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EU RESEARCH FOR SUSTAINABLE URBAN DEVELOPMENT AND LAND USE SUSTAINABLE URBAN ENVIRONMENT



BUILDING THE FUTURE |

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SUSTAINABLE DEVELOPMENT, GLOBAL CHANGE AND ECOSYSTEMS

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A LEGACY WE CAN BE PROUD OF?



The everyday experience of as many as 80% of all EU citizens is formed by the urban environment. Yet its frequent noise, pollution and social problems still belie the priority accorded to sustainable development in European Union policies. Research and demonstration are urgently needed if we are to realise our common dream of dynamic, environmentally and user-friendly cities.

Europe's cities continue to grow, often in a haphazard manner that does nothing to improve them. Buildings account for nearly one-third of the world's carbon dioxide emissions, and urban construction and demolition produce Europe's largest waste stream – over half of all waste by weight. At the start of the 21st century, massive improvement is still needed in the way our cities are planned and built. Urban planning can and should give equal status to the environmental, social and economic consequences of every development. It is possible to revitalise depressed areas in ways that satisfy the wishes of residents and businesses.



Resources such as land and materials can be reused and recycled. The scope for improving the way that buildings are designed, constructed and disposed of is tremendous.

Research is essential. But we must also make sure that every city manager, policy-maker, designer and developer in Europe is able to use the results of that research. And we need to make sustainability attractive. Sustainable development demands a shift from historic economic models, and the creation of a market that will deliver long-term growth in a way that enhances the environment and social structures. This is already beginning to happen – in the construction sector, regulators, clients and suppliers now have a responsibility to look for improved ways of working. Yet the challenge remains to convince cities that long-term benefits are as important as short-term gains – that they can become attractive, vibrant centres of life and culture which we will be proud to bequeath to our children.

Dr Scott Steedman

PRESIDENT OF THE EUROPEAN COUNCIL FOR CONSTRUCTION RESEARCH,
DEVELOPMENT AND INNOVATION (ECCREDI)

BETTER DECISIONS FOR BETTER BUILDINGS

The European Union is committed to sustainable development, as it makes clear in its Strategy for Sustainable Development⁽¹⁾. Research under the Fifth and Sixth Framework Programmes is improving environmental technology in Europe, and developing decision and planning processes that incorporate a broader view of sustainability.

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BUILDING THE FUTURE

Innovation needed

Almost every human activity occurs in association with some kind of building, and cities' physical infrastructure is crucial to achieving sustainable development. Two primary groups contribute to the management of this built environment – the construction industry, and those who decide what should be built where.

The European construction industry is intensely active. Accounting for 10-12% of EU GDP, and employing 30 million people, it is largely made up of small and medium-sized enterprises which operate locally. But the industry is not very sustainable. Construction is highly regulated and tends to stick to established, traditional methods. Consumption of resources like water and energy is high, while investment in research and development is much lower than in other sectors.

New technologies and approaches developed by EU research projects are helping the construction industry to adopt concepts of sustainability. Under the Fourth Framework Programme, about €300 million was spent on construction-related projects. A similar commitment was made in the Fifth Framework Programme, whose Energy, Environment and Sustainable Development programme included the key action 'City of tomorrow and cultural heritage'.

(1) COM(2001)264 final



False economy

In managing the built environment, sustainability must be incorporated at various levels, from regional planning to individual construction sites. Planners, city councils, designers and urban residents all help to determine how cities develop, and what construction methods are used. The 'cheapest' option is not always the most attractive, when long-term costs and benefits are considered. A pleasant environment may in the long run be more valuable than squeezing in as many buildings as possible. Investing in the rehabilitation of existing sites may be preferable to developing new areas. But it is hard for decision-makers to assess such options scientifically. European research is producing a wide range of tools to help them introduce sustainability, including good practice databases, visualisation tools, and decision-support systems.

The CommunityViz Scenario Constructor is designed to make land-use decision-making more visual, more collaborative and more effective. It offers a powerful means to compare land-use alternatives.



