Products

Different training programmes that can be used in secondary and post-secondary education, as well as in modified form for in-service training in enterprises, in the certification of professionals, etc. Various kinds of government rules and administrative obstacles or opportunities will also be evaluated against this background.

BKF will analyze the municipal rate systems

Using examples in an incomplete study, the Building Costs Delegation had pointed out that municipal rates and fees varied within rather wide limits and could act as cost-driving factors in different ways in different parts of the country. BKF was commissioned by the Government to make an in-depth analysis of the reasons why the municipalities' prime costs for rates and fees associated with building vary so much between different municipalities.

Goals

BKF will contribute to the creation of a clear and traceable picture of how rates and fees are set and applied in different types of regions, municipalities and localities and for different types of construction projects.

BKF will also examine how different municipalities work with planning and development projects, and to what extent developers or owners participate with their knowledge and expertise in this work and what agreements are signed between the parties in such contexts.

Products

BKF will take examples from some representative typical municipalities that explain the cause-and-effect relationships and why the sub-items (land costs, design and development costs, contractor costs, financial costs, administration etc.) for otherwise comparable cases can lead to quite different rates and fees.

Future direction of the Forum for Building Costs

In 2006 and 2007, within the framework of adopted programme areas, BKF will mainly focus on pilot projects with the following principal themes:

- Industrialized building, industrial processes, lean production and a more efficient building process,

- Life Cycle Costing (LCC),
- Energy efficiency improvements in the existing building stock,
- Application of Information Communication Technology, ICT, in building (IFC, BIM and Building Smart),
- Public procurement and purchasing processes,
- Supplementary development in existing residential areas (additions, extensions and infill),
- A holistic view of urban renewal with regard to traffic, accessibility, and social, economic and ecological sustainability).

BKF will continue to present the results of completed and ongoing projects in reports and in articles and on its website. In this way even more people can find out more about a more efficient building process and the fact that it is possible to build good, sustainable housing even for households with ordinary incomes. BKF will naturally also continue to penetrate the question of prices and costs.

9. 2. 4 The Building Commission

The National Board of Housing, Building and Planning's Construction Cost Forum had not worked for more than a year when the Government, via the Ministry for Finance in 2002, created a new committee to look at competition, quality and costs in the building sector. The committee called itself the Building Commission, and its terms of reference called for it to work speedily. The reason for the creation of this Commission can be traced to a number of "building scandals" that came to light in a short space of time and led to big headlines in the newspapers. Some that were mentioned by the Government were:

- Stockholm's prestigious housing area in terms of environment and aesthetics, Hammarby Sjöstad, was afflicted by mould problems due to carelessness and poor organization on the building site,
- Moderna Museet (the Museum of Modern Art) in Stockholm, a recently finished prestigious building in the half-billion-kronor class, was afflicted with sick building syndrome,
- Cracks began to appear in a newly-built tram bridge in Stockholm caused by faulty calculations,
- Cartels were found to have been formed between large construction companies, who divided the market (e.g. for asphalt paving) amongst themselves, causing high costs for municipalities,
- Irregularities and competition-restricting forms of collusion had been revealed in the building materials industry,
- Irregularities involving illegal labour and undeclared wages and per diem payments proved to be very common in the industry.
-

The Government wanted quick measures and ideas for cleaning up in the industry so that competition could be stimulated, quality could be improved, and unsound structures, habits and behaviours could be broken down. The Building Commission's terms of reference are more reactive than proactive. It is worth pointing out that the Government's terms of reference did not mention any of the criticism levelled by the Swedish Construction Federation at the forms of compensation paid to construction workers.

The secretary of the Commission became BKF's project manager, which led to synergies so that some of the work already done by BKF in the first year was of benefit to the Commission.

The Building Commission's final report was entitled *Skärpning gubbar* ("Look sharp, boys! – About Competition, Quality and Competence in the Building Sector", SOU 2002:115). The title reflects the fact the building sector is a male-dominated industry with macho codes that encourage risk-taking and short-term profits. The Commission presented a couple of dozen proposals, most of which were aimed at state authorities and state-owned companies in the building sector. Few of these proposals have led to Government assignments to the concerned authorities. The Commission did, however, propose that a development programme should be put together for the construction industry. As a model, the Commission proposed the British project *Rethinking Construction*.

It may be worth mentioning that the building sector – acting on its own initiative and at about the same time as the state commission – started its own building commission via the Swedish Construction Federation called *Utmaningar för nytänkande*, ("Challenges for Rethinking"), which worked by soliciting viewpoints from both inside and outside the sector. Some testimonies were relatively self-critical. The purpose of the industry's work was to make the building sector more attractive to work in and cooperate with. On the good side, the reports did not absolve the sector completely of blame for its tarnished reputation.

