w w w . o p e n h o u s e - i n t . c o m

The journal of an association of institutes concerned with the quality of built environment. The publishing framework is shaped around the forces which act on built environment, which maintain, change and transform it. The content consists of articles which deal with these issues and in particular with responsive, self-sustaining and re-usable environments which have the capacity to respond to change, provide user choice and value for money.

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open house international association

Aims

The Open House International Association (OHIA) aims to communicate, disseminate and exchange housing and planning information. The focus of this exchange is on tools, methods and processes which enable the various professional disciplines to understand the dynamics of housing and so contribute more effectively to it.
To achieve its aims, the OHIA organizes and co-ordinates a number of activities which include the publication of a quarterly journal, and, in the near future, an international seminar and an annual competition.
The Association has the more general aim of seeking to improve the quality of built environment through encouraging a greater sharing of decision-making by ordinary people and to help develop the necessary institutional frameworks which will support the local initiatives of people in the building process.

Open House International

The journal of an association of institutes and individuals concerned with housing, design and development in the built environment. Theories, tools and practice with special emphasis on the local scale.

International Seminar/Workshop

To be held annually and hosted by a member institute. Explores the many interlocking forms of public/private relationships which are emerging in housing and settlement development.

The competition

To be sponsored annually, in connection with the Seminar. Covers principles, methods, tools and practice which may he transferable and interchangeable in evolutionary planning, neighborhood and housing design. An international panel of judges selects the top submissions.

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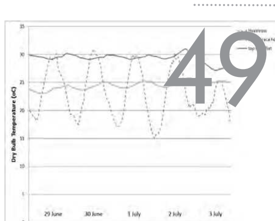

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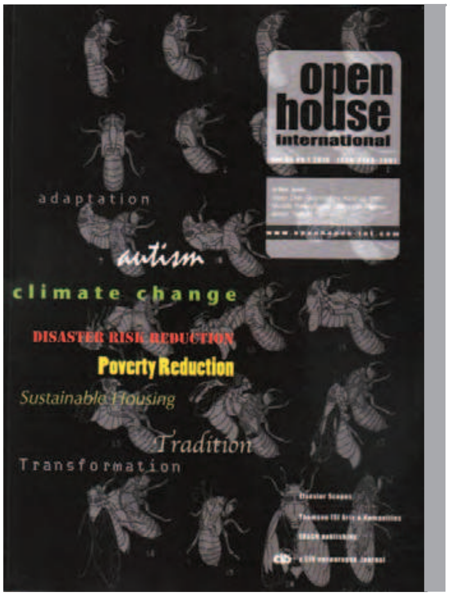

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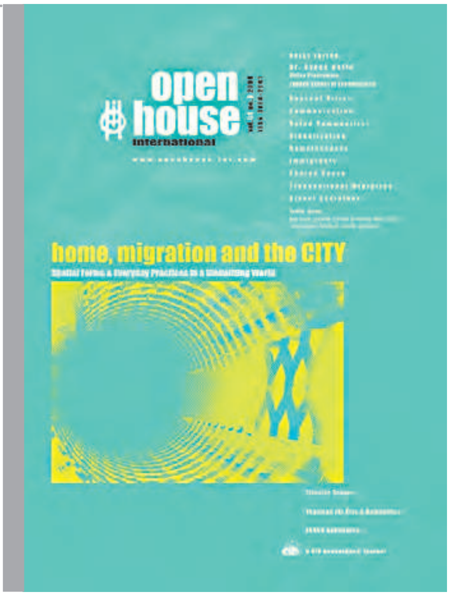

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Editorial

Evert Hasselaar

What can a special issue on sustainable and healthy housing contribute to the widespread ongoing debate? Well, there is a need for good examples, for successful strategies and for "stepping stones", meaning that better practices are based on acquired experience. Also, the young generation has to be prepared for state-of-the art sustainable principles and products and not to treat them as innovations.

The topic of Sustainable and Healthy Housing was boosted by pollution issues in the 1960's and the two energy crises in the 1970's. The generation that became aware of environmental effects has retired now. Since 1987 the Brundtland report formed the guideline in global climate meetings, for instance the summit in Rio de Janeiro in 1992 and in Kyoto in 1997. It took until 2005 before the Kyoto Protocol was ratified. The ambitions for reduction of greenhouse gas emissions have been set and policies at the national level are being executed. The generation that received its advanced education then is in power now. Sustainability is on the agenda, but is not mainstream. The second generation recognised the early adopters as innovators and demonstrators, they were confronted with the call to get involved, but this involvement has had minor effect on global sustainable performance quality. This situation creates pessimists and optimists. The pessimists blame the economic crises for the drawback in sustainable policies. The optimists see a worldwide awareness and popular support and take the crises as a challenge to change priorities. In the Special Issue we follow the optimists, because the conditions for change are available: the proper knowledge, the technical solutions for better sustainable performance, the money to do it, the wide support and last but not least, the creative imagination to follow a new path toward a sustainable world.

The third generation visits colleges and universities now and they can become fully prepared to adopt an integrated sustainable reality: CO2 neutral, sustaining in the social and economic meaning, with high quality urban developments. However, we are not there yet.

We face many challenges.

The course designer in higher education is facing the challenge to create the expert specialists on sustainable issues. Should sustainability be part of all courses, or be treated as a field for specialists? Two teachers discuss this challenge and opposing views illustrate that preparing the next generation of experts in all kinds of fields poses important dilemmas (Itard and Van den Bogaard)

Climate change indicates an increase in extreme weather conditions, with regions where draught and other regions where extreme rainfall will cause problems: deserts and deltas. Large cities generate a micro climate with overheating and negative side-effects on health and comfort and. An example is provided of what an extreme warm period brings about in houses in the London city area (Mavrogianni et al.).

Energy is still the keystone in sustainable performance. In buildings, the environmental load is often not determined by construction activities, but by the energy use and maintenance activities over the exploitation period of 20 years for installations, 35-50 years for façade elements or even 100 to 200 years for the main building structure. Heating and cooling and the periodic maintenance activities are the major parameters of the environmental load over the life cycle of the building. Energy efficiency of the built environment is a major policy goal. Three articles focus on promotion of the sustainable performance and in particular of the energy performance. Strassl, who is a key figure in promoting sustainable building in the city of Salzburg in Austria, brings a first hand account of the important role that local authorities have and the type of instruments that support the high ambitions. Mlecnik is deeply involved in promoting passive houses and renovation according to the passive house standard. He evaluates 11 projects of energy efficient renovation in Belgium and discovers that demonstration projects contribute to the diffusion of innovations in the housing sector.

The energy consumption or the ecological footprint is very much influenced by user behaviour. Little is known of the effects of different occupancy patterns and user behaviour typologies. This is a topic for future research. However, occupants that were involved in the design and execution of refurbishment projects have a better understanding of complex technologies that control indoor climate and save on energy consumption than unprepared users. Participation in planning creates a learning environment in which users learn how to be in control of the environment and how to adapt to circumstances that are in conflict with comfort or health. Participative design promotes user oriented solutions, for instance robust control features and environments, designed to support positive social interaction and a sense of identity. Suschek-Berger and Ornetzeder focus on the role of occupants in collective sustainable refurbishment projects and argue that participation promotes better plans. The role of occupants is also crucial in urban renewal projects. Participation is one way to empower people to take better control over the neighbourhood. A social stable neighbourhood that can adapt to changes, for instance influx of immigrants, is a sustainable neighbourhood. Physical and social sustainability are connected. Wassenberg looks at the policies and processes of 50 years of urban renewal in different European countries. He recognises transition periods, with changes based on shifting urban problems and on paradigm shifts. The latest shift is the withdrawal of the central government, while he comes to the conclusion that a stronger role of authorities in solving urban problems is needed. The focus is now on the social quality of neighbourhoods. The urban renewal strategy has become more interactive and integrative and more dependant on private investments. Blueprints for future ideal environments have been replaced by programs and processes. Focus on the poor part of the population shifted to community building: social sustainability is very much a social process. Low carbon cities can only be achieved in vital communities that support climate related strategies.