There are six key challenges in generating a sustainable built environment in Europe's cities:

a. | Urban sprawl

The unchecked expansion of urban areas leads to inefficient resource use and the degradation of inner cities. Single-use developments like business or retail parks are often isolated from transport networks, encouraging the use of private cars. City and regional planning processes can tackle urban sprawl by targeting the regeneration of inner city areas and insisting on multifunctional development.

b. | Redeveloping industrial sites

Commercial sites are important elements of a sustainable city plan, providing work and services to support local economies. But industrial sites deep within cities are often small, surrounded by housing and with outdated infrastructure, and may be abandoned when companies decide to expand in out-of-town industrial estates. Derelict industrial sites can be reused, but new tools are needed to define strategies for their sustainable redevelopment.



c. | Regenerating brownfield sites

In particular, reuse of 'brownfield' sites reduces urban sprawl and enhances the inner city environment. But many abandoned sites are contaminated and dangerous – cleaning them up can be unexpectedly expensive. This risk deters private developers, but municipalities often cannot afford to rehabilitate brownfield sites. As a result, many remain disused. New, cheaper technologies and ways to manage such revitalisation efficiently are an important focus of European research.

d. | Sustainable construction

The process of construction is often noisy, disruptive and wasteful, while many buildings still use energy and other resources inefficiently. Better technical solutions abound – the problem is to get clients and designers to specify and use them. Sustainable construction methods are often perceived as costly luxuries. The economic and environmental advantages of the new techniques need to be demonstrated on a large scale.

e. | Green space

Green spaces are a vital element of sustainable cities, providing people with opportunities to rest, exercise, play and socialise. New green spaces need to be incorporated into development plans as a matter of course, while existing parks and other outdoor facilities could be better maintained and more fully integrated with surrounding districts.

f. | Regenerating distressed neighbourhoods

Deprived areas are both a symptom and a cause of inner city decline. Planning can help regenerate rundown areas at a number of levels, from neighbourhood to region. But planning for sustainability is complex because it involves accounting for the environment and social structures alongside economic factors, and should incorporate the views of local residents and businesses.

CRADLE TO GRAVE SUSTAINABILITY

The built environment is created in successive stages – planning and design, construction, operation and maintenance, renewal and reuse. In a sustainable city, principles of sustainability must inform every stage.

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BUILDING THE FUTURE

Phased approach

The outputs of the 'City of tomorrow and cultural heritage' key action cover each of these stages. Projects such as those in the SUPER cluster on economic development, or the Greencluster projects which provide methods for incorporating green space into urban plans, focus on urban planning, design and maintenance. Planning for the regeneration of inner cities is also covered, while several projects examine urban sprawl from the wider perspective of their regional contexts.

A number of projects cover specific aspects of construction such as waste management, new materials and innovative safety improvements. In the area of renewal and reuse, topics range from defunct buildings to technologies for the assessment of contaminated sites. Several large projects, such as the Cabernet network and Norisc (see *Expert system*), support the management and reuse of derelict sites. Altogether, €30 million has been spent on sustainable building and brownfield regeneration under FP5's Environment and Sustainable Development programme.

Other large projects are helping to evaluate the sustainability of urban development – creating codes of practice and indicators to help designers, developers and planners all over Europe to compare their activities and get advice on improving sustainability.

A rehabilitated area of Tirana, Albania, around the Lana river.

Sotiri, Tirana 2003



The European perspective is important. Some parts of Europe are experienced in certain aspects of sustainable urban management, so the challenge is as much to transfer knowledge as it is to undertake new research. In some Dutch and Scandinavian cities, for example, almost all construction waste is recycled, following years of political pressure to reduce waste. In southern and eastern Europe, meanwhile, much construction waste is still disposed of in unsustainable ways. Cultures and construction methods and materials differ, so a single route to sustainability cannot be imposed uniformly.

Sustainable research

Each research project focuses strongly on the durability of its results. Guidelines, databases and decision-support tools must be effectively disseminated and kept up to date once the project has finished. Consortia are encouraged to find ways of generating further investment – for example, by setting up companies to sell or support the product.

MAKING LIFE BETTER

Urban sprawl has major impacts on a city's environment, social structure and economy. But it is brought about by planning and development activities which are driven by policies, incentives and the behaviour of urban residents and enterprises. European projects are studying the causes and consequences of urban sprawl to identify actions and policies that can reduce its impacts.

Every city is different, and policies must be tailored to individual needs. The Slovenian capital, Ljubljana, has problems with prosperous suburbs that grew up during periods of poor planning control, for example. The 2004 Olympics will leave Athens with a legacy of large out-of-town developments. For many years, Warsaw strictly controlled the numbers living within the city, and retains an attractive, low-density city centre. Projects on urban sprawl have created simulation models, decision-support systems and guidebooks to help planners understand and improve their cities.