In its development work for the industry, the state Building Commission wanted to adopt the consumer, client and owner perspective and demand that the most professional party – the contractor – adjust its behaviour. It is urgent that all employees and consultants on the contractor side, from management to workers, be involved in this change process.

The Commission concludes that the building sector's problems have evolved over a long period of time. Even though vigorous measures are being taken, it is expected to take time to improve the way the building sector operates. For these reasons, the Government and the industry should cooperate in monitoring the change process and helping it along for an extended period of time.

The Government went for the latter suggestion after the industry not only did not reject it, but stood behind it. The industry wanted the development programme to be domiciled in the Ministry of Industry, since it

regarded itself as a branch of industry, while the Government overemphasized its role as a builder of social structures. In the autumn of 2004, the project manager of BKF (also former secretary of the state Building Commission) was appointed *Special Building Coordinator*. The secretariat of the Special Building Coordinator is funded by BKF. Information and communication are the Coordinator's principal tools. It might be said that the circle is closed by the appointment of this person as Building Coordinator.

9. 2. 5 Special (national) Building Coordinator

In its terms of reference to the Special Building Coordinator in 2004, the Government noted that a series of initiatives had been taken by the building industry that demonstrate a strong willingness to change (cf. the situation in 1996 for the Building Costs Delegation) on the part of various stakeholders in the sector. The Commission worked by interviewing representatives of different sub-areas in the building sector. The Building Commission's report served as a mirror enabling the building industry to see itself and realize that it was time for it to clean up its act, as evidenced by many commentaries from important representatives of the building industry. The Government concluded that this awareness of the industry's situation has greatly improved the chances of success in the change process. The National Board of Housing, Building and Planning had laid the groundwork for the Government initiative by holding hearings with important representatives of various interests in the sector ranging from design to production, alteration, property management, building research, municipalities, authorities, state-owned companies and others and compiled a report showing that a coordinated effort with a development programme now (spring 2004) had strong backing in the construction industry.

The Coordinator's assignment is now to work together with representatives of the building, property and civil engineering sector to coordinate a development programme for the sector and strengthen the effect of the renewal efforts that were started some time ago in the sector aimed at improving quality, competence, competition and the ability to attract labour.

The Coordinator's assignment also includes supporting and coordinating the development of assessment criteria and performance indicators used to measure progress in different parts of the sector as well as in the sector as a whole. Another task is to initiate and evaluate demonstration projects and to establish and give out awards to worthy projects and initiatives in the area.

The Building Commission had drawn attention to the uneven distribution of gender, age, ethnicity etc. in the building sector. The Coordinator

should highlight these problems in the different initiatives taken in the change process and work to bring about a more even distribution.

Furthermore, the Coordinator should try to give knowledge transfer and experience feedback a role in the development programme, since a contributing cause to the problems in the building sector is that existing knowledge from research and development is not used.

It will also be the Coordinator's task to see to it that competition in the sector is strengthened, in compliance with legal principles in the EU, and that international trade in building products is promoted.

The Coordinator should collaborate with the Forum for Building Costs, which in this case should be easy, since the Coordinator and BKF's project manager are one and the same person. Funds for the Coordinator's secretariat will be taken from BKF's appropriation for pilot projects.

The Coordinator's first year

The Coordinator has become established in the building sector and held a number of meetings with leading representatives of the sector. According to the Government's terms of reference, the Coordinator is supposed to work with the sub-sectors Building, Property and Civil Engineering. The Coordinator's summarizing slogan – *Utmärkt! Samhällsbyggnad* ("Excellent! Community Planning") – covers these three areas. Through hearings with the industry, the coordinator has decided to focus initially on the concepts *Early Stages*, *Industrial Processes* and *Life Cycle Costing*. The Coordinator anticipates a long, patient process with many small steps forward, but also intends to show results and keep morale up in the industry by picking "low-hanging ripe fruits", as someone expressed it.

9. 3 Some other initiatives than the Government's for the purpose of improving conditions in the building sector

During the ten years the state and the Government have taken the initiatives described above, the industry's self-insight has increased. Owners in particular have strengthened their position in relation to contracting firms.

The Swedish Construction Sector Innovation Centre (BIC), which is owned by the industry, collaborates with the state-sponsored building research programme by co-funding research projects of urgent importance for the sector.

The Ecocycle Council for the Building Sector is an association of developers, contractors, building material manufacturers and building consultants who are working for a sustainable construction industry.