Health is the quality of life here and now and as such the human aspect of sustainability. The relationships between the environment and health are apparent, but not specific: many indicators of health hazards, health perception and of physical and behavioural influences interact. The paradigm shift is from focus on hazards to the effect of hazards. Evidence based priorities are set, making slips, trips and fall accidents relatively more impartant and the traditional focus on the triggers of asthma and other respiratory problems less important. Ormandy, who is deeply involved in the development and use of the Housing Health and Safety Rating System in England, explains the shift from defects to the effect of defects. Health promotion through better -evidence based- performance of housing is the result of this new approach.

The social performance quality is emerging as a robust indicator of integrated sustainable performance. Where occupants play an important role, for instance in cooperative housing, semi-public spaces emerge as a buffer between private and public areas, while the quality of semi public spaces has a low priority in mass-produced commercial developments. Outdoor spaces are an indicator of the sustainable quality of housing areas. Hussein et al. compare traditional with contemporary housing in Palestine and discover that the poor quality of outdoor spaces in modern housing conflicts with social sustainability, but also with ecological sustainability, because of higher cooling demand and related CO_2 emissions.

The special issue opens with an overview of topics in building energy and environmental health that are important. The impact of climate change on housing and health was explored. This article is illustrative of the emerging focus on the effects of climate change adaptation and mitigation.

Housing managers face the dilemma of constantly picking low hanging fruit or of improving the performance level of retrofitting projects to the highest possible standards of energy saving or sutainable performance. The passive house strategy represents the high-end option and claims positive results in the long run.

The local community has a key role in bringing together different stakeholders to reach high performance quality in urban restructuring and renovation projects. Effective instruments range from design contests to subsidies that increase in accordance with the proportion of the sustainable and health performance level. In England, instruments for assessing and improving housing health and safety are in operation, with attention to the effect of defects in housing.

Different strategies are followed to include the occupant in housing maintenance and renovation and to optimize the mutual benefits of social processes and technical measures.

The contributions show that the scale of sustainable and healthy housing is the neighbourhood and city, which includes the social and cultural dimension of individual buildings. The time frame is the future starting today, and learning from the performance now. The popular concepts of sustainable neighbourhoods are renovation, community building, urban restructuring and climate change adaptation. All is interwoven and the professionals in the field are learning to deal with open ends. The professional world takes an interest in example projects, while the involved stakeholders consider each individual project as a demonstration. Well, sustainable and healhty housing follows patterns, a stepping stone strategy and a learning by doing approach. The perspectives are education, sustainable communities and climate change.

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ERRATUM 1.The editor apologizes to Dr. Mukaddes Fasli for ommitting the name of her university on the last page of her article Vol.35 No.1, page 82, ASSESSING LAGUNA DISTRICT'S SPATIAL QUALITIES IN GAZIMAGUSA, NORTHERN CYPRUS,pages 74 to 82. The address should read, Eastern Mediterranean University, Faculty of Architecture, Department of Architecture, Gazimagusa, Mersin 10, Turkey. (mukaddes.fasli@emu.edu.tr)

ERRATUM 2. The editor apologizes to Dr. Christopher Wilson for printing the name of his University incorrectly. The article, in Open House International, USERS' EVALUATIONS OF HOUSE FACADES: Preference, Complexity & Impressiveness on pages 57-65, should have had his University's name listed as IZMIR UNIVERSITY OF ECONOMICS and not Izmir University as shown on page 65.

TEACHING ENVIRONMENTAL SUSTAINABILITY TO HIGHER EDUCATION STUDENTS: Some Reflections

Laure Itard & Maartje van den Bogaard

Abstract

This paper deals with teaching environmental sustainability to students in higher education, focusing on the sustainability of buildings and the built environment and more specifically on energy. Integrating sustainability issues into the curricula of engineering education proves to be a big challenge. The main issues are: the fuzzy definition of sustainability; continuously advancing insights in environmental sciences and mono disciplinary versus multidisciplinary approaches. These issues are put into relation with theories and practice regarding curriculum development and change.

Keywords: *Environmental Sustainability, Education, Learning.*

INTRODUCTION

The challenges of sustainable engineering and design are complex and so are the challenges of teaching sustainability to higher education students.

Three stumbling blocks for education in sustainability

First, when it comes to defining the concept of sustainable engineering, it appears that there is no description that is easy to use. It is well known (Filho, 2000) that sustainability may be interpreted in very different ways, e.g. social sustainability, economic sustainability or environmental sustainability, all of these being legitimate. Inside these different partitions, there is no general agreement on precise definitions. For instance environmental sustainability may be interpreted from the view points of preserving ecosystems, reducing CO2 emissions or reducing the use of non-renewable natural resources.

Second, engineers, architects or industrial designers have the task to develop new technologies and consumption goods continuously in order to solve (technical) problems that arise in the pursuit of fulfilling basic needs like shelter and food, health, comfort or economic gains for a still growing world population. Engineers also have to solve new environmental problems created by these technologies. It is not always possible to predict what sort of problems may arise, especially because environmental sciences are developing rapidly as well. These major progresses also mean that knowledge gets outdated rapidly. How can we cope with this constant discussion about new information?

Third, it is often believed that sustainability is by essence practice rather than a theoretical science. It brings together many different disciplines and therefore collaborative strategies are needed (Robinson, 2004, Holden et al, 2008). Therefore educators need to implement collaborative strategies and interdisciplinary approaches in engineering curricula that are often largely mono-disciplinary.

A literature study on the design of education and how this relates to courses in sustainable engineering is presented in paragraph 2 and the paper then expands on the three stumbling blocks described above. Paragraph 3 deals with the ill-defined concept of sustainability and how that relates to curricula. Paragraph 4 treats the implications of teaching a science that is still under rapid development. Paragraph 5 is about possible conflicts between multidisciplinary and mono-disciplinary approaches of education in sustainability. Finally, we reflect on the questions that need to be answered to fulfil the challenges of education in sustainable engineering and draw conclusions in paragraph 6.

TEACHING SUSTAINABILITY - A LITERATURE STUDY

Over the past 50 years emerging topics have been added to curricula in engineering, reflecting a changing world with new paradigms. Although most stakeholders in education appreciate the added value of these new topics, adding something new to an existing field or curriculum is not easy: often the new part to be added is not fully matured as a discipline and therefore a bit fuzzy, lecturers have not been trained in this new topic themselves and adding something new to a curriculum also means something else has to go in order to avoid curriculum overload. In engineering however, lecturers tend to find everything of great importance and they often feel they should cover everything to make sure their graduates will be the best possible engineers (Sheppard et al., 2009). In that sense, the new part that will be added will probably be competing for time in the curriculum, leaving even less time for other courses. Implementing concepts of sustainability, no matter how important, faces similar problems.

