RECOMMENDATIONS TO PC STAKEHOLDERS

INFORMATION AND COMMUNICATION TECHNOLOGIES IN CONSTRUCTION

Vision

This vision considers the current situation in PC, the vision of the European Construction Technology Platform (ECTP) until 2030, growing society needs, cohesive construction requirements and the directives of Lisbon Strategy.

- To prepare the national scientific programme of intellectual construction and real estate technologies.
- To analyse global and European experience of use of intellectual systems in construction and real estate sectors.
- An intellectual life long learning system must be developed to allow improvement of qualifications of employees in the construction and real estate sector.
- To use satellite technology in construction sites (GPS, means of communication, etc.).
- To develop virtual environment (3D and 4D models) for construction and facility management.
- To develop an intellectual electronic subsystem of construction materials and products.
- To develop an intellectual electronic subsystem of exports of construction materials and products.
- To integrate e-auctions and knowledge-based systems.
- To develop an intellectual electronic subsystem of public procurement.
- Electronic collection, analysis, processing, monitoring and control of data in a construction site and preparation of offers.
- To integrate robotics technology and knowledge- and device-based systems.
- To develop an intellectual electronic subsystem of land plot distribution, land purpose change and to issue e-permits for construction. To implement the system of e-permits by 2008.
- Access to information about the status of national construction works.

- Use of new construction materials based on nanotechnologies which allow to minimize possible defects of constructions during their service life and until major repair works.
- Legal validity of IT use in the construction sector must be granted.
- Common construction standards, norms and regulations must be applied to the exchange of e-information.
- More effective information and decision support systems must be implemented.
- The PC Construction Information System with several subsystems (e-trade in construction products, exports of construction products and services, public procurement, etc.) must be developed to help construction-related organisations get exhaustive, diverse, precise and reliable e-information upon request.
- To use computerised training systems, other software for calculations and modelling (e.g. exports opportunities).
- The Government helps to establish training and demonstration centres where employees (especially from small- and medium-sized companies) could practically learn the newest functions of information and internet technology.
- To develop a web-based directory of web links within the PC Construction Information System allowing to find the information that construction-related organisations need.
- Broader application of IT potential at three levels of construction (national, organisational, project).
- To develop a knowledge base (system) of implicit and explicit knowledge of PC construction experts.
- To install multifunctional computerised information search system (MLS – Multiple Listing Service) on real property for sale or rent available in a certain market (town, local or state).
- To achieve conclusion of real estate transactions (partial of full) in virtual reality using e-signature and virtual document management technologies.
- PC must implement the concept of a "smart (intellectual) house" for people with serious physical disabilities granting more independence and improving the quality of life.
- To use construction materials based on nanotechnologies with physical properties allowing their adjustment to the climate (possible climate control).
- To use implants in building constructions and elements; small microchips, which receive and transfer digital information about the condition of a certain element of the building to the main

network computer of the house. Such self-control systems of a building allow to notice failures in time and to remove them properly.

The programme of strategic research

Construction industry must stimulate and support application of intellectual systems in all construction and real estate branches. At the state level, it is necessary to support development of information and knowledge societies, to attract employees to construction and real estate branches, to consolidate cooperation between scientific institutions and business organisations. Considerable focus on increase of production volumes and exports of construction and real estate services and products is necessary. Measures are needed to create favourable investment climate in construction and real estate branches. It is recommended to develop a model of application of intellectual measures used for life long learning of construction and real estate specialists.

A common study of socio-economic status of construction and real estate sector must be performed to identify the needs of sector participants and possible solutions using intellectual systems.

The global and European experience of use of intellectual systems in construction and real estate branches must be analysed, as well as application peculiarities considering regional characteristics; this analysis must be used to evaluate the technical feasibility. Application of intellectual systems in related branches must be reviewed and evaluated, as well as the effect on development of construction and real estate branches and on employment using intellectual systems. Intellectual life long learning system must be created allowing to improve qualifications of construction and real estate sector employees with the help of multimedia: e-books, audio and video materials, computer training systems, major-specific software, e-tasks and works, testing systems, etc. These systems would allow numerous study alternatives according to learner's needs and selection of the most rational learning material.

The information system for construction permits must be developed further and state-of-the-art technologies applied and installed in cooperation with scientific institutions. The developed information system will help to achieve the following aims:

- A public agency client will be able to select to deliver and receive documents (list of designing conditions, construction permits, various certificates) by electronic means following the "single window" principle.
- Better quality of services.
- Fewer opportunities for corruption.

- Common information system of the status of national construction works.
- Computerised state control of construction process.
- Public agencies will receive up to date and official information about the status of construction works in the country by electronic means.
- Gradual implementation of a virtual document management and accounting system, document copies on paper will be discarded.

The purpose of the information system for construction permits:

- To deliver public services using computer and other IT networks:
  - To receive applications;
  - To issue construction permits;
  - To issue permits to resume suspended construction works;
  - To issue documents on recognition of a building as suitable for use.
  - To issue certificates about incomplete construction works.
- To collect, accumulate, process, structure, keep and use national data about the status of construction works and about state supervision of construction works from the day the list of designing conditions (to prepare a building design) is requested till the building is recognised as suitable for use.
- To provide data to state institutions and offices.
- To deliver data to state registers and natural and juridical persons.

The following basic subsystems of the functional-informational system are planned:

- Management of data on construction permits.
- Preparation and accumulation of drafts of legal acts.
- Management of documents and their content.
- Accounting.
- Data delivery to users.
- System administration.
- Classification management.
- Data exchange.

Intellectual systems are yet scarcely and inefficiently used in PC construction and real estate branches; therefore, attempts will be made to analyse at length the potential of intellectual systems in the

sphere of construction and real estate during implementation of a scientific programme. The research will allow to solve the following problems related to application of intellectual systems: 1) common construction standards, norms and regulations applied to exchange of e-information; 2) feedback between various stages; 3) legality of application of intellectual systems in construction and real estate branches; 4) increased efficiency of applied information and decision support systems; etc.

The scientific knowledge gained during the research will help to develop a unified intellectual system meeting EU standards in the future; the system would have many subsystems (e-trade in construction products, exports of construction products and services, public procurement, conformity of facilities to the essential requirements during their lifecycle, integrated modelling of deformation of ferro-concrete elements, etc.). In order to speed up communication between a user and a construction company, trade systems for construction materials and products must be implemented in practice. They facilitate search for desired cheaper SMG, users get the most recent and comprehensive information, quick search is available, it is possible to find the most rational SMG, users can continue using the received information (specifications, drawings), costs of the procurement process are reduced (no need to print directories on paper and send by post, call operators (replying/calling on SMG supply) are redundant, no call fees).

The research related to the development of a multifunctional search system (MLS) and its application in practice must be supported. MLS or the Multiple Listing Service is a multifunctional computer-based information search system of real property for sale or rent available in a certain market (town, local or state). Real property agents use this system for mutual information exchange. MLS facilitates the easiest client attraction, because agents represent about 80 % of buyers, and MLS becomes a primary tool for agents in search for an affordable housing.