The Swedish Council for Constructing Excellence (BQR) places the emphasis on strengthening quality in construction and property management. *Renewal in the Civil Engineering Sector (FIA)* is an initiative taken

by the National Rail Administration and the National Road Administration, along with the three biggest construction companies in Sweden, to bring about acceptable conditions between owners and civil engineering contractors.

These organizations, plus a several others that work with training, have in the past year moved into the same office building in Stockholm, where the Building Coordinator also has an office.

9. 4 What importance have all these initiatives had for the building cost trend?

As we have seen so far in this account of the Swedish initiatives for renewing the building sector, the underlying ambition has been to reduce building costs and property management costs while maintaining, or preferably improving, the quality of what is built. A more knowledgeable and attractive building sector fosters competition. For the owner/clients in both the public and private sectors, this means lower costs, while for the builders it means higher profitability. This is a win-win situation. Most methods for keeping building cost increases under control fall under the following seven headings:

- Enhancing the clients'/owners' competence and ability to lead the building process,
- Reducing the number of defects in building construction and management,
- Choosing suitable forms of contract and eliminating non-value-adding activities during the building process,
- Focusing on early phases (planning, sketching and design) and bringing experiences back into the building process,
- Introducing an industrial approach (processes, logistics, procurement and purchasing),
- Stimulating a life cycle cost (LCC) approach and sustainability in building construction and management,
- Utilization of ICT (Information and Communication Technology).

9. 4. 1 Enhancing the clients'/owners' competence and ability to lead the building process

Most initiatives in which BKF has invested resources, whether own initiatives or pilot projects in which BKF has participated, fall into this category. This is natural since inadequate competence in the form of skills, knowledge and expertise is what the critics consider to be the greatest deficiency in the sector.

At an early stage in BKF's activities, it became clear that many industry representatives lacked certain seemingly elementary knowledge of an administrative, economic or technical nature. It was found that different building cost concepts that come up in conjunction with construction were interpreted differently by sector representatives. After studying BKF's website, even well-informed, influential persons in the industry realized that they did not have a clear grasp of the different concepts, despite the fact that they procured projects for tens of millions of kronor on a daily basis. In order to be able to compare projects from a cost point of view, you have to know what types of costs you are comparing. This is just the type of misunderstanding which the Government wants the Forum for Building Costs to clear up. Since costs were a key concept for BKF, it was only natural that different types of *costs* should be dissected and explained on BKF's website.

Anyone wanting to know was able to learn the following. *Production costs* are the total costs for a project including cost of land, fees and other costs related to the project. The concept also includes the cost of measures required to realize the project, such as extraordinary foundation costs, demolition costs, purchase costs and costs associated with development agreements etc.

Another general concept that is often used is *building costs*, which are usually of the same order of magnitude as production costs. The concept is used to be able to compare, in similar projects, the actual costs of construction not including the price of the land but including fine grading of developed land, connection fees and other *land development costs*, which in turn are the aggregate costs for land, design, fees and taxes, such as VAT.

Contractor costs is the concept that is best suited for comparisons of what it costs to erect similar buildings in the form of divided contracts. In the case of design-build contracts, however, design is included in the contract costs, so the contractor cost concept should be used with knowledge of the form of contract in the case in question.

A cost template was presented on BKF's website showing how much different sub-items included in the production costs for a normal multi-family dwelling can amount to if a household with normal incomes, by Swedish standards, are to be able to afford to rent a unit. The template was utilized frequently by owners in evaluating and comparing bids and by housing companies in negotiating with the municipality to buy land.

The following breakdown of production costs is given in the December 2004 price level. BKF introduced the term NFA (net floor area) as relevant for making cost comparisons.

- Total contractor costs: SEK 7 000-10 000 per sqm NFA Sub-items:
Structural work, masonry, sheet-metal work, painting, flooring, tiling, heating and sanitation, ventilation, electrical installations, hoist,

control and monitoring equipment, site preparation on development site, fine grading and site equipment, material supplied by the client, costs estimated by the client or additional costs.

