



**European Cooperation  
in Science and Technology  
- COST -**

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**Brussels, 8 December 2011**

**Secretariat**

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**COST 4188/11**

**MEMORANDUM OF UNDERSTANDING**

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**Subject :** Memorandum of Understanding for the implementation of a European Concerted Research Action designated as COST Action TU1104: Smart Energy Regions

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Delegations will find attached the Memorandum of Understanding for COST Action as approved by the COST Committee of Senior Officials (CSO) at its 183rd meeting on 30 November 2011.

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**MEMORANDUM OF UNDERSTANDING**  
**For the implementation of a European Concerted Research Action designated as**  
**COST Action TU1104**  
**SMART ENERGY REGIONS**

The Parties to this Memorandum of Understanding, declaring their common intention to participate in the concerted Action referred to above and described in the technical Annex to the Memorandum, have reached the following understanding:

1. The Action will be carried out in accordance with the provisions of document COST 4154/11 “Rules and Procedures for Implementing COST Actions”, or in any new document amending or replacing it, the contents of which the Parties are fully aware of.
2. The main objective of the Action is to investigate the drivers and barriers that may impact on the long term creation of low carbon regions in Europe. Work will focus on the broader issues associated with low carbon technologies and processes within the built environment.
3. The economic dimension of the activities carried out under the Action has been estimated, on the basis of information available during the planning of the Action, at EUR 60 million in 2011 prices.
4. The Memorandum of Understanding will take effect on being accepted by at least five Parties.
5. The Memorandum of Understanding will remain in force for a period of 4 years, calculated from the date of the first meeting of the Management Committee, unless the duration of the Action is modified according to the provisions of Chapter V of the document referred to in Point 1 above.

**A. ABSTRACT AND KEYWORDS**

Low carbon technology is advancing. Government policy throughout the world needs to achieve considerable reductions in CO<sub>2</sub> emissions over a relatively short time scale to avoid catastrophic climate change. The built environment needs to play a major role in CO<sub>2</sub> reductions and needs to be addressed at a large scale.

A broad set of issues have a significant impact on the successful adoption of new technologies and processes on a larger scale to create a low carbon built environment, including a lack of flexibility and shortage of skills in the supply chain, a misunderstanding of capital and operational costs, where technologies can be implemented, the impact on quality of life and policy and planning for the future. These need to be understood to enable technologies to be widely applicable and transferable within and between regions.

This Action will investigate the drivers and barriers that may impact on the long term creation of low carbon regions in Europe. It will identify what can be done to assist the large scale implementation of low carbon technologies and processes. The main focus will be on new and retrofit of existing buildings, their operation, embodied energy and potential for using low and zero energy supply.

**Keywords:** Low carbon, region, built environment, implementation, processes.

## **B. BACKGROUND**

### **B.1 General background**

The low carbon agenda is top of most governments' priorities in relation to mitigating climate change, ensuring future security of energy supply and depleting resources. To meet international and national targets for carbon reductions the built environment must be 'decarbonised' by reducing energy demand, for operation and embodied energy, and using low/zero carbon energy supplies. Although there has been considerable development in government policy concerning the low carbon agenda, little impact has been made. Most of the drive has been through improvements in building regulations for housing, which is a minimum requirement. Some countries have set targets for achieving zero carbon for new build, but, targets are often over ambitious at first and are diluted as the difficulties of achieving targets are realised. Consequently industry and end-users get conflicting messages.

Achieving a zero carbon built environment, although unrealistic in a single step, is realisable by taking smaller steps over an appropriate period of time. The size of step and period over which steps are introduced is a balance between meeting global targets as soon as possible whilst bringing industry and end-users along. Steps need to be challenging enough to encourage innovation, whilst at the same time be achievable within the limits of technology, skills and costs. The steps should encourage the adoption of new technologies so that costs come down through up-scaling. The whole process needs evaluation so that lessons learnt can be quickly fed forward, expanding knowledge and skills, and how to integrate them into the wider market.

Emerging technologies are being developed but they are not being applied due to shortcomings in the process and concerns over costs and skills. The development of a 'Systems Approach' to low carbon design, as opposed to a 'bolt on' component based approach, is essential if the appropriate balance between reduced demand and renewable supply is to be achieved as has been demonstrated at the EMPA zero energy office in Zurich and the Rockwool Research Centre in Denmark, however they are not yet the norm. Systemic dynamics play a significant role at a regional scale including policy, decision making structures, supply of materials and quality of life. These need to be understood to enable technologies to be widely applicable and successfully transferred within and between regions.

Therefore, to maximise the impact of the low carbon approach to the built environment, it should be dealt with at a regional scale, enabling integration of building scale and larger urban scale approaches. Low carbon built environment projects or programmes need to be seen as ‘the norm’ that can be replicated at a regional scale, taking into account contextual issues, rather than novel and expensive luxuries that are out of reach of the real world. Local and regional government have a key role implementing policy along with working with industry to build appropriate supply chains and training. Buy-in from building developers and building users is essential they must be informed of the costs and cost savings, together with added value in terms of improved quality of life and global benefits.