The research must focus considerably on the development of the PC Construction Information (LCI) system. All PC construction associations should be encouraged to contribute to the development of the System. The LCI System would have a comprehensive directory of web links on all issues of interest, spreadsheets, software and artificial intelligence. The PC Construction Information System would have the following main functions:

- Deliver required information (normative construction documents, offers for contraction works, recommendations, documents of transactions, information about construction organisations, projects, state-of-the-art technologies, data on scientific and technical research, various articles, specifications of construction products, information about manufacturers and their products, projects in progress, dictionary of construction terms, etc.).
- Deliver software, expert and decision support systems (for a fee or free of charge).

- Help to prepare and manage construction documents.
- Links to similar foreign websites will be provided.
- The subsystem will contain information in several languages (PC, English, German, Russian, etc.). Multiple languages will help to strengthen relations with foreign buyers, sellers and other stakeholder groups.
- Would help to perform various calculations.
- Would help to analyse various construction stages and components and to determine the most effective alternatives.
- Would help to search for alternative loans, to make their analysis and to determine the most effective.
- Would help to prepare an order and to select the manner of payment, to pass the order, to pay for the order, to check whether the payment is made.
- Would help to find new and expand the existing markets of construction products and services.
- Would help to attract more investment to PC.
- Would help to reduce business costs, increase its efficiency and quality.
- Would help to enter global markets of construction products, services and loans.

The PC Construction Information System would include several subsystems:

- E-trade in construction products.
- Exports of construction products and services.
- Public procurement.

It is offered to include a directory of web links in the LCI System. The links could be classified into the following first-level subsystems: sales information, market analyses, statistics, continuous studies, useful addresses, information about international exhibitions and fairs, search for business partners, information bulletins, useful advice, libraries, magazines and newspapers on construction, encouragement of exports by financial and non-financial measures, etc. All links of this first-level subsystem can be classified further in a tree-shape manner, for example, according to countries, topics, period and other aspects. Since websites of developed countries continuously update their information, PC branch organisations will always have access to the newest relevant information in PC and English. The directory of web links would have the following main functions:

- Would provide all available links to relevant information according to a certain classification.

- PC construction organisations will be able to use spreadsheets and software available in the specified websites.
- Artificial intelligence will be available in the websites. It could be used to analyse various alternatives and to determine the most effective.
- Would provide links to existing or planned websites of PC institutions and construction organisations. Thus PC construction organisations and the supervising agencies would be able to get the needed comprehensive information from this and other websites.

It is offered to develop a subsystem of the LSI System for e-trade in construction products with the following main functions:

- Search for construction products. User can search for alternatives in various directories of suppliers or manufacturers. Standardized data formats would enable such search. Such standardization enables using special programmes-agents, which find the required construction products in various directories and collect information about them. The search can also be limited by one or several regions.
- Search for alternatives and their comparison tables or table preparation. The results of a search on suppliers/manufacturers of a certain construction product are delivered in one table, which can include direct links to the website of a supplier or manufacturer.
- Multiple criteria analysis of alternatives and establishment of the most effective alternatives on the basis of a criteria system (price, discounts, heat conduction, sound resistance, harmfulness to health, aesthetic evaluation, weight, technical parameters, physical and moral durability etc.) and values and significance of the criteria. Usefulness and priority of alternatives is calculated on the basis of the obtained information summarised in comparison tables.
- Links to similar foreign websites will be provided.
- The subsystem will offer information in several languages (PC, English, Russian, etc.). Multiple languages will help to strengthen relations with foreign buyers, sellers and other stakeholder groups.

In order to support exports of construction products and services from information and analytical perspective, it is offered to develop a subsystem of the PC Construction Information System on exports of construction products and services. It would facilitate more effective competition in the global market and would help to create new job places. The subsystem of exports of construction products and services would help:

- to prepare and manage documents on exports of construction products and services;
- to perform various calculations;

- to analyse various exports steps and components (goods and services, sectors, markets, investment, suppliers, distributors, etc.) and to determine effective alternatives;
- to search for alternative credits, to analyse them and to determine the most effective;
- to prepare an order and to select the manner of payment, to pass the order, to pay for the order, to check the payment;
- to find needed information;
- to find new and expand the existing markets of PC goods and services;
- to attract more investment to PC;
- to reduce business costs, to increase efficiency and quality;
- to enter global markets of goods, services and loans.

In order to guarantee effective conditions for construction activities, users must receive information in electronic form and the problems related to integration and processing of information of various types, formats and structures and its uniform delivery to stakeholder groups must be solved.

It is offered to make a scientific research and to develop the Knowledge Base (system) of explicit and implicit knowledge of PC construction experts. The knowledge base of implicit knowledge of best practice in the sphere of construction includes unofficial and non-recorded procedures, practical experience and skills. This knowledge is basic, because it defines employee abilities and competence. The expert knowledge base and knowledge systems allow to search for experts and to facilitate communication with such experts by means of internet technologies. Upon connection to an Expert Knowledge Base and knowledge system, a professional can search for an expert with certain knowledge and to communicate in real time using online messaging software, e-mail, phone or internet conferences. Thus an SME professional can get direct implicit help from an expert experienced in a similar case. Considerable amount of explicit knowledge is also available in construction. Explicit knowledge is documents and data (e.g. estimates, price lists, technical, economic and qualitative indicators of construction solutions (walls, windows, floor, etc.)) stored in a computer memory. This information must be easily accessible for employees to get all necessary knowledge and to use it in practice without hindrance. For this purpose a special system for accumulation, registration, ordering, filtering, analysis, taking and distribution of explicit knowledge is necessary.

Different knowledge about the same object provided by various specialists makes a whole which comprehensively describes the efficiency of a building's lifecycle:

- Databases on best practice of client servicing are being developed globally. They are based on the analysis of the best examples of client servicing. This analysis enables formulation of specific recommendations how to provide higher quality services and to meet client needs better.
- Designers provide examples of best practice of architectural, aesthetic, volume-layout solutions of a building, how to guarantee soundness and stability of a building's constructions, comfortable indoor conditions (air temperature and relative humidity, natural lighting, noise prevention), rational engineering systems (heating, ventilation, water supply, sewerage, communications, automation).
- Hygiene specialists can pass their experience on how to determine environment pollution and various construction solutions harmful to health.
- Economists can offer knowledge about land plot and building prices, operating expenditures, taxes, insurance, loan interest rates, trends in change of building prices, the level of building quality (social, technical, economic indicators);
- Contractors can prepare a subsystem of knowledge on effective technologies, organising and management methods.
- Specialists of facility management can provide knowledge about effective use of buildings, their maintenance and renewal.

The research determined the possibilities to apply intellectual technologies in construction and real estate branches by using the potential of e-supply, management of relations with consumers, automation of work flow, supply chain management, extranet or intranet, e-commerce, knowledge management, internet infrastructure, company's resource planning, account management, project cooperation, project management, digital exchange, wireless technology, etc. Methods and models for implementation of the potential of intellectual technologies in construction and real estate branch according to the specified application possibilities will be developed during the research. After successful implementation of a scientific programme, its results and methods will be universally applicable. They will be suitable to solve construction and real estate, environmental, energy, agricultural, management, economic and other issues. It is a great advantage giving long-term value to the research, because analysis of opportunities for economic development is a priority task of PC science and will remain in the near future.