In recent years engineering curriculums have been turned up side down as accreditation boards require engineers not only to have a firm grounding in the technical disciplines, but also to be efficient communicators who are able to deal with ethical questions and to apply principles of sustainability in their designs. As a result Delft University of Technology requires that sustainable technology is embedded in all engineering courses (Holmberg, 2008). Many engineering schools have adopted the ABET (Abet, 2008) or similar requirements, but in practice the graduates do not always seem to be able to apply principles of sustainable development. In this paragraph we take a look at some principles for designing education, the status quo in sustainability courses and on the difficulties of implementing new topics in education.

Designing education

The concept "Constructive Alignment" (Biggs, 1993) is a useful framework for understanding how education can be designed. Within this framework, the design of a unit of learning starts out with drawing up the learning goals for that unit. The learning goals are leading for designing the assessment protocol and the learning and teaching activities.

The increasing complexity of cognitive learning objectives is recognized and described by Benjamin Bloom in his taxonomy of educational objectives (quoted in Segalàs et al., 2009-1). This taxonomy is shown in figure 1. The most basic educational objective in the cognitive domain is for students to learn factual knowledge. Once students have mastered some knowledge and comprehend it, they can learn how to apply it. Once students can apply knowledge, the fourth step in complexity is to analyse materials and the fifth step is to synthesize all the prior knowledge and skills and to combine it in the design of something new. As Sheppard et al. (2009) point out, learning these ever more complex skills is not a one way movement from down to up. She states that students who are on their way to become engineers, have to move from highly structured problems involving formal concepts toward building the ability to recognize and solve less structured and more uncertain kinds of problems. However, learning how to do this is not a linear process, starting with simple tasks and moving to more complex tasks progress in time. Learning goals should be formulated in such a way that they reflect the complexity of the desired learning outcomes.

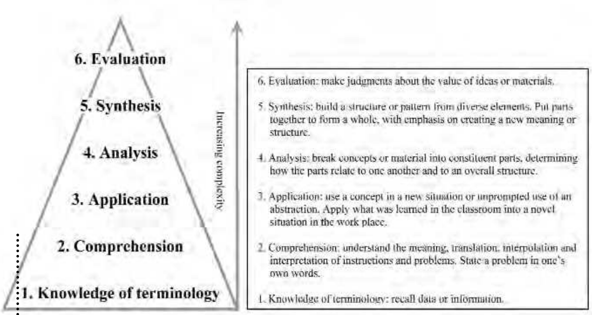

Figure 1. *Bloom's taxonomy of the complexity of educational objectives (Adapted from Segalàs et al., 2009-1).*

Segalàs et al. (2009-1) analysed the bachelor level courses on sustainability in three universities in Europe. They looked at the complexity of the learning goals that were formulated for these courses using the Bloom's taxonomy. They found learning goals formulated on all levels of the taxonomy in all three universities. The question is to what extent the content of the courses in the three universities can truly be compared. The authors fail to report on the kinds of assessment that are in place and this makes it hard to understand if the courses have similar outcomes. Nor do the authors mention the long term effects in the learning and attitude of students who have taken the courses.

In other research Segalàs et al. (2009-2) study the link between learning outcomes and didactical model in place in courses on sustainability. They did this at the end of bachelor level courses and they used concept maps to assess the learning outcomes. They found that that students achieved better cognitive learning results as more community oriented and constructive learning pedagogies were applied. This is consistent with other research in (engineering) education, that shows that active teaching and learning formats yield better results (Heywood, 2005).

Implementing innovations in education

The three universities mentioned in the preceding paragraph have policies that require education for sustainable development (ESD) to be embedded in all mono disciplinary technical courses (Holmberg, 2008). This is much harder to implement than just adding a 'sustainable development' (SD) subject specific course to an existing programme. Holmberg et al. (2008) studied how the universities had gone about with implementing their policies and they identified five success factors for embedding sustainable development. These factors are:

1. Legitimacy: is it seen as legitimate for lecturers to focus on environmental issues and sustainable development in research and education?
2. Commitment in university management: Is the university management determined to integrate ESD in the educational programmes?
3. Responsibility spread throughout organisation: Is the responsibility spread between departments and individuals?
4. Skilled teachers: Are there many lecturers in the organisation that have a long experience of working with ESD?
5. Effective structure of organisation: Is the education organisation structured in such a way that it enables or facilitates ESD integration efforts?

The authors state that the stronger the basis in each of these areas the higher the likelihood of success of an ESD effort. The authors remark that in one of the universities "SD capacities of the students that are trained today do not differ much compared to those graduating in the 90s." (Holmberg et al., 2008, page 278). Despite efforts to implement concepts of SD in education and its relative success, one could wonder how much of it is percolating through to the students.

All three universities used the individual interaction method to implement SD concepts in mono disciplinary courses (Peet et al., 2004). These authors found that top down attempts to influence the content of the courses triggered resistance among lecturers. Interaction with lecturers about integration of SD concepts in mono disciplinary courses proved to be difficult, because of a lack of mutual understanding. Peet et al. experimented with several strategies to implement SD in engineering education and found that a semi-consultant approach directed at individual lecturers who were interested in practical ideas on integrating sustainability in their courses, yielded the best results. In this approach the lecturers were asked how they believed concepts of SD could be tied into their courses. The 'consultant' who was an expert in the field of SD would assist the lecturer in implementing the concepts in the course. Peet et al. observed that sometimes lecturers would be sceptical about SD, but a discussion on the different definitions of sustainability would often be a turning point where scepticism could become enthusiasm. Many lecturers named the lack of time and material to adjust their mono disciplinary courses as the main obstacle for implementing concepts of SD. Peet et al. observe that using this method is time consuming and that it is a slow way of initiating change. They also mention that add on courses on sustainability remain necessary, as not all the ins and outs of SD can be covered in an integrated curriculum.

THE ILL-DEFINED CONCEPT OF SUSTAINABILITY

Defining sustainability

As stated in the introduction, the diversity of definitions of sustainable engineering poses a problem: which one(s) to use in specific educational situations? Generally the triple bottom line, also called 3-P approach is used (Elkington, 1997): People, Planet, Prosperity. It is impossible to treat all relevant economical, social and ecological view points. It may be possible to help engineering students develop a basic understanding of social and economical sciences - although the question remains whether this should be done in a course on sustainability.

The art is to make a consistent appraisal of what to take and what to leave. In a short introduction course for bachelor students from the faculty of architecture the choice was made to focus on technical and ecological sustainability. Looking at the relationship between physical dwelling qualities and social neighbourhood quality, neighbourhood development, life styles or social cohesion is relevant, but in the time available it proved to be impossible to deal with all relevant themes at a sufficient level.

When it comes to defining ecological sustainability itself, the definition by Brundtland "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987) is not very practical because it lacks specificity. Without a clear definition of sustainability we can only give students lists of possible solutions to apply, like "use south orientation", "apply insulation" or "use heat pumps". This may be enough for some lower level courses, but checklists with solutions for now do not give students enough understanding of sustainability to find solutions for tomorrow's problems valid in different contexts. A simple example of this is the orientation of buildings. It is often recommended (e.g. Santamouris, 2001; US Department of Energy, 2001) to use a south orientation to maximize the solar gains to limit the heating energy. This applies only if sustainability is defined as reducing the heating energy. However, a more relevant viewpoint would be to reduce the total energy consumption. In the context of Dutch office buildings, which have high internal heat gains, placing a large glass area on the south will mostly produce an increase in cooling energy that will counteract the reduction of heating energy. Furthermore, placing large windows on the south side implies using sun shades to avoid glare, which produces an increase of electricity use for artificial lighting. On the contrary placing large windows -with a good thermal quality- on the north side will have a beneficial effect on visual comfort and electricity use because of the maximal use of natural diffuse light. To give the students the means to weight such considerations, we should at least teach the basics of energy and thermal performances of buildings.