A COST Action is the ideal approach for this broad area of investigation, enabling an collation of currently fragmented knowledge to provide an organised method of information exchange between a very diverse set of stakeholders who are all instrumental in pushing forward to create low carbon regions. It will encourage interaction between Action participants, ESRs and traditional stakeholder groups together with interaction with those outside the normal working practises of the built environment to stimulate the uptake of low carbon technologies.

## **B.2 Current state of knowledge**

Previous research into low carbon built environment has mainly been technically oriented and largely component based, focussing on reducing energy demand through the efficient design of the building and its environmental services and the low carbon agenda has encouraged building integrated renewable energy systems. In the past improvements have been achieved by a series of progressive modifications, in future the need will be to design differently, both in terms of the technical solutions used and also in relation to the processes of planning, design and construction on a larger scale. However, there is a lack of understanding of how to implement the technologies in a holistic way, how they can be introduced over an appropriate time period through building regulations and other government lead incentives, cost, the skills needed, and what their value added is in relation to quality of life.

One of the main requirements of the Energy Performance of Buildings Directive, a key driver for reducing energy demand in the built environment, is to establish calculations of energy performance to comply with national targets among other targets. COST Action, C23, reported that most countries had implemented all the requirements by 2009 although there were many difficulties and variations in approach. A number of countries have set a series of targets over time to reduce CO<sub>2</sub> emissions, typically by some 25% reduction every five years. The recast of the EPBD in 2010 was to strengthen energy performance requirements and clarify provisions including all new buildings in the EU will have to consume 'nearly zero' energy by December 2020 and the energy will be 'to a very large extent' from renewable sources. Public buildings should lead the way with the target being reached by December 2018. An increasing number of European countries are seeking to encourage higher performance standards for energy efficiency and reducing CO<sub>2</sub> emissions than what are the mandatory requirements through building regulations including Minergy in Switzerland and the Code for Sustainable Homes in the UK. The German Passive House standard has been adopted voluntarily as criteria for low energy design across Europe. Some countries have introduced grant aid and tax incentives to encourage energy efficiency, and fuel tariff structures for encouraging the use of renewable energy supply systems.

New build has been a priority in terms of regulations, but there has also been increasing attention to reducing the CO<sub>2</sub> emissions associated with the existing housing stock. The introduction in the UK of the 'sustainability and security bill' (The Stunnel Bill, 2004) provided government with the powers to capture more of the existing stock in building regulations, requiring the application of energy efficient measures during refurbishment or extension work, in addition to those directly related to the refurbishment work itself. However, ensuring compliance in this area is fraught with difficulties and the full powers of this Act have yet to be taken up by government which highlights the difficulties in dealing with a broad diversity of housing types and ages in different contexts. In the current Retrofit for the Future programme in the UK Government are funding demonstration refurbishments, predicted to achieve up to 80% reduction in CO<sub>2</sub> emissions for over 70 existing social housing case studies. Although the cost of such high reductions is likely to be considerable, typically £50-80,000 per property, the programme will point the way to future solutions and cost reductions identifying where problems exist in rolling out such schemes on a larger scale. The problem is therefore the implementation of technology to align with the progression of the development of new technology.

This Action will therefore focus on how low carbon technologies can be implemented through appropriate steps over time. It will focus on the evaluation and feedback processes required in developing understanding and knowledge.

### **B.3 Reasons for the Action**

The Action is needed in order to promote the development of a large scale low carbon built environment from a component and building scale, to large scale implementation technologies. Experts with a wide range of research experiences relating to the planning, design, construction and operation of the built environment will contribute to identify solutions to overcome this large scale roll out.

The benefits will be to demonstrate innovation, not only in developing new technologies, but also in the processes involved with planning, design and construction and operation of buildings to implement the technologies. Low carbon design includes, the building form and fabric, its environmental services and the integration of renewable and low carbon energy systems. Technologies will be the same for existing buildings as they are for new-build; however the process and application is very different. It is more difficult to apply regulations to existing buildings, and more incentive driven schemes are perhaps more appropriate, such as Feed In Tariffs and Renewable Heat Incentives in the UK, Housing Modernisation Programme in Germany and Efficiency Credit Scheme. Energy generation and storage between group of buildings or communities can be more economically viable and ‘merit good’ market incentives in Europe have the potential to drive innovation in these areas, providing investment opportunities for both individuals and companies. Modern methods of Construction (MMC) can help to reduce waste and provide better quality products resulting in the desired integrated approach. As operating energy levels reduce, embodied energy will become more relevant. Databases for embodied energy of materials are being developed and industries are already looking at how to decarbonise products. Future designs may have an embodied energy value in kWh/m<sup>2</sup> associated with the whole building performance and will need to consider pollution levels.

