

WORKING GROUP

**SUSTAINABLE CONSTRUCTION
METHODS & TECHNIQUES**

INTERIM REPORT

July 2003

**ANNEX 1 – BARRIERS AND RECOMMENDATIONS FOR MORE SUSTAINABLE
CONSTRUCTION LISTED BY ACTOR**

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SUSTAINABLE CONSTRUCTION METHODS AND TECHNIQUES WORKING GROUP

Interim Report - ANNEX 1: BARRIERS AND RECOMMENDATIONS LISTED BY ACTOR

Barriers and Recommendations listed per actor

The following actors are identified as relevant for the construction industry and are listed below, organised in five clusters of actors that belong together:

Cluster 1: Ownership-related actors:

Actors motivated by financial criteria:

- Property management companies
- Owner
- Real estate agent and valuer
- Promoter

Cluster 2: Production-related actors:

Actors motivated by financial criteria:

- Manufacturer
- Labour force
- Contractor
- Controller
- Design Team
- Utilities
- Waste Disposal Service

Cluster 3: Policy-related actors:

Actors motivated by environmental criteria:

- Urban Planner
- Municipality / Local Authority
- Health Care
- Member States
- Standardisation Institutes
- European Institutions

Cluster 4: Market-related actors – Consumer /Communication / Information / Education:

Actors motivated by cultural, environmental and social criteria:

- Occupier
- Local Media
- Education and Training
- Research
- NGO and local opinion associations / groups neighbourhoods
- Global Media

Cluster 5: Finance-related actors:

Actors motivated by financial criteria:

- Insurance Companies
- Banks / Mortgage Institutions

The input of each of these actors is by no means similar in quality, quantity nor importance; Some actors are listed mainly because of the barriers they pose others because of the barriers they suffer imposed by other actors, others because their potential beneficial role could be relevant in mainstreaming good practice. Annex A lists for each of the above actors in the vertical chain of action of the construction industry. The barriers are divided into two groups: those barriers the specific actor experiences and those barriers the actor creates. The recommended actions are listed with the actor that can take the action on, to overcome a specific barriers:

On Cluster 1: Ownership-related actors:

The actors grouped in this cluster are probably mostly motivated by financial criteria, because their relationship with the building is predominantly a business relationship. Their interest is that the building increases in value over time;

Property management companies

This actor has a continuous and close relationship with the building (finger on the pulse of the building's ageing process) and is therefore key in reducing refurbishment costs by appropriately intervening in the maintenance;

Barriers experienced:

- Not all property is managed by professional companies;

Barriers created:

Recommendations:

- The aim is to reduce the need for refurbishment by adequate maintenance; In order to create an incentive for maintenance, these companies could benefit from a considerable VAT reduction for maintenance work to the building;
- Property management companies should train their staff to interpret the symptoms of the building and the reactions of the end users (this is to make the most of the fact that these companies have the finger on the pulse of the buildings and can intervene before damage is critical);
- This actor should be made responsible to contribute to public awareness by communicating improvements that the owner / occupier can contribute to with his / her everyday actions;
- Monitoring of the building should be ongoing, and therefore property management companies should be made responsible for monitoring of the buildings and interpreting and communicating the resulting information;

Owner (not end user)

When a building owner doesn't use the building he owns, there is an important dimension that he doesn't relate to – the performance of the building: comfort and energy consumption. It is important to connect the building's performance with the building owner;

Barriers experienced:

- When buying a building for investment (and to rent it out to end users), the building owner to be is not aware of the building's performance;
- People perceive sustainable construction as more expensive and this is only partly true and is causing a lot of damage to the image of sustainable construction;
- The value of the future cost using a discounting process is so low that there is no incentive for the owner to spend more money on the construction to reduce running / maintenance costs later;
- The current tax system only takes into account the initial cost;

Barriers created:

- As the owner who doesn't use the building there is no real motivation to improve comfort levels and to reduce running costs;

Recommendations:

- CO2 credits – the reduction of CO2 emissions into the atmosphere - should revert as a inverted tax, to the benefit of the building owner;
- The buildings energy performance directive, which introduces the energy certification of buildings, should apply to all buildings, no matter what size;
- Life cycle costing can change the current perspective that only takes into account the initial construction cost, to a broader view, including running and maintenance costs;
- Tax systems could take into account running and maintenance costs, in order to encourage the reduction of these (this could also have a positive impact on refurbishment);
- Make the owner share the cost of energy / running of the building, by changing the contractual tradition; It is important that the user also shares the cost in order to motivate efficient use;

Real estate agent and valuer

This actor is usually the first direct link between the building and the end user; He has the power of influencing the end user's choice of building and of informing the end user;

Barriers experienced:

- Technical information is not always available in a quantified and clear way in order to assist the sale of the building;

Barriers created:

- In a frenzy to sell m2, real estate agents transform the technical characteristics of buildings to suit their purpose, reducing the credibility of their own words;

Recommendations:

- Increase the level of training required of the real estate sales teams, so these can contribute to the increase public awareness and communicate real building performance data;
- Create an incentive to involve real estate agents in the energy certification of buildings process;

Promoter

The promoter is responsible for defining the brief of the building and selecting the design team, the contractor and other actors...; They can have an significant impact on the quality of the building, as the decision of purchase or the instruction of procurement is theirs. The brief of the building can be determining in the determination of the building's quality; It is very important that the building's brief is flexible enough to allow as wide a scope as possible for sustainable construction, unless it

already includes these qualities; The 'maître d'ouvrage' (who orders the construction of his own house) also has a determining impact on the quality of the resulting building – as an end user himself, this actor is particularly sensitive about taxes on transactions;

Barriers experienced:

- Different perspectives in terms of the life span and of the interests of the different actors: some will aim at having long lasting 'products'; others will look for a sustainable activity (and not a sustainable product);
- Lack of research and development concerning refurbishment and renovation techniques;
- The initial changes in the building brief and in the processes in order to achieve sustainable construction, represent an added risk for the promoter; There are no incentives to make up for this larger risk;
- Uninformed promoters perceive sustainable construction as more expensive than conventional construction, and this is not always the case; The clear boundaries of the extra cost need to be clear so as not to dissuade by ignorance;
- Some measures to make a building more sustainable are an added cost that doesn't have a short term pay back period, and they ought to be stimulated;
- When buildings are promoted to be sold, there is no clear advantage for the promoter to invest in the long term quality of the building, nor in the efficient performance, mainly because the market doesn't pay more for the added value;
- Refurbishment, rehabilitation and renovation are a sector of the construction industry with a high risk, although these have the largest potential in terms of improving building performance on a large scale;

Barriers created:

- Lack of awareness and lack of information associated with the construction process, produce some very unsustainable buildings, which are neither suited for their use, nor integrated into the context they occupy, resulting in built environments that bring out the worst in people;

Recommendations:

- VAT reduction, for the refurbishment of existing buildings and in new buildings that perform better than or according to a set of sustainability indicators set at EU or MS level;
- Municipalities should encourage sustainable construction measures; This could mean an allowed increase of the gross area construction, to compensate the promoter for investing an extra budget in sustainable measures; (see example overleaf BEDZED)

- Always supply a user manual to the end user, with the aim of giving him / her the know how relevant to making the most of the comfort, systems and services the building can offer; (In some MS this is obligatory);
- Certain Investment Funds hold the label 'socially responsible' – if these invest in real estate, then it should be in sustainable buildings that comply with pre-set performance targets;
- Make it the advantage of the promoter to increase the long term qualities of the building even though he / she may not be the end user; Energy certification of buildings will begin to make a difference in the eyes of the market;

On Cluster 2: Production-related actors:

The actors grouped in this cluster are probably mostly motivated by financial criteria, because their relationship with the building is predominantly a business relationship. Their interest is that the service they are providing to the building can happen in an efficient way and within the cost budget estimated; Since their service is technical by nature, any divergence from the usual processes is seen as a threat; The general motivation is: the more of their service they can sell the better it is for their business;

Manufacturer of building components / products / materials

Construction products (building components and materials) are more and more under the influence of international building standards, that define in a prescriptive way how they are to be produced; The multi-national companies that produce building components and materials have little motivation to adapt their production to local needs or requirements; The manufacturer is relevant to many (often hidden) aspects of sustainable construction, like prefabrication and deconstruction;