Creation and development of a "smart" (intellectual) house (building) systems must be supported. A building is intellectual when special technologies create the ideal environment for work and ideal professional conditions, guarantee the necessary level of protection against natural disasters and unauthorised intrusion and energy and utility resources are used the most rationally. Each element of an intellectual building must be

intellectual, i.e. it must be designed using a methodology that will “force" this element to select an optimal solution but of course considering the interrelation of elements.

In order to encourage implementation of the newest IT and internet technology achievements, the construction sector should: establish training and demonstration centres where employees would practically learn about the newest potential of information and internet technology; to develop the PC Construction Information System with several subsystems (e-trade in construction materials and products, exports of construction products and services, public procurement, etc.); to create a directory of web links in the PC Construction Information System allowing to find the information needed by construction organisations; to encourage e-business in construction; to use more IT potential at three construction levels (national, organisational, project). These measures would help to inform small- and medium-sized construction companies about the construction business conditions and opportunities in world and EU countries and would create conditions for more effective penetration into foreign markets.

QUALITY OF LIFE

Quality of Life in Built and Humanised Environment

The construction sector aims to provide built and humanised environment for human activities. The more rapid global economic development, increasing environment pollution, diminishing natural resources force to turn to sustainable building lifecycle (setting aims, designing, manufacturing of construction materials and products, construction, commissioning, facility management, demolition, utilisation and recycling of construction materials and products). The chapter on quality of life analyses the effect of the lifecycle of built and humanised environment on health, safety and environment. In order to humanise traditional technical and technological concept of the construction sector five main areas are analysed in the *Vision* and *Strategic Research Programme*:

- Indoor microclimate, morbidity, quality of place of work and studies.
- Work safety and creation of attractive work conditions.
- Reduced effect on the environment.
- Reduction of natural and technogenic dangers.
- Transformation of the construction and real estate branch.

Solutions to these issues are reflected in various European directives and action programmes: increasingly stricter control of pollution (air, water, soil, etc.), CO_2, air quality, noise, vibrations, work place safety, etc. Such regulation improves building lifecycle quality integrating nature, built environment and residents.

Lifecycle of built and humanised environment has a tremendous effect on the environment. Various construction materials and products are used, energy consumed, air, soil and water polluted. It is attempted to adjust and integrate the following functions: life, work, leisure, health care, communication, green areas, environment and waste management, etc. Failures in this area will make daily city life inferior. Before it was considered that creation of new and well-paid jobs would always mean sufficient qualified employees to fill them. However, the experience of recent years shows that that is not enough. Employees are also interested in cultural life, good conditions for leisure, good quality health care and other services.

Life quality in a city particularly depends on transport. Transport is not only the means of full-fledged human life but also a guarantee of thriving local economy. Increasing number of residents in the city means higher density in one square kilometre and thus a more intensive traffic. Increasing traffic intensity has a considerable negative effect on the environment and human health, encourages a sedentary lifestyle (its

effect on health and life expectancy is negative, especially due to cardiovascular diseases) and worsens life quality in general. The high air pollution caused by transport damages human health and causes increase of the greenhouse effect. Therefore, a goal is set to reduce the number of people using personal cars and to develop the potential of diverse public transport able to satisfy consumer needs better.

Low-energy technologies in construction not only will reduce emissions of pollutants causing the greenhouse effect but also will reduce the general building lifecycle expenditures. Implementation of solar energy technologies will reduce emissions of pollutants and will help to save funds. Transportation and utilisation of construction waste requires additional expenditures for construction companies and the state. Reduction of waste during building lifecycle helps to save funds of the state and construction companies not only now but in the long-term as well. Minimisation of waste in construction has other positive features as well. Part of waste (e.g. concrete) can be recycled and reused. Bricks and metal can be reused without recycling. Less waste transported to dumps means resource saving both for a contractor and a country and preservation of ecologic environment.

EU applies high environmental requirements to industrial waste. Environmental policy encourages search for ways of better use of manufacturing waste. Construction is the main consumer of powdery materials and it can reuse waste of other industries.

Poverty is closely related to the quality of the existing built environment. In most cases unemployed and uneducated members of the society are the ones that live in poor housing. Such situation is harmful to the built environment. Retraining and education of unemployed and uneducated people preparing them to work in construction, maintenance of built environment, landscaping and other works would reduce poverty and improve the quality of built environment at the same time. It would also mean integrated solution of social, environmental and economic issues.

The fact must be acknowledged that many serious housing problems are not related directly to the physical structure of housing (unemployment, vandalism, lack of education, divorce, hooliganism, stealing, etc.). These problems may be solved by investing more to infrastructure development, good neighbourhood and housing commissioning programmes by giving better education to young people.

Negative effect of the whole built environment lifecycle on natural and technogenic environment is being radically reduced (wasteless construction, effective use of resources and nature conservation, etc.) thus considerably increasing the sustainability of the construction and real estate branch in PC.

To reduce CO_2 emissions in new and existing buildings. To reduce effect of daily technogenic activities on the environment (pollution, vibrations, radiation, noise) and to express reduction of this effect on health and safety by quantitative and qualitative criteria.

Indoor Microclimate, Morbidity, Quality of Place of Work and Studies

European citizens spend over 90% of their time in buildings and means of transport (i.e. in closed space). Therefore, conditions of human life, work, leisure and travel highly influence life quality and health. Harmful construction materials and products, too high/low indoor temperature, humidity, lighting, air quality (CO_2, tobacco smoke, small and large dust and particles in the air, microorganisms, etc.), noise, allergens, harmful gases, etc. can endanger health. They can cause various health problems. Dust in the premises can harm people allergic to dust. Too low relative indoor air humidity can case serious problems of nasal cavity to some people. Air humidity can have indirect effect on human health, including mould on internal building surfaces and products and increased amount of household dust. Air humidity must be regulated by maintaining rational heating level, ventilating premises, humidifying or drying indoor air and the air supplied to the premises.

Thus improvement of indoor microclimate can help to improve human life quality, to increase productivity, to reduce morbidity and health care expenditures, to increase life expectancy. For instance, the Quality of Life Report of the European Construction Technology Platform [7.1] specifies that the total annual financial burden due to lung diseases in Europe is 102 billion euros. Therefore, it is necessary to develop construction products (floors, partitions, wall trimming, ceiling materials, paints, varnishes, etc.) that would not emit pollutants to indoor air and to improve air quality (fewer carpets, ventilation and cleaning of premises, etc.).

It is estimated that 15-30 % of *housing* in Europe suffer from moisture and mould. Only in recent years the link between the indoor fungi and allergic reactions and respiratory diseases has become widely known. About 20 % of European citizens are allergic to mites and fungi, and domination of asthma and allergy in residential buildings increases constantly. One of seven children in Europe has asthma, and children in Western Europe experience rates 10-fold than those in Eastern Europe [7.1].