SELMA is studying the effects of decentralising economic land use on quality of life, assessed in terms of the environment and social and economic welfare. Based on case studies from Tel Aviv to Copenhagen, the project will produce a simulation model allowing planning strategies to be tested for different city layouts.

Development concept for Antwerp's inner city – urban green spaces define and connect individual districts.
Sotiri, Municipality of Antwerp



All sorts of sprawl

Urbspandens is a collaboration of nine institutes studying urban sprawl in seven European cities, from Liverpool to Athens. It examines patterns of sprawl and the factors that drive it. Is it the poor environment of the inner city that drives people to the suburbs, or social aspirations? Why do businesses choose to move out of city centres? What planning policies control sprawl?

Urbspandens will create a model of urban sprawl that describes relationships between interdependent variables and links them to key drivers and relevant policy options. The worse the environment in the inner city, the less new housing is built there, for example. Each case study will be fitted to the model, which will cover the full range of urban sprawl situations. The model will be incorporated into a CD-ROM-based policy guide, helping planners to identify their own form of urban sprawl, and offering recommendations on how to manage it.

Further information | <http://www.pik-potsdam.de/urbs/>

Regenerating brownfield sites

Each brownfield site has a different history, geology and pollution profile.

Decontaminating sites is a major challenge for city regulators – and for developers fearing subsequent litigation. There are many different ways of making a site suitable for housing or industry, but finding the most cost-effective and reliable demands skills from as many as five scientific disciplines. European projects are helping planners and developers by producing technologies and decision-making tools specifically for the development of contaminated brownfield sites.

In the western part of Genoa, the *Prà Park* is under development on a reclaimed site between the port and an area of dense housing.

Regione Liguria, 2002



Subterranean topology affects the behaviour of pollutants, leading to costly delays if it is not properly understood. Hygeia is creating new imaging technology that maps the underground features of a site. The Concerted Action on Brownfield and Economic Regeneration Network, Cabernet, is a network of 49 experts from 21 countries, working to enhance access to information and coordinate research on brownfield regeneration across Europe. It promotes the latest technologies, proposes new research projects where needed, and is devising practical guidance in specific areas.

Disused contaminated sites must be incorporated into basic urban planning. The Rescue project is generating guidance on such sites for planners and local administrations. The resulting on-line manual will describe how to deal with contamination, how to decide what to put on the site, and how to judge whether a project is sustainable.

Expert system

Developing a contaminated site can be costly and time-consuming. There are literally hundreds of decisions to take – investigation and remediation can be biological, chemical, geophysical or hydrological, and new techniques are being developed all the time. **Norisc**, a consortium of European research groups, companies and regulators, has made the process much easier by creating a piece of software to guide the user through this process. It draws on a huge quantity of data including contamination profiles from different industries, EU and US legislation, and an inventory of techniques with their costs and outcomes. Designed for use by regulators, consultants and developers, the software supports evaluation of a site, risk assessment and the choice of remediation method. It has been tested in four European cities, showing that it can reduce the cost of redeveloping contaminated sites by half, and the time taken to carry out a risk assessment by up to 80%.

Further information | <http://www.norisc.com/>

Sustainable construction

Smaniotta Costa, IOER 2002

In the Sustainable Housing for Europe (SHE) project, social housing organisations will build 714 cost-effective, energy-efficient and innovative dwellings in eight cities, with expert advice and citizen participation. When the project finishes in 2008, planning and construction lessons will be published for designers, citizens and policy-makers.

The success of such sustainable building projects can be measured using the on-line database of more than 500 sustainability indicators produced by the CRISP project. Sets of indicators relate to products, buildings or processes, and to strategies, and range from the aesthetic (colour harmony) to the social (school underachievement rate) and the practical (on-site grey water usage).

Construction is the most hazardous major industry, accounting for 50% of all work accidents, and the safety and durability of many modern buildings could be significantly improved. European projects are addressing these issues, particularly in earthquake zones. RISK-UE is developing a model for cities to predict earthquake risk, highlighting individual structures that are likely to fall, or to do particular damage if they do fall. The Safefloor project is developing a way of constructing buildings from recyclable elements of new, lightweight materials that will greatly reduce accidents on building sites and injury during earthquakes.