Barriers experienced:

- The main barrier for deconstruction is its economic viability; The non-mineral fraction is easy (95% is recycled already), but the problem is wood, plastics and metals;
- The problem with prefabrication in refurbishment is that every existing building is different, and adapting to these specific needs of each building makes prefabrication uneconomical;

Barriers created:

- Persistence of construction material industry to protect their products from comparison (some of manufacturers don't want to compete with sustainability, because they think that LCA-methods are not reliable enough, simple assessment tools with common international background and differentiated national adaptations);

Recommendations:

- Performance based design and construction require good information about the performance of the different components and on how these are produced; It is important to make the manufacturers responsible for the information required by sustainable construction – about the way the components / materials contribute to the overall performance of the building; Contractors frequently use technical descriptions and these existing vehicles can be further explored;
- Assessment methods of construction materials help to comprehend sustainable factors and give a chance for several applications concerning different actors.
- Strong methods of legislation are necessary: landfill taxes, aggregates taxes, taxes for recycled content, perhaps even a tax for radius of supply;
- Tax reductions for R&D on new sustainable products;
- For materials that are relevant to improve the performance of buildings (such as insulation, higher performance glass, shading systems, heat exchange ventilation systems...) there should be a reduced tax (for example the VAT), as this communicates a clear top down message: use resources efficiently;
- Materials with recycled components should also be encouraged by having reduced taxes (for example VAT); Inversely materials with no recycled content could be penalised;
- Materials with toxic ingredients should have higher taxes;

Labour force

The labour force in the very labour intensive construction industry, is not exactly a decision-maker in the process, since it is their role to execute what has already been decided. Nonetheless, every building's quality depends on the skill and on the will of the labour that construct it;

Barriers experienced:

- As the construction industry can take in a very wide spectrum of levels of skill, it becomes a non-harmonious, difficult to manage group of people;
- The construction industry is seen as tough, unhealthy and dangerous for workers, and it is therefore not attractive for young, qualified people;

Barriers created:

- Difference of the levels of skill operating simultaneously on any one building site results in and increased risk of misinterpretations and serious mistakes;

Recommendations:

- Skills training and education have to become a permanent and accessible reality for the construction sector's labour force;
- Working conditions must be improved and the training of the workforce enhanced, ongoing / continuous training provided, including all aspects of sustainable construction;

Contractor

This actor is responsible for transforming the project into a tangible structure; The construction phase is one of the most vulnerable in the life time of a building;

Barriers experienced:

- Difficulty to communicate with and control large number of sub-contractors in major building projects;
- Difference of the levels of skill operating simultaneously on any one building site results in increased risk of misinterpretations and serious mistakes;

Barriers created:

- Lack of flexibility: narrow focus on cost of construction and liability makes it difficult to introduce improvements during the construction process;
- Limited approach to the quality of the final product (the building) makes the dialogue and optimisation of new systems very difficult;
- Waste on site is a very badly managed potentially valuable resource;
- Lack of knowledge about the best available construction methods and techniques makes construction prices rise on the basis of the risk factor attached to that which is not known;
- The lack of know how in implementing the above can lead to bad execution;
- A contractor has a short term relationship with a building and has therefore little interest in taking into account the life cycle costing of components; Especially when the contractor manufacturer are in a product development position, the running costs resulting from the options taken are not their concern – they are the concern of the occupier;

Recommendations:

- Performance-based design needs to be implemented on site; Therefore random control mechanisms need to be in place to verify that the construction corresponds with the design specifications;

- Re-engineering of the building process is necessary; A more intelligent construction process has to become general practice; If IT is used, materials can be used more efficiently and less waste created on site;
- Information has to be disseminated on how to avoid creation of waste on site and on how to make the most of it;

Controller

This actor can considerably reduce the vulnerability of the construction phase of the building;

Barriers experienced:

Barriers created:

Recommendations:

Design Team

The design phase is the most determining in the life time of the building; Sustainable construction is defined in the design of the building;

Barriers experienced:

- Although not relevant to all EU MS, cultural characteristics (such as the Beaux Arts school for Architects) don't encourage multi-disciplinary teams to work together from an early stage of design;
- Simple guidelines for architects and technical engineers for making sustainable choices are not yet easily accessible to all; Most designers and companies can't afford time-demanding research and development work concerning ecological matters during the design phase;
- In the professional education, sustainability is, generally and at best, a vertical subject, making the approach to sustainability an isolated rather than an integrated one;
- Specialists don't always work towards the same goals, resulting in a not integrated approach within the design team;
- Client's (promoter's public or private) perception of sustainable construction as more expensive can limit the scope of measures, techniques and components the specialists are permitted to implement in the design;

- Incorporating new solutions to improve building performance may require more time and a bigger project budget;

Barriers created:

- When a design is not incorporating the state of the art in sustainable construction it is often a 100 year missed opportunity;

Recommendations:

- To address the Design Team: An all encompassing data base of sustainable construction needs to be created and actively made available EU wide and a universal and adaptable method of assessment of sustainable construction needs to be made actively available to the construction related professions (like an accessory programme included in all Auto CAD and Archi-CAD software); Alternatively, a unified structure for the existing data together with a toolkit which can be attached to any software, in order to facilitate the access to data from different sources;
- Motivating design teams to produce more sustainable buildings:
 - Municipalities must encourage more sustainable construction, possibly by reducing the time of approval for projects that contribute to the local CO2 reduction targets (this could well be all projects);
 - All prizes for buildings should contemplate the dimension of the building's environmental performance;
 - Special prizes should be created to raise the profile of sustainable construction;
 - Building energy certification passport should include other performance areas of the building: indoor air quality, health, water consumption, materials, etc...
- Find ways of rewarding architects for the effort of making their architecture more sustainable, such as a higher fee (?), such as prizes that objectively reward sustainability; Also the fact that a building passport will come into existence will emphasise the need for a technically good team as opposed to just any team will do;
- Fix the fee of the mechanical engineer in order not to dissuade him / her of seeking appropriate sizing of the systems; Perhaps even make the mechanical engineer's fee connected to the excellence of the buildings' performance – offering a royalty on the energy saved?
- The capacity of the design team to work together towards a common goal (architect, specialities, promoter, manufacturers and even the contractor), from an early design stage is critical for the creation of a more sustainable building;
- Create awareness that the environmental performance of the building is no less important than the aesthetic result;

- Create awareness and make tools available to design for durability, flexibility (adaptability), re-usability, deconstruction and accessibility;
- Create conditions for the end-user to participate from an early stage in the design process – in an interactive relationship;
- Could there be building codes based on performance ? Architectural, European design codes;

Utilities

Utilities are becoming more and more service companies and their privileged relationship with the end user they serve, can be instrumental in the raising of public awareness; They can be instrumental also at the local scale, by becoming responsible for installing and running decentralised and renewable energy systems, guaranteeing the quality service for the end user;

Barriers experienced:

Barriers created:

- Due to the global privatisation process of utility companies, the profit making objectives get in the way of demand side management best practice motivation and the dissemination of reduction of consumption levels;
- The price for energy is too cheap and doesn't reflect the real price, including environmental impact repair costs...;

Recommendations:

- Energy utilities should be encouraged to disseminate demand side management as well as to finance and operate local, de-centralised energy production, relying on clean energy sources, as much as possible renewable, guaranteeing a full quality service to the end user;
- Water utilities should be encouraged to disseminate demand side management as well as to finance and operate local, de-centralised grey water recycling systems, guaranteeing a full quality service to the end user;
- Increase the price of energy to a more real level, taking into account the cost and infrastructure impact of peak use;
- Consumers should be encouraged to select their providers taking sustainability into account (examples UK and ??);

Waste Disposal Service

The separation and recycling of waste, starting with the end user and closing the cycle with the waste disposal companies is critical for the good functioning of the sustainable cycle;

Barriers experienced:

- The quantity of waste the end user separates adequately is often below what it could be;

Barriers created:

- Information on correct procedures on waste separation are not easily available;

Recommendations:

- Projects of new buildings should include the relevant infrastructure to maximise the potential reuse of waste – for example facilitate the separation of waste and the use of organic waste as fuel;
- Public infrastructures for local waste disposal should be included in Urban planning;
- Information campaigns on adequate waste separation and incentives (like Pfand Preis);
- Waste transformation companies that use organic waste as a fuel to produce energy, ought to provide the free service of collecting the waste to developments that provide the organic waste;