A human can live only for several minutes without breathing, a week without water and a month without food. This illustrates the influence of clean air, water and ecologic food on human health. Water used for drinking, household and food preparation must not cause harm to human health. The main requirements applied to water supply are related to the quality of the supplied water and debit and to use of materials and products suitable for water supply and sewerage systems and their effective commissioning.

Poor housing is aesthetically unattractive, uncomfortable, can be the source of various diseases or acute social problems (dirty environment, drinking, hooliganism, etc.). It affects the neighbours from various perspectives. The government solves these problems in two ways: by setting minimum standards of housing

and its environment and by providing financial support to residents unable to meet the specified requirements. Commissioning and maintenance of multi-apartment houses where apartments are privately owned becomes a relevant issue. The condition of shared constructions and premises in many cases clearly deteriorates and sometimes is even dangerous to the buildings and human safety. Therefore, financial state support must be provided for the primary repair of the shared constructions and premises. Maintenance and renovation of existing residential houses, especially multi-apartment, causes concerns.

Only 20 % of the existing *offices* can be called healthy, thus 80 % offices are open for improvement of employee productivity by 1-6 %. Human productivity can be increased by reducing the sick building syndrome, i.e. by reducing the incidence of allergy and asthma and improving work conditions. In case indoor environment becomes healthier and more comfortable for work, EU15 would save [7.1]:

- 3-6 billion euros annually by reducing allergies and asthma (based on 8-25 % reduction of medical costs);
- 15-45 billion euros annually by reducing the symptoms of sick building syndrome (based on 20-50 % reduction and 2 % productivity improvement);
- 30-240 billion euros per year because productivity would increase by improving work conditions (if employee productivity increases by 0.5-5 %).

Guarantee of comfortable and healthy premises in PC would help to save considerable resources pro rata to the aforementioned numbers (number of residents and GDP).

Education and day-care institutions and other agencies are the environment where many people spend their day in a closed space. In especially dense environment quality of hygiene conditions (physical possibility become infected), personal environment control, etc. are the specific problems that need attention.

Healthy, comfortable, accessible, usable and safe indoor environment and microclimate improve productivity and GDP, reduce health care expenditures and guarantee quality of life. It can be achieved by integrated analysis of social, environmental and economic issues which reflect daily, immediate and long-term problems of and opportunities for people.

Most difficulties are related to the fact that a construction site is dangerous naturally. Uncertainty cannot be avoided no matter how detailed are the risk evaluation for construction processes. This feature is characteristic of the construction branch. It is necessary for scientists and practitioners to join efforts and create attractive jobs in construction by using various sciences (management, economics, architecture, law, engineering, technology, organising, ethics, aesthetics, psychology, organisational theory, sociology, professional medicine and ergonomics).

Work Safety and Creation of Attractive Work Conditions

In the EU, the probability that a construction worker will be killed is three times higher than the average of all industries, and the probability of injury is twice as high. Currently, a killed worker is evaluated by 1.5 million litas in PC. However, this sum does not include all expenditures. The whole family mourns for a dead relative. Injured workers and their families suffer for many years after the accident due to the injured body.

In the construction, the physical work place is rather unattractive. The tasks performed are still related to manual work, especially in construction sites, and the tools and equipment, in contrast to many other industries, are not intellectual. Attempts to industrialise construction processes by minimising activities in a construction site were successful only partially. Due to the aforementioned examples the construction branch suffers a poor image in the society and thus has more difficulties to attract better workforce. One of the main directions of innovation is intellectualisation of machines and equipment and maximum process industrialisation and mechanisation.

More processes must be performed not in a construction site, work in construction site must be automated, communication and teamwork must be knowledge-based thus creating a naturally safe, effective work environment favourable to humans.

Improvement of work relations in the vertical management structure of organisation, improvement of career opportunities and use of the latest technologies would help construction organisations to make better use of their potential and to increase construction efficiency, which would bring benefits to all stakeholder groups.

Part of PC construction organisations are united by associations, which represent their interests in state institutions and abroad. These associations may help to use the potential of organisations better, to create unions and trusts for larger projects in PC and abroad, to solve issues related to vocational training and qualification improvement, to take over part of state functions, for example, attestation of specialists.

Reduction of the Effect on the Environment

Means of transport are among the largest sources of pollution in cities of PC. Transport pollutes urban territories by exhaust, it is very dynamic and penetrates all urban territories: residential and industrial areas, city centre, hospital and sanatorium territories and recreation zones. The exhaust gases contain about 200 various chemical compounds.

Incidence of chronic bronchitis is by 72 % higher among residents of polluted areas in contrast to residents of non-polluted areas. Similar increase of morbidity is noticed in case of other respiratory

diseases. Another important regularity is obvious correlation between the atmosphere pollution and incidence of acute myocardium infarct. Studies of environment pollution show that higher CO, NO_2 and SO_2 concentrations determine increased incidence of respiratory system and other diseases. Pollution can cause the following diseases: allergies, respiratory and cardiovascular diseases, cancer, preterm birth and increased infant mortality, neurological and psychiatric disorders, mortality, worse immunity and hematological characteristics.

EU pays very much attention to preservation of the environment. It is acknowledged that environment pollution harms development of humanity, health, and work efficiency and the negative effects are evaluated in billions of euros. The derived criteria on influence of pollution on human morbidity in respiratory and cardiovascular diseases and asthma.

Reduction of natural and Technogenic Dangers

The effect on people, built environment, nature and economy can be considerably reduced by better understanding the resistance of buildings and infrastructure to earthquakes, excessive rainfall, storms, floods and erosion, whirlwind winds, fires, climate and geologic changes and by making special studies of natural dangers which would allow to develop strong and economical countermeasures for built environment lifecycle.

Vision

This vision is prepared on the basis of the current situation in PC, the vision of the European Construction Technology Platform (ESTP) until 2030, growing society needs, requirements of cohesive construction and directives of the Lisbon Strategy.

Common vision: radical reduction of the negative effect of lifecycle of built and humanised environment on the environment, preservation of resources and guarantee of quality of life by broadly applying technical, technological, social, cultural, ICT, organisational, management, economic, business, work safety and other innovations and basing the significant economic prosperity on social agreement among all levels of the society.

Indoor Microclimate, Morbidity, Quality of Place of Work and Studies

Development of lifecycle of healthy, comfortable and aesthetic premises for people using innovative solutions.

Work Safety and Creation of Attractive Work Conditions

The construction site is a safe, attractive work place based on modern innovations (technical, technological, ICT, organisational, managerial, economic, business, social, work safety, etc.).

Reduction of the Effect on the Environment

Radical reduction of the negative effect of built environment lifecycle on the environment (through effective use of resources, wasteless and other innovative technologies) and restoration of the desolated environment and ecosystem.

Reduction of Natural and Technogenic Dangers

The effect of natural and technogenic dangers on built environment is evaluated at the EU level and normative documents of the built environment lifecycle are prepared for various areas of reduction of natural and technogenic dangers (resistance of buildings and infrastructure to earthquakes, excessive rainfall, storms, floods and erosion (river and coast systems), whirlwind winds, landslides, explosions, fires, climate and geologic changes, etc.).