Measuring sustainability

The problem of measuring sustainability is closely related to the problem of defining it. There is a tendency to apply reasoning like "it is better to use recycled materials than raw materials" or "waste is food" (McDonough & Braungart, 2002). Although these are in general inspiring ideas, it may be tempting to ignore their limitations (e.g. it may be that the process of recycling certain substances requires so much energy that it is better not to recycle). In bachelor and master courses, we usually present four ways of measuring sustainability and explain their advantages and drawbacks.

- Using quantities of materials and energy used: the fewer kilograms of materials and the fewer megajoules of energy are used, the more sustainable the design. This is also known as Material Flow Analysis or Input/Output analysis (e.g. Daniels, 2002, Treolar et al., 2000, Yokoyama, 2005). The main advantage is the relative simplicity of the method and the fact that it leads to thinking about dematerialisation: how to achieve a same function with less materials? This led to developments like the use of steel bearing constructions in combination with cavity floors and walls instead of traditional bearing walls. The major drawback of this method is that the use a few grams of a harmful or energy intensive material (like steel) may be more detrimental to the environment than the use a few kilograms of a less harmful or energy intensive material.
- Using simple indicators, based on the three step strategy (Hendriks, 2001; Duijvestein, 1997; Rovers, 2005; Brouwers & Entrop, 2005), like low environmental impact materials, high environmental impact materials, renewability, recoverability, recyclability, downcyclability, and dismantleability of materials and components used. This goes beyond the use of quantities, but the question remains on what criteria materials are classified as low or high impact and to what extend materials may be recovered, reused or recycled (Guerra Santin, 2008)
- Using the environmental footprint of materials and processes (Wackernagel & Rees, 1996). The environmental footprint gives the biologically productive land and water area needed to produce or extract the natural resources needed (plants, mineral resources, animals) to produce materials (including food) and energy. One of the greatest advantages of the environ-

mental footprint is that it is a very strong communication instrument and a good proxi for the use of natural resources. A major drawback is that it doesn't catch environmental impacts, like depletion of resources, toxicity or CO2 emissions. The collection of data necessary to calculate the environmental footprint necessitates however, like in a material flow analysis, an inventory of materials, energy and production processes used.

- Finally the use of environmental impacts from life cycle assessment (LCA) (ISO, 1996 & 2006). The impacts of the production, use and disposal of building components on the environment are calculated by first making an inventory of the flow of all substances to and from the environment over the component's complete life cycle. Each substance's potential contribution to environmental impacts is calculated. The complete set of environmental effects is known as the 'environmental profile'. The indicators used may be endpoint indicators, mostly three: damage to human health, damage to ecosystems and damage to resource availability. The quantification of these endpoints is subject to high uncertainties, because they result from the effects and interaction of multiple impacts. That is why the preferred method in a LCA is to work with so-called midpoint indicators that are a measure for reasonably understood environmental mechanisms (impact categories). There are different methods to quantify these impact categories, e.g.m CML, Eco-indicator, ReCiPe. In the CML 2000 method, 10 impact categories are used: abiotic depletion [kg SB eq.], global warming [kg CO2 eq.], ozone layer depletion [kg CFC 11 eq.], photochemical oxidation [kg C2H4 eq.], human toxicity [kg 1,4-DB eq.], terrestrial ecotoxicity [kg 1,4-DB eq.], fresh water aquatic toxicity [kg 1,4-DB eq.], marine aquatic toxicity [kg 1,4-DB eq.], acidification [kg SO2 eq.] and eutrophication [kg PO4 3- 3q]. In the new ReCiPe 18 categories are used.

We insist on Life Cycle Assessment because it is the only method that quantifies the impact on the environment. Detractors of the method argue that it is too complex and too time consuming to gather data which results in large uncertainties, that the list of environmental effects is not complete and that there are differences between the impact assessment methods. For instance a drawback of the CML method is that it does not include depletion of biotic resources. In addition, some believe it is too difficult to deal with multiple indicators and to communicate complex results: Indicators should be weighted and summed up to one environmental indicator. In the authors' view it makes more sense to use multicriteria analysis and multi objective models than to try to compare apples with oranges. LCA methods are still under development and one can expect a greater degree of completeness and harmonization in the future. Furthermore one should be aware that the determination of low or high environmental impact materials (like in method 2) or the determination of the ecological footprint (like in method 3) can only be achieved by using LCA-like methods.

Dealing with definitions in education

In most of the courses we teach, there is barely time to allow students to develop basic competences in making LCA. There are almost no LCA courses at the Delft University of Technology, which is quite an embarrassing situation: we ask students to think 'sustainably' without giving them the means to do this properly: supplying students with simple software and methods to design solutions is not aligned with the complexity of the learning goals..

To avoid the complexities related to the measurement of sustainability, the idea of 'measuring' is often replaced by a description of strategies intended to achieve sustainability, like the three step strategy (Hendriks, 2001; Duijvestein, 1997; Rovers, 2005; Brouwers & Entrop, 2005), the ecodevice model (Leeuwen, 1985, Tjallingii 1996) or Cradle to Cradle (McDonough & Braungart, 2002). This strategies can help to understand basic principles and to give a design or research horizon, but the results of differing realization of a strategy need to be assessed and without a LCA this is not possible. We give an example of an education practice.

Example: Assessment of energy conservation measures. A complete analysis of the case can be found in Itard (2009).

In this case different options for the renovation of a Dutch terraced house built in the seventies are studied and compared. The non-renovated dwelling is heated by a gas combination boiler with a standard efficiency. Six renovation variants are studied.

- Variant 1: the façades (including roofs and ground floor, but excluding windows) are insulated with mineral wool.
- Variant 2: the single and double glass windows are replaced by highly efficient insulating glazing.
- Variant 3: the gas combination boiler with a standard efficiency is replaced by a high efficiency gas combination boiler.
- Variant 4: the standard gas combination boiler is replaced by a highly efficient gas boiler combined with a heat pump boiler for hot tap water, with a coefficient of performance (COP) of 2.5. The heat source of the heat pump boiler is indoor air and electricity is used to run the heat pump.
- Variant 5: the standard gas combination boiler is replaced by highly efficient gas boiler and by 2.7m2 solar collector and a stainless steel buffer tank for hot tap water.
- Variant 6: the natural ventilation is replaced by a mechanical ventilation system with heat recovery. This system uses electricity to power the ventilators.

The energy savings achieved by each of these variants are shown in Figure 2. They include operational energy for space and hot tap water heating and the energy embodied in the components used for the renovation. Energy is saved in all variants, façade insulation being the most efficient (savings of more then 30%) and the heat pump boiler and mechanical ventilation systems the less efficient (savings of 8%).