On Cluster 3: Policy-related actors:

The actors grouped in this cluster are probably mostly motivated by environmental criteria, because their relationship with the building is policy-related. Their interest is to achieve a good performance from the built environment in the interest of future generations;

Urban Planner (to be linked with the work of the WORKING GROUP ON SUSTAINABLE URBAN DESIGN)

Sustainable urban planning is upstream from sustainable construction; The conditions created in sustainable urban planning can be instrumental in improving, for example, the energy performance of buildings by up to 50%; (see example overleaf Parque EXPO in Lisbon)

Barriers experienced:

- Values and indicators that classify the quality of the built environment are neither consensual nor widely available;
- There is no consensus yet among urban planners as to the objectives of sustainable urban planning;
- Tools for sustainable urban design for the planner are not available;

Barriers created:

- Generally planning is focussed on ‘what not to do’ and what terrible mistakes to avoid, rather than on defining targets / goals for the qualitative performance of the built environment; Most urban planners don’t work with quantifiable indicators; The result is that an unclear and mostly arbitrary sounding message reaches the promoter and the design team, who follow the rules but don’t identify with them;
- When urban planning is prescriptive and doesn’t incorporate the relevant flexibility for implementation of sustainable construction, it is a missed opportunity for improving the quality of life of many generations;

Recommendations:

- Terms of reference with a set of quantifiable and other less quantifiable sustainability indicators must be defined and adapted to each different local context and followed by the developers and design teams;
- In order to make the promoter and design team an ally of the urban planner, it is necessary to establish a common language and a context in which an ongoing, active dialogue can be held, so that the values can be established within this dialogue and the implementation will follow naturally from the consensus;
- Participation of the end-user in the planning process is fashionable since the 70s, but it needs continuity and the establishment of a common language, so that the values to be aimed at are consensual;
- Since urban planning is critical for sustainable construction, building physics and the performance of the built environment need to become part of the know how of urban planners;
- Land use and soil management are critical for the sustainability of the built environment; Land Taxes should compensate for the public value certain sites offer to the public;

Municipality / Local Authority

In some MS municipalities play a critical role in determining the quality of the built environment, in their role of awarding building permits; This is often a missed opportunity, as municipalities haven’t yet defined indicators for the quality of the built environment nor targets for each indicator;

Barriers experienced:

- The technical team working in municipalities is not always willing to implement changes;
- Often the role of preservation of the quality of the built environment is a barrier for the implementation of the implementation of sustainable construction in refurbishment;

Barriers created:

- Increasing insulation in a building envelope is an increase (or corresponding reduction) of the gross construction area and therefore – in some MS something has to go because of it, which is sellable, like for example a car parking space – the promoter prefers to have one more car parking space to sell than the insulation no one is yet asking him for;
- Buffer zones on the façade, such as terraces / verandas / greenhouses are all counting as gross construction area in some MS, and although they have an important role in the indoor climate, in the attractiveness of the buildings and in the quality of life of people, because they are not spaces one can use all the year, they can't have the same market value (only seasonal use is possible), but should be encouraged by planning;

Recommendations:

- Municipalities should adopt their share of the responsibility of the Kyoto protocol commitment, by quantifying their share of CO₂ reduction and setting building performance targets which they can transform into incentives for promoters; In order to get the Municipality to encourage sustainable construction within their role of approving projects, for example in terms of CO₂ emissions reduction, could be translated into the accumulation of 'points' for the Municipality and used in negotiations to increase their annual Government budget;
- Sustainability can be linked with attaining planning permission; The municipality, if motivated to reach their share of the Kyoto protocol commitment, should translate this goal into incentives for the promoter, which could include:
 - Permission to increase the construction area in proportion with the reduced environmental footprint of a building project;
 - Permission to increase the construction area in the amount of thermal and acoustic insulation used in the building project;
 - In the calculation of the construction area, buffer zones (green houses, terraces and verandas) should not count as long as they don't go over 5% of the overall gross construction area;