Sustainability is therefore as much about process as technology, and new technologies cannot be applied without changing the way buildings are planned, designed, constructed, operated and maintained. Also, the building is not the end point in itself, but rather, part of the process to support lifestyles. The ultimate aim for a sustainable built environment is to enable a good quality of life and in a way that does not harm the environment. There is a need for the whole system to be flexible and adaptable being resilient to change. The Action will therefore address both the economic/societal needs, and scientific/technological advancements in the subject. The Action will seek to understand the full societal benefits including cost savings, cleaner, healthier living conditions, reducing the use of natural resources and the creation of new 'green' jobs and businesses.

The results of the Action will be in the form of guidance on implementation of low carbon agenda in the built environment, within the context of climate and location, and historical and cultural backgrounds across the range of partner countries. This will be achieved through the network activities drawing research results from the partner research programs. The Working Groups will deliver results on policy and technology, cost and skills, and end user engagement and added value. The Action will enable cross disciplinary exchange of information between members whilst allowing for contextual issues from different countries to be discussed and evaluated in order to identify real good and best practice and to identify the opportunities for promotion of these.

#### **B.4 Complementarity with other research programmes**

The Action will align with the SET Plan Activities of the European Commission, particularly with European Initiative on Smart Cities that 'will support cities and regions that take pioneering measures to progress towards radical reduction to greenhouse gas emissions'. The Action will evaluate the broader reasons as to why such initiatives may not work in other regions due to contextual issues but will investigate opportunities to remove barriers wherever possible and identify where drivers can be stimulated.

The Action will draw from, whilst avoiding duplication, relevant existing and complete COST ACTIONS including TU0701 – Improving the Quality of Suburban Building Stock, TU803 – Cities Re-growing Smaller – Fostering Knowledge on Regeneration Strategies in Shrinking Cities across Europe, TU0902 – Integrated Assessment Technologies to promote sustainable development of urban areas, TU1003 – MEGAPROJECT: The Effective Design and Delivery of Megaprojects in the European Union and TU0802 - Next generation cost effective phase change materials for increased energy efficiency in renewable energy systems in buildings (NeCoE-PCM).

The team involved in the preparation of the Action are involved in and aware of a wide range of projects across the broad spectrum of low carbon issues within the built environment from components and service design, materials, monitoring, urban planning and policy and both retrofit and new build of domestic and non-domestic properties and associated infrastructure. Projects are funded from a variety of both national and international sources providing links across the variety of stakeholder groups necessary. Some examples of projects include:

- IEE projects such as TABULA, Come2COM, Concerted Action EPBDIII, Altermotive,
- Interreg projects such as MMOVE;
- Framework projects Open House, Climate for culture, Energy efficiency and Renewables in the building sectors,
- Training and skills through the Leonardo da Vinci Programme (Vocational Educational Training for Building Observation, Operation and Maintenance) and ESF training programmes (Welsh Energy Sector Training);
- Direct links to the Concerto Plus project, ‘Europe wide initiative proactively addressing the challenges of creating a more sustainable future for Europe’s energy needs’.

The Action will attract experts involved in many complimentary research Centres and Programmes, which have created awareness of the importance of broader drivers and barriers behind the implementation of low carbon technologies. Associations with a wide range of stakeholder groups have also already been established as a result of these initiatives including policy, practice, industry and the public. Some examples partnerships include the Low Carbon Research Institute established to help deliver a low carbon future involving a multidisciplinary group that supports the energy sector, in the UK and globally. Over Euros 60 million of research funding has been obtained since 2008 to develop low carbon generation, storage, distribution and end use technologies, and to provide policy advice; The KIC ‘InnoEnergy’ funded by the European Institute of Innovation and Technology is a Europe wide partnership looking at the need for new technologies for sustainable energy and a climate neutral Europe; Centre for Energy Efficiency Eneffect aimed to support the efforts at all government levels in Bulgaria towards sustainable development; The Research Centre on Zero Emission Buildings based in Norway to develop competitive products and solutions for existing and new buildings that will lead to market penetration.

The Action will evaluate national programmes of implementation of low carbon technologies.

## **C. OBJECTIVES AND BENEFITS**

### **C.1 Main/primary objectives**

The aim of the Action is to investigate the drivers and barriers that may impact on the long term creation of low carbon regions in Europe. The Action will identify what can be done to assist the large scale implementation of low carbon technologies and processes, focussing on the built environment, in relation to the long term development programme of smart regions. The main focus will be on both new and retrofit of existing buildings, their operation, embodied energy demand, and the potential for using low and zero energy supply.

## **C.2 Secondary objectives**

The Action will investigate how Europe can achieve a low carbon built environment by considering drivers and barriers at a regional level. The main objective of the Action is to provide solutions and evidence for long term, large scale new and retrofit projects and programmes to take place when considering broader economic, environmental and social requirements. The Action aims to be inspirational, providing practical opportunities to enhance policies. Contextual issues will have a significant impact on the success or failure associated with the implementation of low carbon technologies and these will need to be considered in depth for each driver and barrier considered.