Transformation of the Construction and Real Estate Branch

The construction and real estate branch is being transformed (by including all stakeholder groups) in order to make it creative, flexible, innovative, knowledge-based, open to new business opportunities and source of attractive jobs in the whole sector. The process will help:

- to achieve more transparency and justice in the branch, and more comfortable and safe built environment, better health and increased mobility;
- to achieve increasing value and importance of the branch to our urban and regional economy and to remain an important employer to urban and rural people.

In order to bring this vision to life, a certain strategic research programme must be implemented. It must be analysed how this programme can be effectively implemented in practice, i.e. to include these measures in practical business solutions.

The Strategic Research Programme

Indoor Microclimate, Morbidity, Quality of Place for Work and Studies

In order to implement the vision on *guarantee of indoor microclimate, reduction of morbidity and improvement of place for work and studies* it is necessary:

- To make integrated analysis of life quality using various sciences (environment protection, economics, management, organisation, architecture, law, engineering, ethics, aesthetics, psychology, sociology, professional medicine and ergonomics).
- To pay special attention to satisfaction of consumer needs, i.e. implement consumer oriented and knowledge and device based transformation of the built environment lifecycle.
- To express requirements and needs of stakeholder groups (including persons with various disabilities) and requirements to the indoor environment by quantitative and qualitative indicators and to develop a relevant knowledge and device based decision support system for accumulation, processing and analysis of such information, decision making and offering recommendations.
- To create healthy, comfortable and safe environment by applying innovative construction materials and products (non-emitting pollutants to the indoor air), sensors, intellectual systems, engineering systems, facility management methods.
- To construct more social housing units.
- To create new technologies minimising negative effect of construction sites on health, safety and life quality of neighbourhood residents (dust, noise).
- To minimise use of harmful construction materials and products in construction.
- To adjust built environment to the disabled and senior people.
- To increase safety (non-slippery stairs, floors, etc.) of built environment (home, work, recreational and other places and travelling between those places).
- To grant rational thermal comfort, lighting, humidity, to reduce noise.

- To reduce sick building syndrome and incidence of respiratory diseases and allergies and to improve conditions for work and studies.
- To optimise healthy and comfortable indoor environment in integrated manner and sustainable low energy built environment.
- Reduction of social problems in built environment.
- Issues related to the quality of life are solved applying intellectual e-democracy systems.

Work Safety and Creation of Attractive Work Conditions

In order to implement the *vision of work safety and creation of attractive work conditions* it is necessary:

- To install automated production lines for construction materials and products by moving more and more construction processes to factories and minimising construction processes in a construction site. Construction materials and products are adjusted to manufacturing of semimanufactures in factories, larger variety of modular products. This will improve productivity and work safety.
- To intellectualise machinery and equipment, to industrialise and mechanise construction processes.
- To reduce number of accidents in construction using the newest technologies (3D and 4D modelling, intellectual devices, equipment and clothing).
- To minimise the number of accidents and professional diseases.
- To integrate the latest knowledge in all construction processes.
- To use the latest knowledge and device based intellectual systems in all construction processes.
- To improve the image of the construction branch. To attract the maximum number of qualified employees to the construction branch, women among them; to minimise amount of unqualified work force.
- To increase responsibility of each worker and to encourage effective group work.
- To create conditions for employees to improve their qualifications during their active working life.
- To improve work relations along the vertical management hierarchy, to improve career opportunities.

Reduction of the Effect on Environment

In order to implement *the vision on reduction of the effect on environment* it is necessary:

- To rationalise the planning of geographic location of various city functions (residential, work, recreation, industrial areas, highways, green zones).
- To perform urban planning and management from the perspective of the city (block, district, building) lifecycle theory. To reduce negative effect of the city (block, district, building) lifecycle on the environment. To restore the desolated environment (green areas, etc.).
- To organise construction so that negative effect on the environment and energy consumption are reduced to the minimum during the building lifecycle (i.e. setting goals and designing, manufacturing of construction products (including recycling and recycled materials and products), construction, commissioning, facility management and demolition).
- To design and construct building so that the noise that reaches people residing in the buildings could not harm their health and would allow them to work, have a rest and sleep in good conditions.
- To improve protection of people, animals, plants and the ecosystem against the effect of pollution and the surrounding environment (air, soil and water pollution prevention).
- To regenerate the polluted soil.
- To develop soil and water quality monitoring systems (chemical sensors providing real time information about ground water quality, integrated technologies for protection of soil and water against critical situations or drastic changes, etc.).
- In order to reduce energy consumption and its negative effect on the environment (e.g. CO_2 emissions) studies are performed and innovative solutions implemented in the following fields:
    - Installation of low energy and renewable energy technologies.
    - Development of new technologies for production of efficient and clean energy. Development of technologies for efficient energy management in built environment.
    - Development of construction products which drastically reduce heating needs of new and renovated buildings.
    - Construction of new buildings able to create energy without CO_2, able to produce energy which they will use without CO_2 emissions.
- In order to improve the system of public transport, studies will be performed and innovative solutions implemented in the following fields:
    - Development of personalised public transport accessible to all (the disabled among them).

    - Development of a logistic system with centres at the edge of urban areas (no trucks in city centre) integrated with main highways.
    - Innovative and more efficient public transport.
- To use waste of various industries in construction.
- In order to save resources and energy used for manufacturing of construction products and to increase reuse of waste, to improve manufacturing processes of construction materials and products.
- Building construction, demolition/disassembling, utilisation and reuse of construction materials and products will be planned already in the early designing stages. This will help to use waste produced during building construction, demolition/disassembly and utilisation and to use unused resources (designing, work in a construction site, etc.) more efficiently.
- To create integrated systems for analysis of the effect of building lifecycle on the environment (traffic noise and vibrations, air, soil and water pollution, etc.); the systems should be able to model and forecast negative effect of built and humanised environment on the environment.
- To develop intellectual teamwork (of all stakeholder groups) systems.

Reduction of Natural and Technogenic Dangers

In order to implement the *vision on reduction of natural and technogenic dangers* it is necessary:

- To harmonise EU scientific research (new construction products, sensor technologies, mathematical models, computer modelling methods, natural research) and the normative documents of various fields related to reduction of natural and technogenic dangers (resistance of buildings and infrastructure to earthquakes, excessive rainfall, storms, floods and erosion (river and coast systems), whirlwind winds, landslides, explosions, fires, climate and geologic changes, etc.). By analysing the effect of climate changes on built environment to evaluate the increasing effect of floods, excessive rainfall, storms, coast erosion, etc.
- To develop advanced integrated methods, models and systems for monitoring, evaluation, forecasting, early determination and notification, management, prevention, risk analysis and reduction of natural and technogenic dangers; the methods, models and systems should include information to the society, preparation for unforeseen cases, analysis of the effect on business processes, distribution of roles and responsibility in crises, training and competence, quality and performance management.

- Natural and technogenic dangers are reduced with participation of stakeholder groups (end users, policy makers, practicians) and using interdisciplinary knowledge.
- To inform the society about the existing and forecasted situations. Development of the system for lifelong e-education and training of the society.