It will be necessary to harmonise these incentives in order not to have different encouragement from different municipalities;

- The creation of a sustainable environment (good environment) in any given Municipality will also increase the demand for becoming a resident of that Municipality, while increasing the value of its resources; Define indicators and targets for these other aspects of building performance;
- In order to facilitate the market penetration of sustainable construction in refurbishment of buildings, five areas of refurbishment were defined, with all due respect for the cultural dimension of historic buildings:
 - a) Important historical buildings (constituting about 1 to 2% of the stock) which can only be restored, with old appropriate construction techniques;

- b) Old / existing buildings with a special character worthy of preserving, to which a new building / part of a building is added (see examples of Carlo Scarp);
 - c) Old / existing building with part that can be kept and refurbished and part that needs demolishing and replacing;
 - d) Old / existing building that can take the new demands in terms of use, function and comfort and therefore only needs a face lift;
 - e) Make a new building that looks as if it were old;
- If permissions for the refurbishment of buildings could be severely simplified (also reducing the time it takes to have approval) and if the information the Municipality has on the building itself would be made easily available, the risk of this kind of operation could be reduced and refurbishment promoted; A refurbished building, if energetically upgraded, can have a stronger impact than new energy efficient buildings because the comparison is direct – vv the previous stage of its existence the energy saving and the increase in comfort can be clearly shown;
 - Public procurement methods should be assessed from the point of view of sustainability and the competition brief should include the LCC perspective from the outset;
 - Municipalities should cease to impose minimum car parking spaces on new construction projects;

Health Care

It is easy to understand that the indoor environment has a connection with ill health in our society, if we take into account the fact that people spend 90% of their time in buildings; Further, research has shown a direct connection between indoor air quality and respiratory diseases; Research has also shown a direct connection between the toxic emission of finishes materials that are in contact with indoor air and indoor air quality; Ventilation systems and their regular maintenance have also for some while been known as potentially dominant air contaminants;

Barriers experienced:

- Nobody is held liable for indoor air quality, which is the cause of most of respiratory (and not only) diseases, which have cost implications for the Health care system, for social security and the business sector;

Barriers created:

- As health care functions predominantly by reacting to and not by preventing ill-health, it hasn't been possible to create an institutional connection between indoor air quality and health;

Recommendations:

- In order to obtain a healthy indoor environment, the costs of ill-health should be transformed into a penalty tax for buildings that (with random monitoring) prove to have low indoor air quality;
 - Similarly a prize could be given to buildings that are found to have a high indoor air quality;
- In order to implement these, it will be necessary to define Europe-wide acceptable levels of indoor air quality;

Member States

At the political level, MS have a critical role in communicating a clear message for the improvement of the built environment towards sustainability; MS also have a critical role in promoting sustainable construction in their role as public procurers;

Barriers experienced:

- Unclear links between environment and economy for many of the daily environmental impacting behaviours;

Barriers created:

- Lack of international co-operation relating sustainability in construction sector, especially common actions and strategies;
- Lack of good and encouraging pilot projects, also from the economical point of view (LCC);

Insufficient effort of the public sector to set example in the public building projects.

Recommendations:

- Public buildings have to set the example; Public Procurement needs to be addressed: define guidelines and good practice for sustainable construction: tenders, terms of reference; design teams eclectic; performance based building code; sustainable assessment tools; specific audits and certification tools – all to be clear and transparent from the early stages of each procurement;
- Lack of economical inducements; Sustainability may demand further economical investments in the construction phase, some of which pay themselves back sooner or later but some may not be economically beneficial even in the long run. Sustainable actions should be categorised also by the economical benefit. Relevant non-beneficial actions should be promoted by state by fiscal procedures, taxes or economical subsidies.