- Site costs: SEK 500-1 000 per sqm NFA
 - a) Sub-items: Purchase price for site or undeveloped land, interest on purchase price from acquisition to start of construction, property formation costs, title registration costs, plan costs, costs for streets, roads, water supply and sewerage etc. outside development site, and other costs for e.g. demolition or remediation.
- Fees: SEK 200–600 per sqm NFA
 - a) Sub-items: Water connection fee, electricity connection fee, cable TV/broadband connection fee, district heating/natural gas connection fee, costs for parking spaces, other fees.
- Consulting costs: SEK 300–800 per sqm NFA
 - a) Sub-items: Architect, soil mechanics and foundation engineering, heating, ventilation and sanitation, electrical installations and hoist, control and monitoring equipment, site preparation incl. fine grading and site equipment, quality officer acc. to PBL (Planning and Building Act), owner's supervision and inspection, expert statements, inspection beyond documented self-inspection, loan and subsidy documents, other consulting costs.
- General land development costs: SEK 300–600 per sqm NFA
 - a) Sub-items: Construction administration (project management, self-inspection), building permit, building notification, setting out, plot map, construction defect insurance, other contractor insurances not included in the contractor's obligations, marketing and sales, mortgage deeds, unforeseen costs, evacuation costs, artistic ornamentation, other costs. Financial costs: SEK 200–400 per sqm NFA
 - b) Sub-items: Credit interest, credit fees, leasehold fee during construction period.
- Value-added tax: SEK 2 000–3 000 per sqm NFA
 - a) Sub-items (without taking into account any deduction for output VAT for premises subject to VAT or reduced VAT for small apartments): VAT on fees, VAT on consulting costs, VAT on contractor costs, and other VAT.
- Total production costs: SEK 10 500–16 400 per sqm NFA

This breakdown of production costs has become something of an unofficial standard, or rule-of-thumb measure, that is used by owners when negotiating with contractors or landowners, for example municipalities, to buy land.

In addition to a website with elementary information, a large number of pilot projects have added new knowledge under this heading. Some typical such projects are:

- MKB Fastighets AB – Turnkey project
 - a) The project embraces the entire building process from idea to management of the property, and some 500 apartments are being built for households with ordinary incomes in 4–6 projects. The project is being led and coordinated by Prolog Bygglogistik AB, which was started for this purpose by an assistant professor at the Division of Engineering Logistics at Lund University. Several young postgraduate and doctoral students associated with the Division are a part of Prolog.
- Mitthem AB, Sundsvall
 - a) The purpose of the project is to develop wooden house construction and knowledge of wooden house construction to enable good and sustainable housing to be built for households with ordinary incomes. The project is being partially funded, followed up, documented and evaluated in cooperation with Luleå University of Technology and MidSweden University in Sundsvall.
- The Swedish Council for Constructing Excellence, BQR
 - a) The project is aimed at development of a model for customer-oriented development of construction and civil engineering projects for the purpose of giving the owner/client in particular a flexible tool for evaluating and comparing construction and civil engineering projects against the “Best Practice” available at any given time. The project is being partially funded by Formas (the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning).
- ByggherreForum (Construction Client Forum), Stockholm
 - a) The project is aimed at conducting a feasibility study in order to clarify academic structures and conditions for developing a university-level development programme for property developers (40 points) under the working name Byggherre MasterClass (Developer MasterClass). The project is being carried out by a working group which, in addition to representatives appointed by ByggherreForum, also consists of representatives of Chalmers in Göteborg, KTH (Royal Institute of Technology) in Stockholm, LTH (Lund University) in Lund and LTU (Luleå University of Technology) in Luleå.

9. 4. 2 Reducing the number of defects in building construction and management

Construction defects are probably the issue that upsets the ordinary citizen the most. Public buildings, paid for by taxes, such as day-care centres, schools and museums that are afflicted with Sick Building Syndrome (SBS) and have to be closed, decontaminated or even demolished without any blame being attached, arouse strong feelings. Obvious design defects that should have been discovered on the building site are not reported to the site management, etc.

The high incidence of construction defects was the main reason the state Building Commission was created. The Building Costs Delegation concluded in its report that all the “normal” everyday defects in an eight-storey building cost as much to remedy as a whole storey in the building costs to build. Researchers at Chalmers University of Technology, who are involved in some of BKF’s pilot projects, believe that contractor costs could be reduced by 30–40% if construction defects could be eliminated.

Some pilot projects within BKF that shed light on these aspects are:

- Stiftelsen Signalisten in Solna
 - a) The purpose of the project is – in a full-scale project (60 apartments in two tower blocks in cooperation with Chalmers University of Technology – to study and develop method for finding and supporting behaviours and concrete strategies and measures, both big and small, to reduce the costs of defects in the construction of rental apartments.
- Chalmers University of Technology, Building Economics
 - a) The purpose of the project is to identify and eliminate non-value-adding activities in the construction of some 300 apartments outside Göteborg. In an application from Bostadsbolaget Signalisten in Solna, this project is linked to a construction project in Solna where the purpose is to identify and minimize the number of defects in the process.
- Business Development and Information
 - a) The purpose of the project is to investigate the actual additional cost in the management phase resulting from defects that arose in the production phase but have not been corrected and to shed light on the process of correcting these defects. The project is being carried out in collaboration with the Division of Construction Management at Lund University (Faculty of Engineering), LTH.