Regional scale is particularly relevant as opportunities and solutions can be looked at in a holistic way whilst still being able to be influence and be influenced by the public and private institutions. It will also allow the advantages and disadvantages of scaling up to be considered.

The specific objectives will be to:

- 1 Identify and catalogue case studies, based around low carbon policy and low carbon technologies, illustrating good and best practice for different scales and identifying barriers and drivers at local and regional scales;
- 2 Develop a framework of solutions to enable long term, large scale implementation of low carbon technologies, considering contextual issues in different European regions. This will include the evaluation of the main drivers and barriers to large scale implementation of low carbon technologies, focussing on process, performance, cost and skills needs.

## **C.3 How will the objectives be achieved?**

The complexity and cross-disciplinary nature of establishing low carbon regions depends on transfer of knowledge between different areas of expertise and with different experiences from different contextual backgrounds.

The COST Action framework provides an excellent mechanism for exploring the key drivers and barriers to low carbon regions in order to enable large scale implementation of low carbon technologies. The link between low carbon technology development and practice and policy remains weak. Practice, policy and society need to become more flexible and adaptable to make the changes necessary for the low carbon future that is necessary with the economic and resource restraints that exist. By learning from others on how traditional ways of living and traditional working practices can be changed.

#### **C.4 Benefits of the Action**

The benefits of the Action will include an improved understanding of the drivers and barriers that impact on the implementation of existing and innovative low carbon technologies and processes. Solutions to overcome barriers and opportunities to learn from good practice will be identified and transferred to provide support for low carbon action plans.

Case studies will be developed to demonstrate these in a practical way. This will assist those involved in the decision making process to integrate low carbon technologies and processes into practice. This Action will provide evidence that will help to promote innovation that will stimulate growth and strengthen local economies whilst improving the built environment and quality of life.

#### **C.5 Target groups/end users**

The expected results of the Action will be able to be exploited by the policy makers, practitioners, public and academia and will help to provide evidence of good and best practice whilst identifying gaps for future research projects, initiatives and legislation. There is a need to consider multilevel staff within each organisation from high level managers through to technical staff and employees on the ground and different appropriate departments and how these can be encouraged to work together. Stakeholders include:

- National Government;
- Regional Government;
- Local Government and National Government Organisations;

- Home owners including private householders and housing associations/registered social landlords;
- Public bodies;
- Private organisations from large scale multinational organisations to SMEs;
- Building sector including planners, architects, engineers, contractors, surveyors, developers;
- Academia;
- Society as a whole.

The stakeholder groups mentioned above will be involved within the Action. Regions will be used to obtain information and to demonstrate findings from other areas to investigate the transfer of good and best practice.

Partners involved in established Centres and Institutes that have been set up to promote low carbon technologies will be involved in the Action. These enable direct links to all types of stakeholder groups mentioned above.

Developing associations between key stakeholder groups at a regional scale will identify key drivers for energy related reduction of CO<sub>2</sub> emissions.

## **D. SCIENTIFIC PROGRAMME**

### **D.1 Scientific focus**

The Action will look at the implementation of low carbon technologies and the broader drivers and barriers that impact on the larger scale roll out of low carbon technologies and processes.

Specifically it will:

1. Review developments in policy and technical innovation across the partner countries in relation to the low carbon built environment agenda, and identify case studies that demonstrate these developments;

2. Identify skills, knowledge, training requirements to support the regional implementation of a low carbon built environment, and the implications for new and up-skilled supply chains;
3. Investigate the economic cost and added value obtained from the implementation of low carbon technologies implemented at a regional scale;
4. Investigate end user engagement in relation to the low carbon built environment and best practice of dissemination of outcomes at regional scale.

The Action will consider outcomes from new and retrofit built environment projects, and feed this back into the planning, design, construction and operation and maintenance processes. The assessment should not only be concerned with the more quantifiable aspects of technology innovation, such as low carbon performance, energy use, cost and environmental conditions, but also include the more quality related evaluation of the construction processes and the response of the building occupants. The participants will demonstrate awareness of the wider built environment implications of large scale roll out including mobility solutions, planning issues and wider infrastructure requirements.