Transformation of the Construction and Real Estate Branch

In order to implement the *vision of transformation of the construction and real estate branch* it is necessary:

- To reform the branch management by applying more efficient and simpler management systems thus reducing the time and resources required for management.
- To decide how the state will regulate (from maximum state involvement to unlimited market forces) the construction business and how the regulation will change with time.
- To seek that legal acts and normative documents regulating construction business create good conditions for innovation development in construction organisations. It is necessary to apply innovative activities broader, to create legal environment which would facilitate and encourage development of innovative practices. It is necessary to make employees and companies interested in improvement of work force quality.
- To review the documents on construction regulation issued by ministries, counties, municipalities and to create a uniform system of national technical and building safety and purpose requirements free of duplicated, unimportant or ambiguous documents.
- To improve employer-employee relations in the whole sector.
- To develop a consumer-oriented innovative built environment lifecycle.
- To transform the construction and real estate branch to knowledge and device based sector in which the whole value chain (from a client to a rank and file worker) is based on knowledge.
- To develop an integrated knowledge system of built environment lifecycle.
- To use knowledge, information, communication and satellite technologies and electronics during the whole built environment lifecycle.
- To develop “intellectual products” (identification devices, sensors, diagnostic tools) able to pass information about the condition of a construction process (deviations from the work schedule, supply of construction materials, etc.), microclimate, condition of the supporting constructions, etc.

- The quality of built environment is constantly evaluated and monitored in a transparent process, it reflects the new image of innovations, creates new business opportunities and offers good work conditions to all.

CITIES AND BUILDINGS

Vision

Towns can be defined as dynamic reality altering in physical and perceptual terms. Therefore, there occurs a need to define and understand the key forces that form the town. To ensure proper development of towns, the major attention should be paid to its management, creation of town image, and consideration of public needs.

For our towns to be better balanced in future, the following *measures* should be implemented in the planning practice:

- housing systems and forms that would ensure diversity of land use, housing density and its rational layout, use less energy, allow to save in heating and waste collection;
- planning control, which should particularly foster innovations that reduce energy consumption from the stage of planning to the completion and maintenance of the building;
- public facilities and open territories planned at such locations and of such size that the demand for motorised trips is reduced (fuel consumption is 3 times higher at small density territories if compared with high density zones);
- transport strategy should give priority to communication on foot and by bicycle and promote use of the public transport as it has such characteristic features as slower speed, strict requirements on noise limits and pollution, and it also recognises the social life function of the street.

The key *drives*:

- Sustainable development covering economic, social, environmental aspects should be included into the urban development; besides, specific town features, cultural heritage, natural environment should be considered and the impact of anthropogenic factors on the town should be reduced;
- It is necessary to develop reasoned town visions (general plans of territories of municipalities and regions);
- Town structure should be balanced, it should also be related to natural environment and guarantee short-term recreation conditions for residents;
- Priority should be guaranteed for the public transport;

- Engineering infrastructure should be developed in a complex way;
- Attention should be paid to tourism development;
- Sustainable development of the town should be clear both to the man in the street and the representatives of high authorities;
- Special significance should be attached to strategic and physical planning of towns, maintaining balance between them, avoiding protectionism, integrating planning of urban and suburban territories;
- Rational urban development requires political stability of the country and a clear direction of economic policy.

The main goal should cover becoming capable of competing with other towns of Europe.

Energy and environment

It is necessary to use different forms to motivate people to install energy saving measures in buildings. In PC, about 40% of energy resources are consumed for supply of energy to residential and public buildings. According to specialists' estimates and foreign experience, due to improvement of thermo-insulation characteristics of buildings and heating and hot water preparation systems, energy output could be 50% lower.

Construction activities must be organised in such way as to reduce to the highest possible extent the negative impact of the building on the environment and the energy output. To fulfil these tasks, a certain complex of measures must be efficiently implemented by including practical business solutions. The complex of such measures may pretty reduce the costs of building maintenance.

Near-zero energy technologies applied in construction would not only reduce greenhouse gas emissions but would also cut down overall expenses of operational life of the building. Reduction the amount of waste during the life-cycle of the building could result in cut down long-term costs of the state and of construction companies. Reduction of the amount of waste disposed at landfills would contribute to resource conservation and environment protection. Part of waste could be recycled and reused for construction.

Modelling of urban sustainable development

Efficiency of sustainable urban development depends on different variables at micro- and macro-levels. Urban macro-environment includes economic, cultural, political-legal, technological and natural environments. Urban cultural environment facilitates formation of the key public values, attitudes and behaviour norms. Human personality matures in certain society which predetermines his/her dominant values and creeds. The outlook of a human being later impacts his/her relation with other people. Every organisation performs in certain cultural environment consisting of specific traditions, customs, and people who follow them. Urban political and legal environment consists of the following: political system, legislation, ownership right, public regulation degree, governmental and public bodies and organisations, and other stakeholders. Business to a great extent depends on the level of bureaucracy of the existing system.

Variable factors of urban micro-level (pick of a field of activities, innovations, prices of land plots and buildings; infrastructure, public transport, process of operational living of developed surroundings, etc.) depend on the influence of macro-level factors. To achieve efficient functioning of the town and to improve environment quality of the town, transport must be reliable, safe, speedy enough, and affordable to all persons and society groups. To ensure the efficiency of urban sustainable development, it must be going out within certain limits set by micro- and macro-level factors. Changes in these factors are followed by changes in the level of efficiency of urban activities.

The life cycle of the developed environment

To design and implement an efficient life cycle of the developed environment, it is necessary to have a complex analysis of its components, involved concerned groups, and their goals and possibilities. It is also essential to take the impact of external micro- and macro-environment into consideration. The life cycle of the developed environment consists of the following constituents: setting of goals, designing, production of materials and products, construction, maintenance, management of the developed environment, demolition, utilisation, and reuse of building materials and products. All these constituents might be rationalised, for example:

- Setting of goals and designing. In the course of designing, attention should be paid to solution of such issues as renovation and maintenance of buildings, management of housing stock, demolition, waste recycling, reuse.
- The life cycle of building materials and products. Installation of automated production lines for building materials and products by transferring construction processes to the plans for preparation of semi-manufacturers. In this way, productivity and safety at work would be

improved. To recycle and reuse building materials and products, it is necessary to have more knowledge about the properties of the life cycle of building materials and products. It would be rational to develop support systems for selection of solutions concerning building materials and products and new technological systems for waste recycling and reuse. Efforts will be laid to implement a closed loop system for the life cycle of maximum value of building materials and products.

- Construction process. Sensor-based intelligent real-time monitoring systems of a construction process should be developed, and they should make it possible to know, analyse, and control the situation in construction, and to detect deviation from the schedule of works and to give timely reports and recommendations.
- Business and economy. New models of business and cooperation among concerned groups should be created and applied.
- The stage of use. Aesthetical properties of buildings, as well as efficient use of resources, health, hygiene and safety during maintenance and management of the building stock should be ensured.

Variety and innovative nature of the above-mentioned constituents help to have a more rational look at the micro- and macro-level factors of the external environment; to cut-price the life cycle of the developed environment; to better satisfy architectural, aesthetic, comfort-related and other demands and goals of the concerned groups. To improve the life cycle of the developed environment, is its necessary to have in place the systems based on knowledge and tools containing experts' experience and versatile sensor-generated information. Knowledge advisers will contribute to more efficient implementation of the life cycle process of the developed environment.