9. 4. 3 Choosing suitable forms of contract and eliminating non-value-adding activities during the building process

The Forum for Building Costs has thrown itself actively into the discussions of the different ways of procuring construction projects. The different owner organizations that work to put the client's interests first have not always found it easy to choose the type of contract. Rightly or wrongly, the Public Procurement Act has made it administratively difficult for public construction clients to choose the type of contract, and they have often opted for contract forms that entail a turnkey commitment on the part of the contractor. Consultants welcome a return to divided contracts, since they strengthen the role of the design stage in the building process. Contractors prefer to see the owner opt for function-based design-build contracts of the turnkey type, which give the contractor greater freedom. In a number of pilot projects that have aroused considerable interest, BKF has shown that the owner can be his own turnkey contractor and purchase building materials himself all over the world. Some of these projects are:

- Karlskronahem – divided design-build contract and pre-purchasing of building materials
 - a) The principal purpose of the pilot project has been to reduce the production cost by creating conditions for good competition on a geographically restricted market. The approach has been to break down the project into 11 design-build contracts and 11 material procurements in order to reach a larger number of small and medium-sized enterprises and, on the materials side, to come as close to the manufacturer as possible.
- Bo Trygg AB – New purchasing channels for building materials can save billions
 - a) The purpose aims at demonstrating alternative purchasing channels for building materials and presents comparison prices obtained from companies in Sweden, the other Nordic countries and parts of Europe. Most of the companies with which the project has been in contact have been found on the Internet and at construction fairs.

Together with the Swedish Trade Federation (Svensk Handel), BKF has produced *Importhandboken* ("Importing Manual") – a guide providing basic information on importing that enables a construction company to import directly and thereby reduce the number of middlemen.

The Building Costs Delegation introduced the concept of design in vain in its report. Indirectly it was a criticism of the municipal building committees, which required design work and planning drawings from owners and developers long before the municipality had ever decided that an area was even to be built on. The outcome is uncertain, particularly in

construction projects in built environments with many concerned parties. If it all comes to nothing in the end, someone still has to pay for the “design in vain”.

9. 4. 4 Focusing on early phases (planning, sketching and design) and bringing experiences back into the building process

The Building Costs Delegation, but also the building sector’s own studies, shows that the sector is bad at applying good and bad lessons learned from experience in the next project. Public construction clients often complain that it is difficult to remain loyal to a winning combination of consultants and contractors if they have to comply with the Public Procurement Act. It is easier for private developers who build and manage their own properties to stick with principles, consultants and contractors in project after project. This problem has been touched upon in some of the BKF projects:

- Melin Förvaltnings AB – High quality and low rent – the procurement of kv. Saftstationen in Ängelholm
 - a) This project demonstrates the need for a clear and aware owner who permits the design-build contractor to make optimum use of his resources and know-how. Consultants and design-build contractors who collaborate and adapt to each other plus a flexible municipal administration guarantee successful results in construction project after construction project.
- BoTrygg Bygg AB, Linköping
 - a) Follow-up, evaluation and comparison of the building process in three housing projects (Linköping, Norrköping and Stockholm/Hammarby) for identification of cost-driving differences. The project is being followed and evaluated via the Department of Infrastructure at KTH. The Department has taken an interest in why certain small contractors who build for their own management are more efficient than bigger organizations.

In yet another reported project *a network of twenty-five architectural offices (PAR-arkitekter)* organized an intra-Group architectural competition on a site designated by the City of Stockholm for the purpose of selecting a project, designing it, selecting a contract form and thereby acting as the client/owner, and finally managing the property. So far, useful knowledge of costs, housing preferences and materials for keeping maintenance costs low in the future have been discussed in study circle form. The purpose of the project is to create a new role for the architect as the owner’s confidant.

9. 4. 5 Introducing an industrial approach (processes, logistics, procurement and purchasing)

The Forum for Building Costs has come to the realization that increased industrialization is necessary in order for the construction industry to develop from a domestic market industry to an import-export industry.

The terms *industrial* and *industrialized* are occupying researchers all over the country. BKF has chosen to define the terms in the following manner for the purpose of clarification.