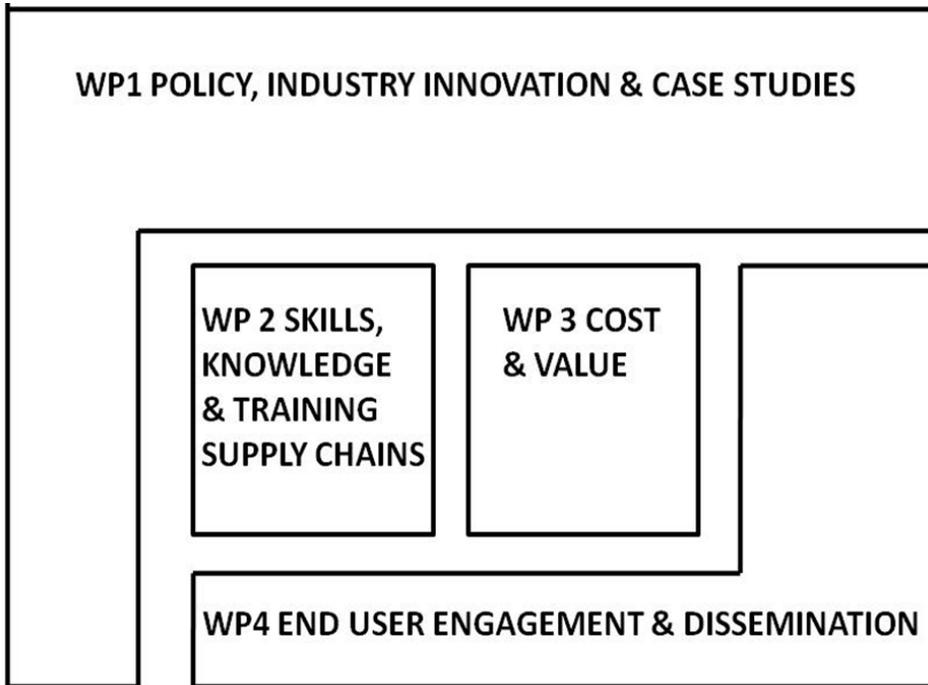
Specific areas that will be considered include:

- ***Passive design*** approach and other innovative technologies used in building fabric and form in order to reduce energy demand. The extent to which new technologies contribute to passive design will be explored as will their implementation in both large scale new build and retrofit programs;
- ***New environmental systems*** will be required to meet peoples' need for comfort, in a way that responds to this reduced demand. Achieving thermal comfort and good air quality needs to be assessed in the light of low carbon design. Research findings will be considered in relation to the most appropriate heating and ventilating systems, and their controls, to deliver comfortable and healthy environments, taking account of reduced energy demand and the increasing significance of internal and solar heat gains. Fluctuating supplies from solar and wind and the need for energy storage, for both thermal and electrical power is an area that needs consideration as well as introducing diversification in demand;

- **Embodied energy** is becoming of increasing concern, as operating energy is reduced. There is a need to use materials and components that have a low embodied energy. Some materials, such as timber, are naturally low in embodied energy and can lock in carbon. Other materials such as steel and concrete will need to have production processes that reduce embodied energy and incorporate recycling. Materials should also be disposable without causing harm;
- **Renewable energy systems** integrated into buildings and communities will be investigated in relation to large scale programs, such as the Wales ARBED program which combined energy demand reduction and renewable energy systems across Wales;
- **The cost of low carbon design** needs to be better understood in terms of a holistic whole building approach to costing and how costs can be reduced through increasing scale. For low carbon design, the cost implications of the split between building integrated solutions and allowable solutions (including grid based green energy supply) needs to be assessed.
- **Projects do not deliver their design performance** in relation to reducing energy use and carbon dioxide emissions. This may be due to poor prediction, problems in design and construction, construction and equipment not performing as expected, or, the building being used differently to design. In most cases it will be a combination of these factors. A greater understanding of these factors needs to be fed back into the design and construction process.
- **Design research** has developed to be able to understand the true performance of sustainable buildings in operation and to assess the effectiveness of the processes of planning, design, construction and operation. This involves integrating research into real design projects and using this experience to inform future research agenda's. In this way the relevance of research to the needs of the industry is ensured and future research programmes can better inform industry through appropriate dissemination routes.
- **End-user understanding** plays a major role in the uptake of low carbon technologies, and decision-making in relation to cost and perceived added-value.

## D.2 Scientific work plan methods and means

There will be four Working Groups associated with the Action:



*Diagram illustrating WG set up and duration of activity*

### **Working Group 1 – Policy, industry innovation and case studies**

This Working Group will adopt a top down and bottom up approach to find out what is happening across the partner countries in relation to the low carbon built environment agenda. WG1 will consider the different contextual issues associated with the implementation of the low carbon technologies including solutions and problems that are common to different areas and what are contextually related that need to be dealt with on a region by region basis. It will investigate both market and community led initiatives. Approaches taken within different sectors of the built environment will be investigated to identify good practice at a regional scale to identify what lessons can be transferred to other sectors and regions.

Policy and planning can assist or hinder the large scale, long term implementation of low carbon technologies. This is particularly evident at a regional scale. Drivers for support for low carbon technologies and processes through the policy and planning system and the long term implications will be investigated. A top down approach will involve a review of current and planned policy and how this is implemented through building regulations, planning control and other financial incentives such as Feed In Tariffs and Eco Plus.

The bottom up approach will involve engaging with industry to determine how they are responding to government policy. Industry will be considered in two parts. Firstly, the manufacturing industry, who are developing innovative components and materials related to the built environment low carbon agenda. Secondly, the planners, designers and developers, who are integrating these new technologies into the low carbon built environment, both through retrofit and new build.