Figure 3 shows the effects of the six variants on each of the environmental impact categories defined in the CML 2000 method. For each environmental impact, the results of the six variants are compared. It can be observed that the impact category 'abiotic depletion' is the only one that produces results similar to those obtained for energy savings (Figure 2). For all other impact categories, the results are quite different, especially for variants 4 and 6 that cause a particularly large worsening (up to more than 3 times the environmental effect of the reference) for six of the ten impact categories. This worsening is directly related to the fact that in these variants more electricity is used than in the other variants because of the use of the heat pump boiler (variant 4) and the ventilators (variant 6). The performances of variant 5 (solar boilers) are also

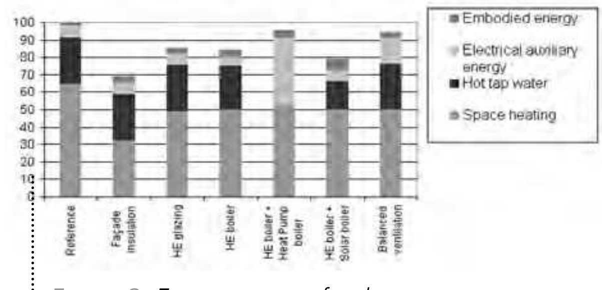

Figure 2. Energy savings for the six variants

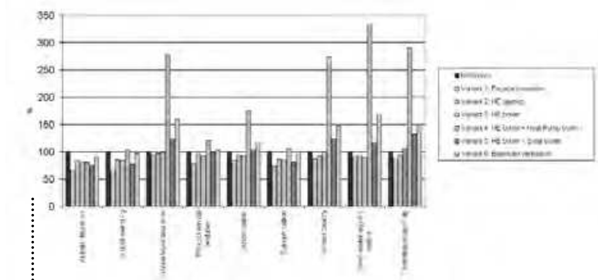

Figure 3. Environmental impacts of the six renovation variants

disappointing. This is due to the presence of the stainless steel vessel for hot tap water. Does this mean we should not use solar boilers or heat pumps? No, but it does mean that more environmentally friendly materials should be used for the solar boiler vessel and that we should be careful when switching from gas powered appliances to electricity powered appliances. Due to the actual Dutch average fuel mix for electricity production (30% oil, 5% coal, 50% gas, 10% nuclear and 5% renewables), a limited change-over from gas demand to electricity demand causes a substantial increase of the environmental effects like ozone layer depletion, photochemical oxidation, acidification, humane toxicity and ecotoxicity. The conclusion is that heat pumps should not be used if they are powered by a conventional electricity plant and have a relatively low COP. The use of electricity produced by a more sustainable fuel mix, or by renewable sources and a high COP, are a requisite when applying heat pump technology.

THE BURDEN OF PROGRESSIVE INSIGHTS

One of the drawbacks of LCA is that the methods and environmental profiles have changed over time and depend on the database used (Peuportier et al., 2005), which leads to large uncertainties in the results. This is a comment that cannot easily be outvoted. Changes in the evaluation method and new insights can cause changes of the absolute environmental quality of variants as well as of their relative values, resulting in possible mistrust and negative attitudes by consumers/ users. However, this is the story of a science under development. When results are used by non professionals of professionals from other disciplines, the subtleties and limitations of the research may be lost and the results presented with the same absoluteness we present results from classical mechanics. However, environmental sciences are sciences in progress, with a not completely well established framework, in need for complex validation processes and therefore still subject to major revisions and shifts due to advancing insights. How to teach them to students that are not educated in environmental sciences? Not by denying the problem, but by making it explicit by telling briefly the history and evolution of models (e.g. models for the relation between anthropogenic CO_2 concentration and global warming), in such a way that it is clear that these models are still in progress. Because of these uncertainties on environmental impacts we argue that it is important to insist on the importance of finding solutions that concurrently address as much as possible environmental problems (multi objective optimization procedures) rather than focusing on one specific environmental impact, which may lead to suboptimal solutions (e.g. carbon storage in the ground, which addresses one environmental impact against decreasing the energy demand, which addresses all of them).

To help students to deal with these uncertainties, it may be useful to use additional theories from other fields. Ecosystem and chaos theories show that small variations in a complex system may greatly affect the state of a system in a -up to now- quite unpredictable way (e.g. Folke et al., 2002, Holling, 2001). For example, it sounds logical that if we burn all fossil fuels present in the earth's crust, this CO_2 will come back into the atmosphere, creating an enormous increase in CO_2 concentration. Simple models are necessary as basis to define new strategies or to make a rapid check on the validity of results. This is a quite common engineering practice: use complex models to make detailed analysis and comparison and use simple models based on intuition, experience and common sense to check the plausibility of the results - which do not replace strict validation procedures. Considering the interdependency of systems leads to differing insights than considering separate systems. However, being able to look at the interdependency of systems means being able to look beyond one's own discipline and therefore pertains to the subject of multidisciplinarity.

MULTIDISCIPLINARY AGAINST MONODISCIPLINARY APPROACHES

Should education in sustainability be organized cross-wise through all curricula, should it be one additional curriculum, or should each curriculum take care for its own courses on sustainability (see Figure 4) Model a) works only in the specific case of a curriculum on environmental sciences being offered. It does not further guarantee that education in sustainability will be implemented in other curricula. In model b), a special group of teachers/researchers has the task to formulate and give education on sustainability in all curricula. An advantage is that basic knowledge on sustainability is made available to all curricula and that some kind of cross-fertilization may be expected (we then speak of inter- or transdisciplinarity). A major drawback is that in-depth knowledge of sustainable engineering in the specific curricula will not be given, as it is not the field of expertise of the teachers. In model c) in-depth knowledge of sustainable engineering and design in a specific field will be proposed, but the relationship with progresses in environmental sciences may be lost as it is beyond the scope of expertise of the teacher. Furthermore, as we saw in paragraph 2, this seems to be a promising but slow method (Peet et al., 2004). Based on the reflections made in paragraphs 2, 3 and 4 it seems logical that a combination of models b) and c) is used, where the basics of environmental sciences will be taught in a common trunk separately from the curriculum specific items. A precondition for this system to be efficient is that teachers in the curricula are aware of the contents of the course in the common trunk and that the courses are sufficiently tuned: an inspiring course on sustainable chemical engineering can only be realized by a teacher having in-depth knowledge of chemical processes, chemical industry and sustainability. However, this combination of models b) and c) is currently barely implemented at the Delft University of Technology.

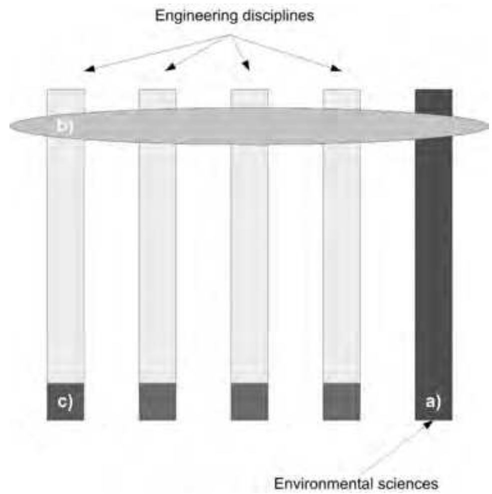

Figure 4. *Three approaches for the implementation of sustainability in higher education curricula.*

A didactical method prevalent in engineering education to help students to cope with multidisciplinarity is problem based learning. The assignments that are the starting point for this method need to be authentic, complex, real world problems that have no one 'right' answer. The students are in charge of the problem and they are engaged in their own learning process while staff members act as facilitators (Graaff and Kolmos, 2007). The projects fill the gap between theory and practice, but also motivate students to study the necessary knowledge and skills to solve the issues. There are examples of curricula in which problem based learning is the leading method and mono disciplinary lectures are set up to support it. Some lecturers and administrators fear that in such a curriculum students do not learn the basics of the disciplines that feed into the field of study. Heywood (2005) shows that this is not the case. However, designing a problem based curriculum is challenging because stakeholders need to move away from the traditional, linear way of thinking about education and the assignments need to be designed in such a way that the students cannot avoid to study those skills that are considered essential in the field. For a meaningful and valuable project experience it is imperative to create an equilibrium between the theoretical and practical components of a course. This is not always easy to achieve. If students do not manage to build a strong theoretical basis, they will lack the power to find the solutions of tomorrow. Overtaking the theoretical basis during working life is very difficult and possibly more difficult that gaining practical experience.