There is a difference between industrial construction and industrialized construction. It is easier to understand the term *industrial* if you can visualize a factory hall in which production of a building is in progress, broken down into suitable, not too small, parts. Production is independent of where the building is to be erected. In industrial construction, the proportion of man-hours spent in the factory is considerably greater than the proportion of man-hours spent on the property, or the construction site, where the building is erected. The total number of man-hours is lower than in the case of on-site construction.

The second term – *industrialized* – concerns a process that may take place in the direction towards an industrial construction process. Benefit is derived from standardizations, pre-cut bars of the right size, the use of lifting equipment and other machinery, deliveries of highly prefabricated building components *just in time* to the logistically planned construction site, which is the same as the property on which the building is being erected, etc. You might say that in industrialized construction, building components and materials that have preferably been manufactured industrially are assembled. The greatest proportion of man-hours is still spent on the construction site. It is characteristic that the costs of materials for the project are higher than in normal manual on-site construction.

Some pilot projects to which BKF has contributed under this heading are:

- Lund University
 - a) Development of a factory line for a new lightweight building system with volumetric modules for prefabrication of multi-unit dwellings.
- Stiftelsen Vetenskapsstaden, KTH – Timber construction
 - a) Development of system for increased use of wood in production of multi-unit dwellings using volumetric modules. A publication, *Trälyftet*, (“The Timber Lift”), has been produced and is sold at Byggtjänst
- AIX Arkitekter AB, Stockholm
 - a) Publication subsidy for compilation and posthumous publication of collected but previously unpublished material on prefabricated multi-unit dwellings of concrete, steel and wood. The project is being carried out by a working group that includes

highly qualified representatives of Structural Engineering at the KTH School of Architecture, the School of Design at Göteborg University and Building Function Analysis at the KTH School of Architecture. The book will be widely disseminated and used in instruction at KTH.

- Scheiwiller Svensson Arkitektkontor AB – Housing built with volumetric modules
 - a) This report reviews the initiatives that have been taken in Sweden in recent years to develop modularized housing construction with volumetric modules. The report examines the strengths and weaknesses of different volumetric module systems. The options available to the designer and the owner to influence a strongly industrially produced product are problematized.

In addition to these projects, BKF has held conferences on the subject. In April 2005 BKF held two one-day workshops on *Lean Production* – a play of processes, at Chalmers School of Continuing and Professional Studies in Göteborg. Lean Production is a concept in stationary industry based on a constant streamlining of processes and achieving more with fewer resources. During the 1990s an international movement embracing Lean Production has emerged within the project-oriented construction industry. The goal of the new philosophy is to streamline the construction process and create value for the customer by optimizing resource utilization and enhancing quality. The programme, which has been given the name *Lean Construction* (www.leanconstruction.org), is now spreading all over the world.

On 25 May 2005, BKF sponsored a spring seminar on the new trends in the building sector. The name of the conference was “*From No Tech to High Tech*”. Some 150 or so participants came from all over the country.

A holistic approach, collaboration contracting and guarantee management are some new Swedish concepts and expressions that are being heard increasingly often in conversations about a renewal of the building sector. What do they mean? Is this also Lean Construction? How do the new methods work in practice? What can the building sector gain from a new process way of approach? These were some of the questions that were taken up at the seminar and are discussed on BKF’s website.

BKF’s 2006 spring seminar was entitled *From Low Tech to High Tech! – Where we go from here...* The main attraction was Professor Glenn Ballard from the University of California, Berkeley. Professor Ballard is Research Director and a co-founder of the Lean Construction Institute. Ballard has more than 25 years of experience in the construction industry and is considered by many to be an expert in project performance improvement. He travels all over the world to speak about the theory

and reality of the Lean concept. The seminar, with pictures and addresses, can be downloaded at www.byggkostnadsforum.se.

BKF has participated actively in the formation of the Swedish organization *Lean Forum Bygg*.

9. 4. 6 Stimulating a life cycle cost (LCC) approach and sustainability in building construction and management

Projects aimed at formulating performance indicators and methods that stimulate processes where not only the present price is taken into account in planning, procurement, production and management, but also the long-term cost, i. e. the *life cycle cost*, LCC. A consistently applied life cycle perspective reduces resource wastage for both the individual property owner and society. Energy-efficient buildings with low operating and maintenance costs can only be achieved if the building sector weighs together both the present price and the cost over the lifetime of the building or facility.

Large parts of the building and housing stock consume far too much energy, especially for heating and the operation and maintenance of the properties. Demands will be made on greatly reduced energy use both in the existing stock and in new buildings, which will require the development of new energy-smart solutions and energy-efficient installations. Projects that aim at demonstrating cost-effective and energy-smart solutions can be supported within the programme area.