The role of regions within the development of low carbon technologies and processes will also be considered across partner countries – how are regions dealt in policy and management across different sectors? What is the value of working at a regional scale? How has this been implemented? How are regional bodies established via a bottom up approach in areas where the need is required for example, Municipal Corporation of Alternate Planning and Development of Kozani in Greece or from a top down approach as in Wales the regional transport plan has encourage groups of local authorities to work together to enable cross boundary working that reflects complex functional and space based issues. What benefits can be achieved from working at a regional scale?

All partners will be involved in WG1 and they will be responsible for providing case study examples from each country for a range of different building types, under different ownership, from different funding streams and at different scales. Case studies will include the use of models and tools that can provide essential information to target resources efficiently and effectively particularly when working at a regional scale. However, information to undertake modelling is limited on a regional scale. Investigations will be undertaken to identify what tools are already in use to undertake modelling, can these tools be transferred to other areas, what information exists and what information needs to be collected?

## **Working Group 2 –Skills, knowledge, training and supply chains**

There is a large skills and knowledge shortage related to implementing low carbon technologies in the built environment. These include both generic and specific skills, from installing and maintain technologies together with the management of long term planning and large scale application. Often, the decision to implement low carbon technologies is made by an individual or group of senior managers on a design team without involving stakeholders who will be installing, operating and maintaining to ensure the long term intended, low carbon performance and can result in critical issues being overlooked.

Case studies will be used to investigate the expertise of actors required in the process of selection, installation and operation of low carbon technologies including skills to ensure that where a systems approach has been taken 'joined up thinking' has occurred and to what extent. This will include an evaluation of the additional commitment and knowledge requirements at different stages of the development and at different levels of management and trade, together with expertise outside the traditional construction sector. Investigations will be made into the training and education sector to identify what provisions are currently in place and how the additional requirements could be accommodated through policy. This will help to qualify and quantify skill requirements and therefore identify what training and at what levels would be required to upgrade the necessary sectors to enable a large scale roll out of low carbon technologies.

Policy documents and other appropriate material, such as the Egan report of 2004 produced in the UK, looking at skills associated with the implementation of low carbon technologies will be reviewed across partner countries to make comparisons and identify gaps.

Availability of components and materials are necessary to ensure large scale roll out of low carbon technologies which is particularly relevant at a regional level. Case studies will be used to investigate the supply chains involved, including the reasons for selecting materials and components such as, detail of design, timescales involved with provision and installation, source of manufacture and raw materials, embodied energy, quality, maintenance and cost. Mechanisms will also be looked at that support businesses within the low carbon technology supply chain to investigate how the market as a whole is being and can be strengthened and supported further. Flexibility and adaptability of the process will be investigated to identify how much the design can be modified to accommodate technologies and at what stage this can occur.

### **Working Group 3 – Cost and Value**

The economic cost and value obtained from the implementation of low carbon technologies is critical to large scale roll out at a regional scale. It is difficult to obtain an accurate cost on low carbon projects to date as they tend to require 'in kind' support and additional funding to enable them to go ahead. There is need to link additional expenditure to provide evidence for larger scale roll out including increased value of the built environment and reduction in long term maintenance and running costs. If capital costs are higher than usual, there is a need to demonstrate that operational costs will be reduced in the long term. Case studies will be used to analyse the additional cost of the implementation of low carbon technologies and how these costs can be reduced and/or justified in the long term.

Scaling up of technology application should reduce costs and add value through job creation. Tools and methodologies for analysing long term cost, potential savings and value added will be investigated including stakeholders involved in the procurement and costing process.

Case studies will be used to investigate social cost and value. The implementation of low carbon technologies on a regional scale will have an impact on the quality of life of the residents of a region both positive and negative. Consideration of how low carbon changes will impact on well being and health including the lifestyle changes that will be necessary to achieve medium and long term goals. Evidence of these changes will provide additional support for investment in low carbon technologies.

### **Working Group 4– End User Engagement and Dissemination**

This Working Group will bring together the WG1, WG2 and WG3 and will involve all Action members to enable consistency. It will consider existing and potential conflicts between areas and the adoption of solutions for other existing, emergent and future technologies to promote large scale implementation. Applicability at both European and global levels will be considered.

Dissemination will include seminars and exchange visits together with an interactive workshop and conference. WG4 members will be allocated responsibility for ensuring successful implementation of Short Term Scientific Missions, involvement of early stage researchers and gender balance, interaction with other COST Actions, and awareness of other relevant programmes and initiatives. Further details of dissemination can be found in Section H. There will be frequent and detailed interaction with decision makers to ensure knowledge transfer.

Reports, academic journals and a book will be produced relating to the Action together with other dissemination materials.

To ensure a holistic approach between WGs a set of themes will be set for evaluation and analysis. These include:

- **Context** – will look at geographical differences between partner countries and the impacts of different scales within a region for example, relating to policy, funding and regulation;
- **Practice** – will consider short and long term temporal issues and targets including existing and innovative technologies;
- **Case studies** - will be used to identify solutions and evidence of how each of the drivers or barriers have been dealt with to allow the project to go ahead and what were the implications. Different scales of case study will be considered that can either be rolled out at regional scale, that can be replicated across a region or are large scale projects that will have a regional impact.
- **Solutions** – what solutions are available, from case studies and generally? The key issues will be identified and contextual issues will provide lessons on methods that are transferable across regions.