Wambuco is close to completing a European Waste Manual for Building Construction, on CD-ROM, containing practical advice on issues such as waste separation and the coordination of different trades on a building site. It promises a 25% reduction in waste by weight, and a 75% increase in the proportion of reusables separated.

When sites are redeveloped, obsolete existing buildings are an immediate environmental problem. They may contain unsafe materials like asbestos and toxic heavy metals as well as recyclable materials. The IRMA project is developing a code of practice for working with contaminated buildings which will include guidance on how to find contaminants, how to deal with them and how to separate clean waste for recycling.



Municipality of Dresden

Encyclopaedia of sustainable construction

How do you make construction more sustainable? To help urban designers and planners address this question, a network of 29 European expert groups has put together a Code of Practice for Sustainable Building. **Presco**, the European Thematic Network on Practical Recommendations for Sustainable Construction, has produced a user-friendly database of over 200 practical recommendations. They cover the entire life of a building, from its inception and planning through its use to its eventual decommissioning and disposal.

Each recommendation is scientifically supported and widely accepted, having been agreed upon by a broad range of consultees in industry and research. Basic environmental issues like reducing energy, water use and waste are included alongside questions of social inclusion – such as how to make buildings accessible to elderly and handicapped people.

Further information | <http://www.etn-presco.net/>

Redeveloping industrial sites

SUPER, or Sustainable Urban Planning and Economic Redevelopment, is a cluster of four projects helping city planners to make decisions about economic (commercial or industrial) developments. It provides decision-making tools such as software that helps optimise the benefits and costs of new or redeveloped sites while avoiding political conflict. One project, Masurin, is assisting five European cities to develop strategies for regenerating inner-city industrial sites, at the same time devising a management guide and a package of software tools to aid decision-making.

Ecopadev is working on the sustainable management of industrial parks on city outskirts, which often have their own waste, transport and pollution problems. Its tools include guidelines on what should be expected of companies, procedures for consensus-building, and sets of indicators for assessing effects on the quality of life of workers and local residents. Zamudio in Spain, Tampere in Finland, and Almada in Portugal will test the new tools.

Working together as a cluster, the SUPER projects meet to discuss common objectives, and will use their combined experience to define future research objectives for urban planning.

Better green space

The indirect economic benefits of parks, gardens and trees can easily be overlooked. Greencluster links five projects that have developed tools and approaches to help urban planners improve the usability of green spaces and incorporate them into their visions of the city environment.

One project, BUGS, has devised a method for measuring the benefits of green space in terms of improved air quality, lower noise levels, economic gain and quality of life. The method will soon be available as a service to urban and regional authorities. Greenspace has assessed the perceived value of green space and incorporated this into a decision-support package that allows planners and citizens to evaluate their own green space and visualise new plans.

URGE supports innovative strategies for the design and management of green spaces within cities by enhancing knowledge of the complex interactions between nature, economy and social systems in urban environments. Encouraging co-operation between practitioners and researchers from different academic disciplines and cultures, it tested a range of methods and tools against the experience of best practice in 15 European cities, presenting the widely applicable, user-friendly results in a handbook for practitioners.



Don't rock the foundations

Buildings in major European cities have a working life of only 25 years. When they are replaced or renovated, foundations must be added or altered. Reusing the same foundations could save time, money and raw materials. But there is usually no record of the load-bearing capacity of the foundations supporting the original building. With no accepted way of testing existing foundations, buildings on second-hand foundations are hard to insure.

Reuse of Foundations on Urban Sites (**RUFUS**), a consortium of seven European research groups and engineering companies, is writing a Best Practice Handbook on reusing foundations, which will cover how to test foundations for strength, upgrade them, and install new multi-use foundations. It also covers documentation of the foundations for future developers. Reference to this approved European Handbook, available by 2006, should convince insurers that reused foundations can be a safe bet.

Further information | <http://www.webforum.com/rufus/>

Sustainable refurbishment of social housing – one of the Sureuro project's pilot sites in Ludwigshafen, Germany.

Regenerating the run-down

Housing estates of the 1950s and 1960s, dockyards and similar disused industrial areas, and run-down neighbourhoods abandoned by commerce offer low-quality urban living and turn people away from city centres. Large European projects like Sureuro are working to achieve the sustainable refurbishment of such housing estates.

A key aspect of sustainable development is to regenerate neighbourhoods 'from the inside'. The sense of ownership when local people are involved in decisions drives further improvement. This presents challenges for city planners, since citizens do not always agree with politicians. But many research projects on the built environment embrace the participatory approach and are generating widely applicable advice on how best to apply it.