One project that has been of importance for the National Board of Housing, Building and Planning's revamping of the national energy conservation rules is:

KTH, Department of Industrial Economics – Study of individual heat metering in German multi-unit dwellings

In this report, the researchers demonstrate, based on their own and independent German research, that a 20-percent reduction of energy use is normally achieved by the introduction of individual heat metering. The tenants and the environment should normally be the winners, but then the Swedish Tenancy Act will probably have to be changed.

In the environment and energy area, the companies in the Building/Living Dialogue have committed themselves to very ambitious programmes for energy conservation. Thus, they have said that in 2020 virtually all heating of the built environment will be based on renewable energy sources, and that the best available technology will be used up until then. Together with Formas (the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning), the Building/Living companies have invested SEK 7 million in development.

9. 4. 7 Utilization of ICT (Information and Communication Technology)

The Forum for Building Costs has worked actively to find appropriate control tools for construction projects. A very promising prototype has been developed with some funding within the framework of BKF's pilot project support. The tool goes under the name of Con-Q-Rent and incorporates all the parameters and variables that are needed for comprehensive process control and evaluation through all phases of the construction and property management process from design to property management. All factors are in place for placing a functioning tool on the market. In BKF's opinion it is up to the different players in the building sector to decide whether the tool is to be put into production and to provide the necessary financing. In a Letter of Intent, BKF has undertaken to support the final development of the tool, provided that the other ten stakeholders in the project also commit themselves to funding the development work.

An inventory of the other project control tools that exist and how they are used, internally and externally in different organizations and companies, has been started but not concluded.

9. 5 Conclusion

During the past ten years – from 1996 when the Building Costs Delegation received their terms of reference from the Government up until the current situation in 2006 – the main reason the building sector has developed is that they have responded to criticism which they have openly admitted is justified. At that time, in 1996, the industry believed it was more or less without fault, but now they see inspired challenges in re-thinking their situation. Such insights are necessary in order to bring about effective change. The industry seems to be prepared to work together with the Government's Special Building Coordinator to fashion a vigorous, competitive and profitable building sector. The industry's study of the methods used in stationary industries, the formation of Lean Forum Bygg, and the fact that they are prepared to put the client/owner in the centre of the building process are promising initiatives.

The number of reports produced by the Forum for Building Costs is almost overwhelming. BKF's conferences and mini-training sessions in construction logistics, procurement technique etc. fills a void. But is this knowledge reaching those who most need it? Is it time to sum up the summing-ups? It sound superficial, but how can we get representatives of the construction industry to sit up and take notice?

Sammanfattning

Höga markpriser och höga kostnader för byggnadsmaterial och arbetskraft är ett problem i många länder, särskilt i snabbt växande områden inom regionen för den nordliga dimensionen. Ett utbyte av erfarenheter och nyvunnen kunskap mellan berörda länder är därför angeläget i syfte att reducera byggkostnader och bostadspriser.

År 2001 gav den svenska regeringen Boverket i uppdrag att etablera ett Byggkostnadsforum (BKF) för att samla in, analysera och sprida kunskap och erfarenheter till berörda aktörer i byggsektorn om viktiga faktorer för utveckling, ökad effektivitet och lägre kostnader i byggandet. BKF förväntas stödja ökad effektivitet och lägre bygg- och bostadskostnader genom att fungera som en kunskaps- och idébank för byggherrar, kommuner, statliga myndigheter och byggföretag.

År 2004 tog den norska regeringen ett liknande initiativ genom att teckna en överenskommelse med representanter för bygg-, anläggnings- och fastighetsbranscherna om ett 5-årigt program för en bättre och mer kostnadseffektiv bostadsproduktion genom lägre produktionskostnader och ökad produktivitet. Syftet med överenskommelsen var att utveckla en mer konkurrenskraftig byggbransch, ett bättre samarbete mellan den offentliga sektorn och byggindustrin och en bättre fungerande bostadsmarknad.

Syftet med den första etappen av detta projekt är att kartlägga, beskriva och analysera initiativ liknande dem i Sverige och Norge för att reducera bostadsbyggnadskostnader och som har tagits i länderna inom regionen för den nordliga dimensionen. I dessa beskrivningar ska särskilt uppmärksammas om lägre kostnader påverkar bostadsstandarden eller utvecklingen av den långsiktiga hållbarheten i bostadsbyggandet. Personer som representerar ländernas regeringskanslier, statliga myndigheter eller andra aktörer har blivit ombedda att sammanställa information om hur program för reducering av byggkostnader är organiserade och om eventuella utvärderingar av resultaten.