- Clear top down message should be communicated in favour of sustainable construction – taxes and incentives should reflect coherently the MS targets;
- Create an agency for the promotion of sustainable construction (with ambassadors) in every MS; Such an administration allows for more continuity, also by using the existing infrastructures (example of MIQC in France);
- Not every MS is at the same level of understanding the relevance of sustainable construction and the need for it to become a stream – let alone a main stream – it is therefore necessary that the mechanisms are put in place for the experience of those MS that are more developed in this respect can share their experience with those MS that are not;

Standardisation Institutes

Barriers experienced:

Barriers created:

- Building regulations in some MS are very prescriptive and this creates severe constraints to the design team's creative role;

Recommendations:

- Standards should apply to manufacturers of building components (such as windows) and more performance based targets should apply to architects / engineers, thus giving them the freedom to be creative in their solutions;
- Develop climate proofing standards and a set of quality objectives for indoor air quality;
- Define a list of toxic materials to be completely excluded from all building components;

European Institutions

The source of the MS consensual and global thinking laws is introduced at the level of the European Institutions;

Barriers experienced:

Barriers created:

- Because the top-down message arriving at member states and multinational organisations (banks, utilities, insurance companies) is not clear about the urgency of moving towards sustainability, there is no collaboration of these very influential stake holders in the construction sector. For these institutions there is no clear connection between their responsibilities in every day practice and the environment.

- The lack of co-ordination among the different laws (directives, ...) doesn't promote synergies in the implementation of the individual laws;
- Lack of commercial and technical systems to assure the availability of materials, products, tools and standards to categorise them (label systems; tendering examples, public procurement; post-occupational auditing, etc.) to create the conditions to kick start a genuine market of sustainable construction.
- Assessment methodology of building performance is different in every MS and sometimes there are even different ways to assess buildings within the same MS;

Recommendations:

- Stricter and quantified results must be required from the MS if any considerable improvements in the performance of buildings are expected; CO2 emission reduction should be connected with excellence performance targets that can be connected with tax advantages;
- The European Commission DGTREN needs to work on a common assessment methodology for Europe, which can then be adapted to the specific cultural and climatic reality of each MS;

On Cluster 4: Market-related actors – Consumer /Communication / Information / Education:

The actors grouped in this cluster are probably mostly motivated by cultural, environmental and social criteria; Although their interest is that the building increases in value over time, these actors are interested in the well being of the community, but are very susceptible to trends and fashions;

Occupier

This actor has the most intimate relationship with the building and is therefore aware of its performance (finger on the pulse of the building's performance); It is the end user that benefits the most from sustainable construction;

Barriers experienced:

- Comfort, health and energy consumption are issues that the end user can understand because they have an expression in their daily life; The message of long-term targets such as CO2 emission levels reduction, has not yet reached the end user;
- Lack of knowledge of how to optimise the performance of the building – security, thermal, energy, lighting... and lack of interest to use the buildings efficiently, as the cost benefits don't show clearly enough;
- Lack of knowledge of how best to use the available systems (for example: recycling waste) and how to contribute to the improvement of the quality of the built environment;

- Complexity and user-unfriendliness of modern HVAC-systems.

Barriers created:

- Lack of pro-activity and participation in the decision-making process makes the adopted solutions less tailored for the end user;
- Due to lack of knowledge and awareness, the specific contributions to the decision-making process are not always adequate, nor in the interest of future generations;

Recommendations:

- Make the end user aware of the benefits and responsible for the correct use of the building;
- Raise awareness of the end user through information, education, training, leisure (games), labelling and certification of energy efficiency of buildings;
- Adequate procedures for feed back from the end user are needed;

Local Media

The role of local media in the raising of public awareness regarding sustainable construction and sustainable behaviour of the citizen can be very effective;

Barriers experienced:

Barriers created:

Recommendations:

Education and Training

Elementary and professional education plays a key role in forming values and in preparing all the actors to have a constructive and pro-active role in the creation of a sustainable built environment; Games, whether didactic or commercial also have an important role in creating awareness and a sustainable attitude and therefore preparing people's perception of value and future participation in sustainable communities;

Barriers experienced:

- Because the academic sector can be distant from the day to day reality of the business world, there is often no clear message as to the relevant tendencies to follow;

Barriers created:

- In professional education, sustainability is taught, generally and at best, as a vertical subject, making the approach to sustainability an isolated rather than an integrated one;
- Many of the existing games motivate very unsustainable skills;
- In some MS Architects are not trained to sustain a continuous dialogue with the engineers and they don't have a common language – this is not only a beaux arts phenomenon, because it affects North European MS as well as the Southern MS;

Recommendations:

- Universities should include sustainability as a horizontal theme in all the disciplines, in order to allow the professionals to internalise sustainability as a permanent, holistic and integrating process; Universities should further encourage project based work with the relevant architect-engineers (multi-disciplinary) teams, so that the dialogue is also learned; (see overleaf example DK school of architecture)
- Some of the most commercially successful games (computer and traditional) could be adapted to sustainable ethics, in an effort to raise awareness for the environment and help form a sustainable attitude in leisure as well as in business; Sustainable communities can't live on the 'live and let die' instincts people are trained to live by;
- Raising awareness to form a sustainable attitude should also be included in primary and secondary education; The younger the child, the more open the mind to take on alternative behaviour patterns;

Research

Research is the backbone of technology and therefore critical for sustainable construction; The EC City of Tomorrow II programme has a focus on demonstration projects of normal buildings and renovation practices;

Barriers experienced:

Barriers created:

Recommendations:

- It is necessary to develop tools and indicators for a more sustainable construction and to harmonise databases;

- A lot of information exists from previously made research; This information needs to be made available in a way that is attractive to the actors that benefit from it; Re-packaging and marketing existing information is the way to make the investment in research worth while;
- Monitoring results also need to be made widely available and the information tailored for the actors for whom it is useful;

NGOs, Local Opinion Groups and Neighbourhoods

Often the least informed of the stakeholders, and therefore not always easy to include in the dialogue of the decision makers; Nonetheless their power is relevant and growing in the EU; In young democracies, these groups have a therapeutic dimension, and this should be taken into account; Given a level of knowledge on the subject of sustainable construction, their motivation can be the purest and they can have an important role in validating the decision making process;

Barriers experienced:

Barriers created:

Recommendations:

- Raising awareness among all stakeholders is important;

Global Media

This actor has a dominant impact on the opinion and on the behaviour of people; The ethical dimension of sustainability can be communicated by the global media;

Barriers experienced:

Barriers created:

- The general public is stimulated by the media to give more importance to life style and design than to sustainable issues, especially because sustainability issues are not fashionable (although this doesn't apply to all MS it is a relevant symptom);

Recommendations:

- Campaigns to increase public awareness and for the implementation of renewable energy systems (see example overleaf – Greece's solar thermal panels) should be part of the obligations of the global media;

- The media message can change the value given to sustainability by making sustainability fashionable and disseminating the sustainability indicators and examples of successful good practice;

On Cluster 5: Finance-related actors:

The actors grouped in this cluster are probably mostly motivated by financial criteria, because their relationship with the building is predominantly a business relationship. These actors have a lot of their motivation in common with Cluster 1, nonetheless, they have not yet realised that their interest ought to be that the building increases in value over time;

Insurance Companies

Covering the risk of building failure on the long term for the owner / occupier, this actor retains a long-term relationship with the building, often beyond the end user; The benefits of sustainable construction revert directly into the building's quality and longevity, which is an added value for the insurance company because it contributes to reducing the risk of failure;

Barriers experienced:

- Liability insurance obligation does not encourage innovation nor improvement of sustainability in construction;

Barriers created:

- Insurance companies are completely unaware of the value sustainable construction can add to the building;

Recommendations:

- Insurance companies should distinguish between conventional construction and sustainable construction, which should benefit from lower ... due to the lower risk factor of building failure and due to the improved building performance;

Banks / Mortgage Institutions

Covering the purchase or construction cost of buildings, this actor also retains a long-term relationship with the building, often beyond the end user; The benefits of sustainable construction revert into retaining the highest possible building value on the long term;

Barriers experienced:

Barriers created:

- Complete ignorance and unawareness of the need for sustainable construction (example: banks don't distinguish between sustainable buildings and not sustainable ones when approving a mortgage);

Recommendations:

- Banks and Mortgage Institutions should be made co-responsible for the potential building failures in performance and their negative impact on the environment; (issue to be accommodated in a realistic time frame) The interest rates for sustainable construction should be lower, reflecting the reduced risk of failure (decreasing the value of the collateral) on the long term – such as the fact that lower running costs that allow the building owner to accommodate his mortgage payments;
- The incentive could be improved conditions conceded by the national bank, proportional with the improved environmental performance of the buildings the bank finances;