Knowledge systems, intelligent systems, automated control systems, and robotized systems

Development and application of the best practice database/knowledgebase and knowledge- and tool-based solution support systems:

- Analysis of the life cycle of the developed environment and its constituents;
- Building renovation by proposing typical solutions for different building renovation situations, also solutions for resource conservation and pollution reduction.

- Development of intelligent electronic sub-system of building materials and products (market researches; transactions and search for business partners; financial information; legal and technical information; information on commercial events; special recommendations; factors that impact the environment of construction and real estate).
- Development of intelligent, robotized, interactive, knowledge- and sensor-based new class construction devices and systems (cranes, excavators, pipe assembling equipment, automatic welding assemblies).
- Integration of virtual construction and building stock management environment (3D and 4D models) and of knowledge- and tool-based systems (digital model of a house or a town; virtual tour in a house or a town; simulation of a street pollution level; virtual designing of a building; analysis of different technological processes in virtual reality; virtual simulation and analysis of building maintenance and stock management; other type virtual simulation (virtual management systems of internal climate of a building, fire, energy consumption, noise insulation properties, safety at work); virtual integrated designing of the life cycle of a building; drafting of tender application and management of construction, etc.).
- Integration of robotized technologies and knowledge- and tool-based systems (robot-mason, robot-road builder, etc.).
- Production and installation of intelligent sensors for all elements of the developed environment by creating conditions for continuous availability of historical and all-embracing information.
- Development of a knowledge- and tool-based solution support system (building materials and products, building stock management, real estate management, building renovation, sustainable development, innovations, international trade, ecology and pollution, building life cycle; ethics, group work, compliance of buildings with key conditions, integral modelling of ferro-concrete elements' deformation, etc.).
- Development of the knowledge-based solution support system for analysis, simulation and forecast of construction and real estate branch.
- Development of intelligent e-procurement sub-system.
- Development of intelligent electronic sub-system for land plot zoning, land purpose changing and construction permit issue.
- Electronic data collection at construction site, their analysis, processing, monitoring, control and putting forward proposals.
- Development and application of intelligent group work systems.

- Development and application of interactive virtual environment designed for estimation of functionality of buildings and the developed environment, also for adopting solution for consumers.
- Development of the above-mentioned systems would result in more efficient transfer of technical, technological, managerial, organisational, economic and business innovations from EU-15 to PC.

Life-long learning

Development of an intelligent life-long learning system will facilitate qualification improvement for construction and real estate sector employees. E-books, audiovisual materials, computerised teaching systems, software, e-tasks and e-works, testing systems, etc. for students will offer more ways for learning and select the most rational materials for studying. It would be important to develop a model of organising remote studies, where different intelligent systems are applied in the process of studies or learning, namely: electronic, student-tailored, compilation of selected objects, intelligent learning, e-mail management, e-testing of students' knowledge, etc. Life-long learning and readiness to continuously adopt innovations will improve productivity, working conditions as well as make changes in work culture.

In PC, structures and buildings must become a healthy, safe, attractive and available environment for living and working; the life cycle of the developed environment must to the maximum extent serve the interests of all the concerned groups. All-embracing programmes of building renovation and renewable energy, construction of new and energy efficient buildings would allow to get drastic reduction of energy demand of buildings. Efficiency of the life cycle process of the developed environment will grow resulting from researched carried out and applying innovative ideas from other branches of industry.

Vision until 2020

- Implementation of sustainable development policy to guarantee holistic development (a human being and a phenomenon are perceived as a whole);
- Significant noise reduction and air quality improvement in towns;
- Involvement of citizens into town management;
- Different designing and optimisation of urban infrastructure and services;

- Improvement of the existing 3D and 4D geo-information systems to improve public administration, private investment, and public involvement in town management;
- Balanced designing of towns (buildings, transport, etc.) would reduce energy consumption and pollution;
- Setting up of the database and knowledge base of the best and worst practice, its public accessibility and application in town planning and management;
- Analysis of complex wear of a building;
- Setting up of open digital administration.

Citizens using open digital administration services have a possibility to make e-submission of official documents, to track their movement in institutions, get urgent information on any problems and possibilities to solve them, to repeatedly use personal information received from different databases (using digital signature), to repeatedly use the verified information. Using open digital administration will result in the following:

- Occurrence of electronic self-service. Most services provided to users will be pooled in one place (i.e. one e-window principle will be applied). Intelligent e-forms will offer a possibility of quicker cooperation and their filling in will not be complicated and time-consuming. Intelligent e-forms will facilitate submission of the necessary information and will grant a user a direct and safe access to his/her files (using digital signature);
- New ways of democratic expression will be adopted. A possibility to directly interact with politicians will be offered. E-discussion forums may be arranged to allow people discussing with other citizens and politicians and dispute some specific matters, for example, conclusion of plans for area development, or allocation of funds for alternative municipal projects;
- Employees of municipal administrations, residents and organisations will be given better conditions for reviewing questions of interest (regulations, information on projects, etc.) and working with this information.
- Better management of files. Sequence of data processing and replies as well as works will be followed. Work process will be more streamlined and speedy. An employee working on the submitted data will be able to send information to another employee by entering self-warning signals giving alert on deadlines of reply. Streamlined and intelligent forms will result in less mistakes, therefore their processing will be easier;

- Closer contacts with residents (e-discussion forums; e-forms and direct access to files);
- Shortcomings, achievements and potential of the whole administrative system will be better seen.

Complex determination of the building wear will be followed by the analysis of its components: physical wear of the building; failure of thermo-insulation of the building to comply with modern requirements; wear of engineering equipment (heating, ventilation, water-supply); failure of the legal framework to fulfil up-to-dare requirements; failure of architectural and aesthetic requirements to comply with modern requirements; functional wear of the building; inadequacy of comfort in the building (sound insulation, humidity regime, temperature, lights); deviation of the building use process from modern requirements; unsolved social issues; economic wear of the building.

Vision until 2030

- Towns are desired places for living;
- In PC, buildings are healthy, safe, attractive and well accessible places for living and working;
- Housing is built and maintained in a sustainable way by applying new cooperation forms between the final user and the construction process in a wide sense;
- Functioning of an open digital administration by applying intelligent systems and knowledge infrastructure and, aiming at consensus, involving all the concerned groups and fully harmonising their various interests is necessary for development of towns attractive for working and living in.
- Designing and construction of affordable, new, energy efficient buildings that might get CO_2-free energy from renewable resources;
- Production of building materials and products that to the maximum extent reduce CO_2 emissions;
- Towns will become places of residence with better quality of living (safety, protection, comfort, leisure, high income), nice and clean surroundings, string local communities, democratic decision-making at all levels, easily accessible information and communication systems and knowledge services, virtual work, good communication by the public transport, clean technologies;
- Silent and expressed knowledgebase (system) of PC construction experts is under development;
- Installation of Multiple Listing Service covering real estate that is being soled or rented on the market of a concrete location (town, surroundings, states);

- Implementation of real estate transactions in the virtual space by using digital signature and virtual document processing technologies;
- Implementation of the idea of an intelligent house for people with physical disabilities; This would make it possible for such people to have better quality of living and being more independent;
- Use of building materials based in nanotechnologies with physical properties able of adjusting to climate;
- Implants (microchips) which accept and transmit digital information on the state of a certain elements of the house to the host computer of the house should be used in house constructions and elements. Self-control systems of such a house would make it possible to notice failures and to eliminate them.