CONCLUSIONS

Difficulties relating to the design of courses on sustainable buildings arise from the lack of a clear definition and a well accepted measuring method for sustainability, which may lead to a poor definition of the goals of courses and consequently to a poor design of assessment and contents. Because of continuously progressing insights in environmental sciences, the current insights and methods are likely not to be the ones of tomorrow and we must give students enough elements to be able to fully understand and even lead future developments. When it comes to multidisciplinary aspects, we argued that a good balance must be found between project based learning in which different disciplines are brought together and monodisciplinary teaching that is necessary to be a good engineer/designer. This favours an approach in which a common education trunk between different disciplines, used to give students a good basis on environmental sciences and insights in what sustainability means in other disciplines, would be combined with a strong monodisciplinary approach of sustainability in the own discipline. Although our literature study showed interesting developments in the field of education for sustainability, there seems to be still a large gap to be filled between the goals and aims set by higher education boards and their practical realization.

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TOWARDS SUSTAINABLE URBAN RENEWAL IN THE NETHERLANDS

Frank Wassenberg

Abstract
Cities and the neighbourhoods within are dynamic and change continuously. Vital neighbourhoods can cope with changing circumstances like outdated use, changing household compositions, consumer preferences and fashions, political turnovers, global trends and economic cycles. Sustainable areas are vital and flexible to changes. Sustainable urban renewal results in sustainable areas. However, what is sustainable urban renewal, and why is quite a lot of renewal policy, as history shows, not very sustainable? European urban renewal policy can be divided into three separate periods, in which different ideas prevailed. This article shows these three periods on four points of view, the contents, the process, the area and a time-focus, and elaborates these on one particular country, the Netherlands.

Keywords: *Urban Renewal, Sustainable Areas, Housing, Urban Policy, Sustainable Urban Renewal.*

INTRODUCTION

Neighbourhoods are no static entities. They change when being used by residents, visitors and local entrepreneurs. They 'age', wear out and need maintenance and renewal. Some neighbourhoods are continuously doing well, while others face decline. In the latter case they get branded as 'problem', 'disadvantaged', 'deprived' or 'concentrated' area', low-income neighbourhood and poverty district. This refers to a downward process in which people who can afford it are moving out and make place for people at the lower social strata, where dwellings and streets are deteriorating, crime and non-social behaviour rise, facilities leave or go out of business and the image is worsening.

Governments develop policies to renew existing neighbourhoods when these do not match with future ideas for the area. Considering a range of countries across Europe during a long time period, we can distinguish comparable goals and strategies on urban renewal processes. We will elaborate on these, but providing such a wide overview, this raises the question why some areas do need the help of an active urban renewal support, while other areas are more or less able to adjust to the -often same - changing circumstances. While urban renewal activities differ enormously between areas, their results differ as much. Some urban renewal efforts result in the intended vital neighbourhoods, while in other areas urban renewal activities take place year after year, placing doubts at the effectiveness of earlier efforts. In the latter areas, urban renewal obviously is not very sustainable, as results don't sustain for a long time. Why are some approaches successful and others not? Or why do results differ from apparent similar approaches? It is intriguing which renewal approaches are more effective than others.

These considerations result in the following overall question: What characterizes a sustainable urban renewal approach?

SUSTAINABLE URBAN RENEWAL

The word 'sustainable' has been subject of numerous debates. It can be used in a more ecological sense, referring to the exhaustibility of our natural resources and following the original meaning provided by the Brundtland Commission in 1987. Sustainable urban renewal focuses on improving the housing stock in an area to decrease energy consumption (see Van der Waals, 2001; Sunikka, 2006; Beerepoot, 2007). Measures on ecological sustainability aim to improve insulation, save energy consumption, generate local electricity, smart grid technology, etc.

Sustainability also can be used in a wider sense including physical attractiveness, safe and clean streets, involvement and collaboration and a mix of functions. In the widest sense a sustainable urban area is functioning according to needs and expectations, and urban renewal is meant to make such a good area. An important characteristic is that a sustainable area doesn't need drastic renewal activities, but has an internal vitality and quality to gradually adjust to changing circumstances over time. A sustainable urban area functions well on physical, social, economic and ecological terms and has enough internal vitality and flexibility to adjust to changing circumstances, use and preferences. Sustainable urban renewal refers to an approach that leads to a sustainable area, an area that functions well.

However, many urban areas do not follow the track of gradually adjustments. These areas have been subject to urban renewal processes, defined as policies and strategies that are formulated to alter the area. Motives can be found in perceived deterioration, or in plans for other uses or functions.

All European countries have policies to renew cities and neighbourhoods. We will share all policies to renew an area under the umbrella term of 'urban renewal': this includes urban regeneration, urban revival, area development and any similar term. Moreover, in all different languages specific terms are used, often with their own political connotations. Not seldom, when a new national administration arrives, new policies are implemented, using a different terminology, and only changing the final activities in a minor way. We don't make difference between any of those related terms and use all these terms equal, as referring to activities that change existing parts of the city.

Three periods of urban renewal policy in Europe

The renewal of urban areas has been a process almost as long as cities do exist. Obviously, by far not all urban areas are able to gradually adjust to changing circumstances. Moreover, many earlier renewal efforts don't result in sustainable areas. What went wrong? What can we learn in current debates and future policies from processes in the past? Therefore we return to earlier urban renewal policies. We focus on urban renewal processes in Europe since World War II, which can be divided into three major periods, distinguished by rather clear changes of policy (Droste et al, 2008).

The first period of urban renewal policy in Europe starts some years after the Second World War. After having overcome war damages, the central parts of the existing cities were completely rebuilt and remodelled for future use during the following decades. Old areas were cleared to provide opportunities for future urban developments. Dwellings were built in new neighbourhoods (the then suburbs) in order to provide housing for displaced inhabitants of the old derelict slums near the city centres. National governments played a predominant role, providing the political framework and major subsidies for implementation at the local level. National governments took the lead in ordering the country and developing welfare states, where housing was considered as a major element of these new welfare states (Levy-Vroelant et al, 2008). This could be social housing for the working classes in countries in North and Western Europe, state housing in Eastern Europe, or individual support to facilitate ownership in Southern countries.

The turning point was the worldwide reaction against the establishment in the late 1960s, with slogans like 'flower power' and 'power to the people', student revolts and demonstrations against the Vietnam War. Urban renewal of those days came under pressure in the early 1970s. Prestigious large-scale road development, ambitious city-centre plans and high-rise housing construction stopped rather suddenly (Turkington et al. 2004). Large-scale top-down plans were replaced by small-scale neighbourhood renewal, based on bottom-up processes. The wave of anti-establishment thinking led to a new focus on popular demand and social needs: urban renewal became more demand-oriented and focused on provision of social infrastructure, including affordable housing.