De nationella beskrivningarna visar att alla de samarbetande länderna för närvarande har problem med snabbt stigande byggkostnader och bostadspriser trots en historiskt låg inflationsnivå. Orsakerna varierar emellertid och i de länder där det finns en politisk vilja att göra något åt utvecklingen har sättet att hantera situationen varit olika mellan länderna. Exemplet från Norge och Sverige visar hur staten och representanter för byggbranschen i samarbete försöker hitta gemensamma lösningar genom branschöverenskommelser och goda exempel. Liknande erfarenheter finns i Danmark och Finland. Trots stora ansträngningar i de nordiska länderna att begränsa kostnaderna i bostadsbyggandet har dock inte produktivite-

ten påtagligt förbättrats under senare år och är i de flesta fall sämre än i andra delar av näringslivet.

För de nya medlemsländerna har inträdet i EU lett till ökad tillväxt och högre levnadsstandard, som har resulterat i en kraftig ökning av efterfrågan på bostäder. Samtidigt har medlemskapet i EU lett till en betydande utvandring av välutbildad och yrkesskicklig arbetskraft, vilket har varit till stort förfång för de inhemska byggföretagen i dessa länder. Förutom ökad efterfrågan och högre priser för byggbar mark ökar således byggkostnaderna även på grund av kapacitetsproblem när efterfrågan skjuter i höjden. Varken i de baltiska länderna eller i Polen har några tydliga initiativ tagits av regeringarna för att reducera höga byggkostnader.

Ett problem för byggbranschen i en del länder är brist på intresse för byggnadsekonomi som profession och akademisk disciplin. Tekniska högskolor och universitet har för få elever i utbildning, otillräckliga lärarresurser och inte tillräckliga många forskarstuderande på det byggnadsekonomiska området. Förbättrad produktivitet och kostnadseffektivitet i byggföretag är inte enbart en fråga om resurser för företagsutveckling inom byggsektorn, men kunskap om och införande av företagsmodeller som kan anpassas till byggföretagen är ett viktigt villkor och avsaknaden av sådan kunskap är tyvärr betydande.

Det finns ett stort intresse för fortsatt samarbete på det här området bland de experter som har medverkat i projektet. En slutsats är därför en rekommendation att upprätta ett program för framtida samarbete om initiativ för att reducera kostnader för bostadsbyggandet. Diskussioner i projektet har också visat betydande enighet om följande ställningstaganden som utgångspunkt för ett framtida samarbete:

- Det övergripande målet för samarbetet bör vara att reducera kostnaderna för bostadsbyggandet med beaktande av kvalitetsaspekter och långsiktig hållbarhet,
- Ett samarbetsprogram bör omfatta både regeringens och byggbranschens roll och syfta till att utveckla verktyg som regeringen och branschen behöver för att hantera situationen,
- Byggbranschen (inklusive professionella byggherrar) bör engageras i samarbetet eftersom den är målgrupp för de åtgärder som behövs för att uppnå ett effektivare bostadsbyggande.

Diskussionerna har också resulterat i en rekommendation att följande aspekter bör ingå i ett framtida samarbete:

- Nationell och gemensam begreppsapparat med definitioner liksom kommunikationsplattformar och strukturer för statistik från varje land om kostnader, priser, kvalitet och produktivitet,

- Nationella och gemensamma kluster för myndigheter, universitet och branschrepresentanter,
- Nationella och gemensamma fallstudier för jämförelse av projekt samt seminarier om aktuella utvecklingsprojekt i länder inom regionen för den nordliga dimensionen.

Appendix A. Network on initiatives to reduce housing construction costs

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Danish Building Research Institute
Mr. Hardy Madsen, *WG*
National Agency for Enterprise and Housing

Estonia Vacant

Finland Mr. Pekka Pajakkala, *WG, AND, PS*
VTT Technical Research Centre of Finland
Ms. Merja Laitinen, *WG, AND*
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Iceland Mr. Bjorn Marteinsson, *WG, AND*
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Latvia Mr. Janis Vanags, *WG, AND, PS*
Riga Technical University
Ms. Santa Liepa, *WG, AND*
Ministry of Economics

Lithuania Ms. Vilma Vaiciuniene, *WG, AND, PS*
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Mr. Valius Serbenta, *WG*
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Mr. Sonny Modig, *WG*
National Board of Housing, Building and Planning
Mr Klas Andersson, *PS*
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WG National representative to the Working Group
AND Author of national description
PS Participant in seminar on 25-26 January, 2007 in Stockholm