The main results and goals for 2030

- Reduction of the environmental impact of the developed environment:
    - 30% reduction of the need for raw materials in the production of building materials;
    - 100% reuse of building demolition waste;
    - 30% reduction of CO_2 emissions in the production of building materials;
    - Cutting the costs of the life cycle of building materials;
    - Implementation of knowledge- and tool-based control of properties building materials and developed environment;

- 30% reduction of overall costs of the life cycle of buildings and structures;
- Development and consideration of alternative construction processes;
- Finding out ways to replace dangerous construction processes with less dangerous ones and offering ways to solve the issues of safety;
- Development and practical application of technical solutions that have no impact on human health.

Measures for vision realisation

The approval of the public will be necessary for the work of specialists provided in the strategy of towns and houses. Therefore, certain preparatory work related to education of the public at large and specialists of this field will have to be done. This could be done in the form of conferences, seminars, workshops and pilot projects, publications in mass media, discussions on TV and radio.

Strategic research programme

Scientific researches have great potential for stimulating town competitiveness and productivity. This could be achieved by developing and applying appropriate production and information technologies. Thus, one of the essential factors guaranteeing productivity and efficiency of innovations that will condition the future and spread of towns is training of numerous construction specialists and staff.

It is proposed to carry out scientific research and create a knowledgebase (system) of town and building experts. Using the knowledgebase of experts and knowledge systems, it is easier to look for experts and to facilitate cooperation with them with the help of on-line technologies. Computer-stored knowledge consisting of documents and data (for example, estimates, price lists, technical, economic and quality indicators of constructive solutions) must be easily accessible. That needs a system of knowledge accumulation, registration, organisation, filtering, analysis, collection and dissemination.

Different knowledge of different specialists on the same object must be a whole that gives a full description of the life cycle process efficiency of the building:

- Development of database for serving customers based on the analysis of the best practice of customer serving. On the grounds of this analysis, concrete recommendations should be made on how to provide better quality services and satisfy customers' needs;
- Designers should use the examples of the best experience on the architectural, aesthetic, special and planning solutions of the building, also on how to ensure strength and stability of the building constructions, create comfortable conditions for the use of premises (air temperature, relative humidity, natural light, protection from noise) and use rational engineering systems (heating, ventilation, water-supply, sewage, communications, automatics).
- Hygiene specialists should share their experience on environmental pollution, harmful effect of different construction solutions on health;

- Economists should provide information on land plot and building prices, maintenance costs, taxes, insurance, loan rates, building quality level (social, technical and economic indicators), and price change tendencies;
- Contractors should create a sub-system of knowledge on application of efficient technological, organisational and management methods;
- Specialists of building stock management should provide information on efficient use, maintenance and renovation of buildings.

It is necessary to support creation and development of an intelligent house in which ideal climatic and professional conditions for the work of the staff are guaranteed by technical means, the necessary level of protection against natural calamities and unsanctioned invasion is ensured, and energy and utility resources are rationally used. Every intelligent building should consist of intelligent elements.

As the meaning of towns in the public life is predetermined by attractiveness of towns, most PC towns must be shortly reconstructed and renewed. In parallel, residents of the town should have access to affordable improvement of housing quality by, at the same time, implementing energy efficient measures so that people choose to live, work and rest in the town in a comfortable way. It is essential to optimise energy consumption during the whole life cycle of the developed environment. To solve this problem, the following should be done:

- 40% reduction of energy consumption and CO_2 emissions in new buildings by 2015;
- 40% reduction of energy consumption and CO_2 emissions in the built buildings by 2030.

Solution of energy problems will allow improving living quality (better microclimate parameters, less health problems, higher building value, better aesthetic view).

Rational use of urban territories for construction of production and service objects and housing, as well and increasing their multi-functionality will allow shuttle migration and create conditions for speedier social development and pollution reduction in the town.

Major share of investment and aid from the EU structural funds should mostly reach the slowest towns.

These problems of both of economic and environmental nature, thus significant reduction in construction costs and mitigated environmental impact would allow implementation of projects.

- Towns should be designed to suit the needs of everyone irrespective of age, skills, social status, etc.;

- General plans of towns and settlements of PC should be prepared and serve as the basis for setting town development priorities in territorial aspect. General plans should be integrated into strategic plans;
- The public should be educated by helping them see the town as a complex system;
- Rational use of the EU aid for the implementation of priorities set in general plans;
- Strengthening of municipal institutions, improvement of specialists' administrative capacities;
- Special attention should be paid to reduction of economic and social development disadvantages in problematic areas.
- Promotion of cooperation among authorities, business and the public;
- Upgrade of the public transport;
- Promotion of close cooperation among different field specialists and development of integrated planning;
- Creation of a sustainable town aiming at lower energy consumption, promoting sustainable mobility and improving urban environment;
- Preservation of ethnic identity by creating new urban development models;
- Creation and promotion of new ways for integrated and open planning preventing closed planning policy;
- Creation of sustainable town models accessible to everyone;
- Guaranteeing inter-relations between the central part of the town and suburbs and neighbour towns;
- Creation of town management models by using experience of other EU towns;
- Possibilities to apply art technologies in towns;
- Promotion of cooperation of different field specialists by applying modern technologies, pilot projects and best practices;
- Territorial regeneration and cohesion of different purpose territories;
- Inter-integration of technological processes and management innovations for town improvement;
- Joining different scientific researches on the basis of holistic approach;
- Ground development, maintenance and management of towns on holistic approach.

Vision realisation needs carrying out scientific researches: creation of methodological grounds for assessment of town development and public involvement in territorial planning, defining of development indicators (and their references);

application of e-government, on-line technologies for remote learning; correlation of land use and physical planning; use of on-line technologies for impartial setting and putting forward town development measures, presentation of such measures to politicians and the public, creation and monitoring of a databases; creation of innovative measures and modern technologies for full assessment of changes of urban development; installation of noise reducing technologies at construction and transport; promotion and installation of wasteless technologies, recycling of secondary raw materials; improvement of the quality of urban environment; training of population on the grounds of advanced sociological theories stimulating their involvement in town management; making urban development territories available for business needs; reconstruction and revitalisation of urban spaces; creation of the system of indicators that define and assess town attractiveness; assessment of the needs of town population and consideration of possibilities for providing social and technical infrastructure aiming at reduces energy consumption and improving environment quality; viable environment by combining public and private spaces in the town territory; ensuring building quality first of all in the terms of energy consumption, assessing their conformity with environmental conditions, their sustainable architectural value, and working and living conditions in them; ensuring close correlation of production and final users on the grounds of consistency principles.