This change in priorities and ideas marked the transition to the second period of urban renewal, which started early 1970s and lasted until mid 1990s. Urban renewal before had been led by urban planning, but now it was led by housing issues. The strategy changed from area clearance to housing renewal in favour of existing local residents and the strategy was to build for the neighbourhood and its people. The participation of inhabitants in planning and renovation was considered essential.

During the 1980s, the theme of urban

renewal broadened from housing alone to the overall residential environment, in order to address problems of pollution, vandalism and safety. As the environment proved to be worst in recently built high-rise estates, the schemes also targeted these areas. Both the dwelling and the environmental strategies were mainly physically oriented, but included also social and physical policies developed in association with residents.

Urban regeneration was mainly a top-down issue in all countries during this second period, with the national governments formulating the goals, the policies and providing the money. Increasingly, local responsibilities grew and larger municipalities got responsible for planning and implementation of urban renewal strategies, mainly physical oriented. The focus of urban renewal policy evolved from the improvement of housing in the 1970s to the improvement of the residential environment in the 1980s. In the late 1980s and early 1990s, social and socio-economic programmes were introduced. These policies had a new aim: to integrate deprived people and to increase social relations between different groups in society. These blazed the trail for subsequent policies and can be seen as the turning point to the third period.

The third period of European urban renewal starts in the 1990s and is characterised by integrated policy. It was recognised that urban problems could not be solved by physical improvement alone, nor was the addition of social measures enough. All across Europe there was an increasing mismatch between the labour market and the urban structure: the working (middle) class commuted each day from the suburbs to the cities, while the people who lived in the city had no jobs, as low-wage jobs had moved towards the outskirts (and abroad). Neither hostile housing design, nor bad housing quality, nor management deficits were sufficient to explain social problems in deprived areas. The city as a whole would end up segregated: lower-class people would live in social housing in sober and inexpensive neighbourhoods, while the middle classes, including families with children, would have moved to suburbs with detached family houses or to neighbouring towns. The least popular areas proved to be not the old pre-war neighbourhoods (with their central location and improved housing stock), but the post-war areas dominated by standardised mass housing. Residents consider both buildings and environment as unattractive, making them areas of 'minimal choice'. Unemployment, social exclusion, crime and tensions between groups are common. Urban sociologists labelled this process the doughnut city (Schoon, 2001): an expensive core in the city centre surrounded by poor neighbourhoods, with wealthy areas surrounding the city.

In most European countries urban regeneration gradually became an integrated policy during the 1990s: City Policy (Politique de la Ville) in France, the national Strategy for Neighbourhood Renewal in England, Big City Policy (Grote Steden Beleid) in the Netherlands, the Metropolitan Development Initiative in Sweden and the Socially Integrative City (Soziale Stadt) in Germany. These territorial and integrative programmes combined physical, economic and social goals and strategies. In these programmes increasingly the strategy was to keep the residents in the urban regeneration areas. Policies developed in a new way: towards a social mix of the population, to be achieved by a differentiated housing stock. There were two main approaches: either to build social housing in areas where it was scarce, or to replace social housing in areas where it was dominant by middle class housing. Richard Florida's ideas (2002) were welcomed everywhere, and cities tried to stimulate the 'creative class' to live within their city limits.

Moreover, years of urban centre upgrading paid out: in most European cities there are more shops, terraces and restaurants, car free zones, and lots of festivals and attractions than twenty years ago. City life has just grown nicer. The urban popularity coincides with major international trends like a growing number of small households, divorced people, retiring elderly, people having a job of their own, groups that often prefer city life.

The national governments gradually lost their leading role during this third period of urban renewal, although they still keep the responsibility for urban renewal programmes (in terms of budget and policy development). The municipalities grew in importance, but even more the non-governmental actors. Policies are made and implemented in collaboration with a range of actors, in what is generally referred to as a shift from government to governance (Healey, 1997; Van Kempen et al, 2005). These other actors include housing associations, private developers, local service organisations, and not in the last place inhabitants.

The historic overview shows that the areas where urban policy focuses on have been renewed, dependent on changing interests, policies and historic circumstances. The object of urban renewal differs per country. When global forces changed the worldwide industrial landscape, former heavily industrialised countries such as Britain, Germany and Belgium had to cope more with vacant industrial plots, that obviously needed transformation and restructuring. In France, Sweden and the Netherlands relatively many inexpensive and sober social housing was produced in the three decades following World War II. When prosperity rose and people could afford other types of housing, these mass housing neighbourhoods increasingly proved to be unpopular resulting in a renewal focus on these post war areas. In southern European countries owner occupancy rules and urban renewal activities focus on the upgrading of central districts. In Eastern European countries, all changes started only from the 1990 onwards after the political turnover. Despite general trends across Europe, local and national circumstances, histories and interests influence outcomes of the process of urban renewal (see Levy-Vroelant et al, 2008).

GENERAL TRENDS AND DEBATES IN URBAN RENEWAL POLICIES

Urban renewal has over time changed from a technical discipline to a complex process, integrating more aspects and involving more actors. More activities are carried out on different scales and on different moments in time, and more strategies and methods are used. Several authors identify different features of the resulting changes in governance, contents and organisation of urban policies (Couch et al, 2003; Van Kempen et al. 2005; Czischke & Pattini, 2007; Droste et al, 2008; Van Gent, 2009). Before analysing any urban policy, it is useful to point at the limits of it. Urban policy is just one kind of policy, dependent on both external developments and policy processes in general. Worldwide megatrends such as globalization, economic industrialization shifts, increasing competition between urban regions, ageing of the population, climate changes, developments in ict, and other trends all have implications for any local or national urban policy, implications we don't discuss here, but one should be aware of. Another set of overall factors are national or European policies. EU-climate regulations limit the construction of (new) housing close to motorways and within dense conurbations, EU-enlargements lead to higher immigration levels and national policies on allowances, tax regulations or incomes influence local urban renewal schemes. Urban policy and urban renewal policy in particular, has a limited influence.

Nevertheless, there are many commonalities in the diagnosis of urban problems, in policy goals and often in methodology. We distinguish four dimensions that are particularly relevant: (1) the area based approach, (2) the integrated approach, (3) the ecological inevitability and (4) the shift from government to governance. We elaborate on these four dimensions, and mention some of the debates that play around these dimensions across Europe. Next to that, we focus on the Netherlands, and describe how these four dimensions work out in this particular country.

(1) The territorial (area-based) approach: problems don't stop at the border, so why should the approach do so?

The area approach is a way to focus activities and to connect policy-making more directly with implementation. The neighbourhood often seems a natural, logical scale to assemble the actors in the urban renewal process, both those within the area (residents and other users) and those with wider responsibilities (municipality, police, social care, housing associations, etc.). Area-based approaches have gained prominence across Europe, largely because they create a good framework for concerted action to counteract multiple deprivation. Area-based approaches can be successful: many problems are solved, the environment looks better, property prices increase and residents are happier in their improved houses and environment - at least immediately after the interventions (see Wassenberg et al, 2007).

But there are critical accounts of area-based approaches as well. It may produce negative side effects: some problems are displaced to other, often adjacent areas. Dealers and burglars just move. These areas may originally have enjoyed somewhat more favourable conditions than the target neighbourhood but then get pushed into a downwards spiral of socio-structural development. Any area-based approach thus should take account of side effects on nearby areas and incorporate plans for adjacent areas.