## **E. ORGANISATION**

### **E.1 Coordination and organisation**

The Action will undertake day to day management and administrative issues. A Management Committee will be established to co-ordinate the Action. The MC will have a Chair and Co-Chair. Four Working Groups will be formed, each with a Chair and Secretary appointed by the MC at the first meeting. Representatives will be identified who will be responsible for STSMs, ESR/gender balance, interaction with relevant COST Actions, interaction with relevant programmes and research projects. These Representatives will be asked to report at each MC meeting.

The MC will remain in charge of the Action.

Research will be carried out in and financed by the participating countries, while COST provides the necessary co-ordination costs.

Three meetings a year will take place and generally MC and WG meetings will take place at the same time and venue to enable cross WG interaction necessary for the holistic nature of the work. Each meeting will take place over two days to allow for the MC meeting, WG meetings, presentations from local stakeholders and ESRs and a summing up session.

The Action will bring together multi-disciplinary researchers in the fields of planning, engineering, architecture and social science. It will involve policy makers at local, regional and national level, and practitioners from large scale to SMEs. Project partners will draw on existing associations with practice and policy makers including links through the Covenant of Majors and through established low carbon organisations.

A website, containing an electronic communication network, will be set up for management purposes and to enable transfer of knowledge and information between WGs and to aid dissemination to end users.

Partners from academia will encourage the involvement of students and early stage researchers. This will be done by encouraging STSMs as much as possible and by having ESR meetings or events to enable full participation and involvement.

Key milestones of the Action include:

- Annual Action reports which combine the findings of 4 WGs;
- Interactive workshop at month 24;
- Action conference at month 42;
- Final report at month 48;
- Action book at month 48.

## **E.2 Working Groups**

The research will be achieved through a series of four Working Groups that will interact. All WGs will have a WG Chair and Secretary. All members of the Action will be invited to be part of WG1 and WG4 in order to maximise links between the WGs and dissemination of the Action in a holistic and co-ordinated manner. Members will be invited to be part of WG2 or WG3. WG4 will ensure frequent interaction with relevant organisations including national, regional and local government in order to ensure a high level of transfer of knowledge.

WG1 will be carried out in 2 stages. The first stage will take about 1.5 years after which a report will be produced and an interactive workshop held. WG1 will continue for another 1.5 years but at a lower level of activity, in order to track new developments.

Case studies identified in WG1 will be used for analysis within WG 2 and WG3 to investigate how the different drivers and barriers to implementation of low carbon technologies can be improved. WG2 and WG3 will both last 2 years.

WP4 will begin after 1 year, initially at a low level of activity and then expanding in the final year of the project.

### **E.3 Liaison and interaction with other research programmes**

Two representatives from the Action will be identified to ensure interaction with other COST Actions and other European and International research programmes to enable appropriate liaison and avoid overlap of activities. Co-operations will be established with other projects where appropriate.

Representatives from these programmes will be encouraged to attend Action meetings to present their progress and representatives from this Action will do likewise at other Action and project meetings.

### **E.4 Gender balance and involvement of early-stage researchers**

This COST Action will respect an appropriate gender balance in all its activities and the Management Committee will place this as a standard item on all its MC agendas. The Action will also be committed to considerably involve early-stage researchers at all opportunities. This item will also be placed as a standard item on all MC agendas. The initial gender balance of the Action is approximately 40:60 (female to male).

STSM will be encouraged wherever possible and opportunities to involve ESRs within the Action will be identified and undertaken. For example, poster competitions at workshops and seminars and presentations of appropriate associated ESR work will be included and local ESRs will be encouraged to attend meetings, presenting work where appropriate.

## **F. TIMETABLE**

The Action will take place over 4 years. Three meetings will take each place each year. Each meeting will involve both MC and WGs to minimise the need to travel to different meetings in different locations and to allow for a cohesive approach to the work.

Reporting of progress of the Action will take place at the end of each year summarising each WG. These will be consultation documents to be circulated for comment to interested parties and key stakeholders. The comments received will be incorporated into the work programme where possible and the final report. The final report will comprise of a summary findings from all WGs.

Gathering of case study material will take place throughout the duration of the Action, and publication on the Action’s website will extend beyond completion of the work. Key project events will be held at the end of year 2 and at the end of month 42.

|  | Year                 |        |            |              |
|--|----------------------|--------|------------|--------------|
| Working group                                      | 1                    | 2      | 3          | 4            |
| 1<br>Policy, industry innovation and case studies  |                      |        |            |              |
| 2<br>Skills, knowledge, training and supply chains |                      |        |            |              |
| 3<br>Cost and Value                                |                      |        |            |              |
| 4<br>End User Engagement and Dissemination         |                      |        |            |              |
| Events   | Interactive workshop |        | Conference |              |
| Reporting  | Report               | Report | Report     | Final Report |

## **G. ECONOMIC DIMENSION**

The following COST Countries have actively participated in the preparation of the Action or otherwise indicated their interest: AT, BG, CH, DE, DK, EL, IT, LT, MT, NO, PL, PT, RS, SI, UK. On the basis of national estimates, the economic dimension of the activities to be carried out under the Action has been estimated at 60 Million € for the total duration of the Action.