HQE2R has worked with 14 urban municipalities – including the Lindevang District in Frederiksberg, Denmark, whose run-down blocks of flats lack bathrooms or kitchens, and where unemployment and crime are high, and Milan's Cornaggia suburb, a densely populated neighbourhood broken up by busy roads and with little green space. The project has developed a method of integrating sustainable development into neighbourhood regeneration that actively involves residents in decisions about their area.

UGIS has evaluated the effectiveness of national and local urban development projects in combating social exclusion. It looked at neighbourhoods with active development programmes in 18 European cities to see whether social factors such as unemployment, quality of housing and level of education were improving. Its evaluation of European programmes will allow policy-makers to see clearly what works and what does not. Conditions vary widely across Europe. Neighbourhoods like Lavapiés in central Madrid are home to large numbers of very poor elderly people. By contrast, social exclusion in cities like Copenhagen concerns young, unemployed immigrants on welfare in low-grade social housing projects. UGIS is considering whether a variety of urban development strategies is required, or whether one model works in all cases.

Further information

FP5's key action **City of tomorrow and cultural heritage**

<http://www.cordis.lu/eesd/ka4/home.html>

'**Environmental Research**' website on Europa

<http://europa.eu.int/comm/research/environment/>

FP6's **Global Change and Ecosystems** priority thematic area

<http://www.cordis.lu/sustdev/environment/home.html>

For specific enquiries concerning the activities presented in this brochure, please contact

rtd-sustainable@cec.eu.int

The **Sixth Environment Action Programme**, Environment 2010:

Our Future, our choice

<http://europa.eu.int/comm/environment/newprg/index.htm>

The **Environmental Technology Action Plan**

<http://europa.eu.int/comm/environment/etap/index.htm>

The **European Union Strategy for Sustainable Development**

http://europa.eu.int/comm/sustainable/pages/strategy_en.htm

Towards a thematic strategy on the urban environment

http://europa.eu.int/comm/environment/urban/thematic_strategy.htm

Thematic Strategy on Soil Protection

<http://europa.eu.int/comm/environment/soil/index.htm>

Impact Assessment

http://europa.eu.int/comm/sustainable/pages/impact_en.htm



Computer visualisations can be used as an aid to participative decision-making.

Isabella M Mambretti, Institute for Spatial and Landscape Development, Swiss Federal Institute of Technology

TO SPREAD GOOD PRACTICE

The overriding challenge for the future is to translate state-of-the-art knowledge about the sustainable built environment into daily practice in every European city.

If urban planners, designers, and other stakeholders used these tools, the face of Europe's cities could be significantly improved. But market forces and the construction industry's conservative and highly regulated nature make it reluctant to change, while politicians are reluctant to listen. These are serious barriers. A fresh attitude is required, from the national politician to the bricklayer. The key may lie in education in schools, or in top-down legislation. It may require financial incentives, or institutional change. But the dynamics are complex and will differ from country to country, so each needs to go through the learning process and adapt its current practices itself. European research should continue to facilitate the process by making state-of-the-art technology available and ensuring that information about best practice is widely accessible and actively marketed in every sector.



Official opening of the Grünau green belt in Leipzig, Germany.
 City of Leipzig, Office for Urban Regeneration and Residential Development 1996

| The city in the region

A second challenge will be to develop assessment tools that support the extension of sustainable urban management to include peri-urban and rural areas in a wider model of regional development. As the European Union expands and its economy grows, changes taking place on the regional scale will directly affect Europe's cities, and these must be anticipated in city planning.

European research will continue to contribute to the development of environmental technologies in the built environment. Priorities for the future will include methods for the rehabilitation of brownfield sites and technologies for the sustainable design, maintenance, renovation and recycling of the built environment, including public services infrastructure. New technologies for improved safety, and methods of assessment and mitigation of risks, are also needed.

The progressive adoption of these approaches and technologies by policy-makers and practitioners will help to make Europe's cities pleasanter and more prosperous places to live and work.

European Commission


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The principles of sustainability must inform every stage in the creation of the urban environment in which 80% of EU citizens live – planning and design, construction, operation and maintenance, renewal and reuse. This publication explains the practical contribution made by EU-funded research and demonstration projects to the realisation of dynamic and environmentally friendly cities that are also attractive, pleasant and clean.



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