This estimate is valid under the assumption that all the countries mentioned above but no other countries will participate in the Action. Any departure from this will change the total cost accordingly.

## **H. DISSEMINATION PLAN**

### **H.1 Who?**

Existing associations with a broad range of stakeholders, from within and outside the traditional construction sector, will be utilised together with developing new relationships to disseminate information to maximise impact. Target audiences will include:

- National Governments will be involved in order to push for changes at higher policy levels such as at EU or national level in order to help the local authorities to have improved instruments and regulation;
- Regional Government - The Action could act as a driving force and guide for the planning and development of low carbon regions and the implementation of low carbon technologies at a regional level in order to stimulate markets;
- Local Government and National Government Organisations – involving local authorities and NGOs will provide a better understanding of the challenges that are involved with implementing low carbon technologies. Local authorities tend to work independently, so the idea of aggregating knowledge and sharing experiences and to create a forum to discuss these issues could be important in terms of broadening their knowledge. Good practice of how this already occurs will be investigated through case studies;

- Home owners including private householders and housing associations/registered social landlords who manage both new and existing domestic properties with different issues to overcome; people who have to make decisions regarding investment, for example, spend little money for construction and more money for long term running cost or vice versa;
- Public bodies involved in urban planning where energy aspects are more and more relevant particularly with regards to sustainable mobility;
- Private organisations involved in low carbon technologies within different sectors of the supply chain from product development including materials and equipment where products can be evaluated and improved the sustainability of their products), to installation through to building certification and energy auditing Technology suppliers at different scales from large scale multinational organisations such as Tata Steel and Grundfoss to SMEs;
- Building sector including planners, architects, engineers, contractors, surveyors, developers;
- Procurement help them to identify and source the most sustainable solutions and procedures;
- Academia including teaching and research staff and students to ensure that knowledge gained can be used in future practice;
- Society as a whole.

## **H.2 What?**

The following dissemination methods will be used to promote and disseminate the findings of the Action:

- Each meeting will allow the opportunity for local stakeholders and ESRs to attend and present work of a local nature. This widens the learning and dissemination opportunities for the project participants;

- An interactive workshop will be held at the end of the second year in order to allow for transfer of information between practice and the Action. This workshop will involve presentation of the findings of the review and to publicise good practice through case studies. It will also provide an opportunity for relevant experts, to lead training sessions to members of the Action and other interested parties on subject areas that are outside of the expertise of the group;
- A conference will be held after 42 months of the project that will produce the final findings of Action. These will be published. Members of the Action will also identify a suitable International conference at the end of the project to present papers on a selection of the findings of the project.
- A website will be set up for the proposed COST Action which will be used as a means of transfer of information between Action members and also to disseminate the aims and findings of the research group to end users and other interested parties. This website will contain a public area and a password protected area for Action members. The website will be linked to an electronic communication network such as Lotus Quicker to enable real time discussion;
- In order to utilise the many online promotional opportunities available, such as Facebook, Twitter and Youtube, branding of the Action will be important so that promotional material is consistent and recognisable. These popular methods of promotion will be used to deliver the Action to large, varied audiences.
- An emailable newsletter will be produced every year to promote the Action;
- Publications will be developed for reviewed journals where appropriate. A special edition of a journal will be targeted in order to present the best papers that are developed as a result of the Action;
- Many of the Action members will be involved within teaching within academia at both undergraduate and postgraduate levels. Findings from the Action will be incorporated into teaching material wherever possible to a promote widespread knowledge transfer;
- A book documenting the overall findings will be published.

### **H.3 How?**

The Action will aim to have a high impact internationally within and outside of Europe. Many of the partners will be involved in national multi-disciplinary centres and institutes which will allow for knowledge transfer and feedback. Existing international partnerships will be utilised, including links with China and the US, to ensure information identified from the Action is disseminated as widely as possible. European initiatives such as the Covenant of Mayors, of which links with partners already exist, will be used to effectively disseminate the results of the action. A detailed mailing list of contacts that will develop throughout the project will be stored on a web based database that can be shared between Action participants.

Meetings between MC and WGs at single venue and time will allow for multi-disciplinary information exchange throughout the duration of the Action. Responsibility will be allocated across Action members to provide a focus for tasks to be achieved. Active participation of all members of the Action throughout will be encouraged in order to maximise information exchange between participants and relevant stakeholders.

The Action will instigate a broader network of stakeholders who will be instrumental in the large scale roll out of low carbon technologies. The Action will increase knowledge and enthusiasm and will help to formulate a comprehensive international approach to address contextual issues in the area.