Another point of discussion is that some problems indeed concentrate in an area, but hardly can be solved on the neighbourhood level. Clean streets, derelict housing and social cohesion can be improved locally, but it is more efficient for issues such as unemployment, inadequate schooling, organised crime or energy use to work on a higher scale level. It is counted that just a mere 1% of all jobs is provided within the own neighbourhood (Marlet, 2009). So, the chance that any jobless finds a job is much larger somewhere else in the city, or in the region.

(2) The integrated approach: the paradoxal balance between place and people

In most Western European countries there has been a shift from sectoral to more integrative policies that require cross-departmental work. The historic overview shows that urban renewal has broadened from physical to social and economical issues in most countries. There has been one or more swings in the focus of urban regeneration among three objectives: socio-economic, socio-cultural or physical-economic. These occur at different times depending on local political priorities.

The integrated approach understands that problems are often 'wicked' problems with no easy solution or one universal remedy. Completely eradicate unemployment, crime or marginality from problematic areas is impossible as these are part of urban life, but they can be made less persistent. It is an open question what the aim of any renewal approach should be: should it lead to an average functioning urban neighbourhood, according to a number of features (safety, jobless, pollution), or could districts at the bottom of the housing market play a vital role in the function of the whole city? The first strategy aims at a social mixed neighbourhood and provides opportunities to keep successful social climbers within the area. The latter strategy aims at solid basic circumstances and to concentrate both control and help opportunities within the area. These are two strategies with totally different management consequences.

A related debate among scientists is whether urban renewal policies should be area-based, focussing on a better place to live, or people-based, focusing on better lives for residents. Physical renewal upgrades the area, but offers no guarantee that residents' daily lives will improve, a situation that was found during the 1980s in western European countries. Socio-economic measures may improve residents' personal situations, but if successful people continuously move out of the area it will stay deprived. This we can call the paradoxical relationship between territorial action and residential mobility. The challenge is to find the right balance between the two approaches, given the particular context of each area.

This balance is dependent on the geographical context and may change during the years. German policies in the eastern part of the country differ from those in the west. Due to the different urban and social contexts and different tensions on the housing market, the eastern Länder do face more physical measures than the western Länder. In France a more physical approach is becoming increasingly popular, while in the Netherlands the movement is away from the physical and towards more social and economic measures (Droste et al, 2008).

(3) The ecological inevitability: from scepticism to action?

It is clear for most people that the climate is changing, despite some few sceptics. Natural resources are limited, energy prices are rising due to scarcity, the planet is warming and biodiversity is shrinking. Al Gore's movie accelerated the global opinion on the theme. The Intergovernmental Panel on Climate Change (IPCC) of the UN presented its fourth report in 2007, in which all leading scientists state that global warming most probably is caused by human activities.

Concerning urban renewal, the main issue is not whether ecological measures are inevitable, but how these should be implemented. Who should take the lead, should invest and implement necessary measures? Should these be national governments? But all across Europe governments are stepping back, leaving more responsibilities, and investments, to the market. Moreover, the financial position of most governments is weak, making them shortcutting on budgets instead of investing. Should the market invest? These will only act when they have to, to avoid competition disadvantages. So, should it be people themselves? Despite some enthusiastic forerunners, the large majority of the population seems not interested to invest much in ecological measures, only when measures will pay back by decreasing energy bills. So, who will act?

(4) Governance: who acts when the government steps back?

The last major shift in European urban renewal policy is the shift from government to governance. Top down and blueprint plans from central governments are replaced by programmes and processes, and the one actor approach is replaced by a game with multiple players. There is an increasing trend towards public-private and other partnerships, cooperation of different actors, local contracts and the inclusion of citizens in decision-making processes. Policies are not to be imposed on people but developed together. This implicates another role for governments, less expectations from laws and subsidies, and more emphasis on individual (residents) and private (market) involvement. For governments this leads to delegation, mandating, service orientation and process orientation.

Countries differ in the compositions of partnerships, in the relations between central and local governments, in the form of citizen participation and in the aims of urban renewal. In Germany and the UK the focus is on integration of the individual, in France on improving social mix as a condition for social cohesion, and in the Netherlands and Sweden the goal falls somewhere between these two. While it is clear that the almighty role of governments had shrunk, it leaves open the debate which other actors should do what. This can be residents, and raises questions about participation, representation and empowerment. It also could be commercial actors, but in times of economic recession few activities are taken, while in economic prosperous times the market is overstressed. Countries that gained from economic prosperity only a couple of years ago (Spain, Ireland, UK, Greece), are hit most by the contemporary economic crisis. Economic downfall has consequences for incomes and jobs, property prices, market demands, economic confidence and on urban renewal in general. Urban renewal that involves major refurbishment or demolitions is slowed down, despite intensive social plans for, and with, inhabitants. Rehousing schemes are delayed by the lack of available housing. These delays bring urban renewal itself into disrepute and raise questions about whether it is better to continue with less intensive upgrading schemes or leave the neighbourhoods as they are.

Figure 1. *Contemporary urban renewal in the Netherlands often focuses on post war built flats owned by housing associations, built in the 1950s and 1960s.*

Figure 2. *Typical urban renewal project from the late 1970s, with 100% social sector rented housing developed in consultation with inhabitants.*

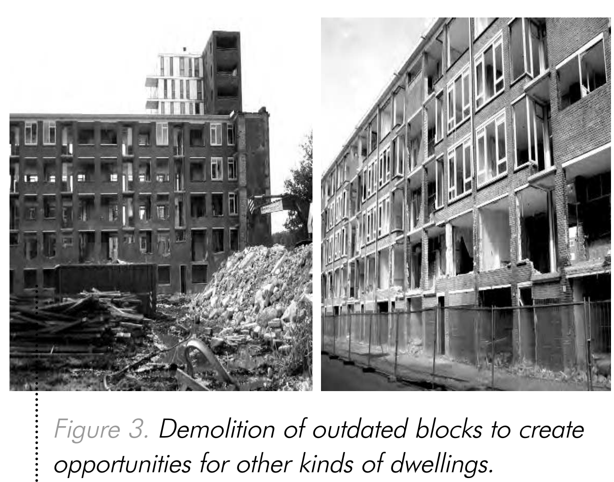

Figure 3. *Demolition of outdated blocks to create opportunities for other kinds of dwellings.*

DUTCH URBAN RENEWAL POLICIES

How do the four selected dimensions work out in Dutch urban renewal policies?

The distinction in three periods of European urban renewal since World War II coincides with 60 years of Dutch renewal experiences. Is this also true for the four distinguished major shifts in European urban renewal approaches? How do these shifts work out in the Netherlands?

The first dimension was the shift towards area based approaches. During the first distinguished period, the post war decades, any area based approach hardly existed. Urban renewal was initiated by sectors like transport, traffic, city enlargement and industrialisation. During the second period, from the 1970s onwards, urban renewal can be characterized as area based, with small scale processes to regenerate neighbourhoods, in consultation with inhabitants. During the 1990s the vitality of the whole city came into the foreground. However, in the beginning of the current millennium the need for a spatial focus was stressed to approach more efficiently concentrated urban problems. In 2003 56 deprived areas in 30 cities were pointed out for urban renewal approaches. These 56 were chosen by the cities themselves, on two arguments: backward areas where progress was expected. Later, in 2007, a new selection of deprived areas was made, based on objective criteria to select the countries' most deprived areas, similar to the way in England 88 problem areas were selected. As a result, 40 deprived areas were selected in 18 cities throughout the country, about half of these the same as those 56, and the other half new areas. Contemporary Dutch urban renewal policy ('wijkenbeleid') focuses on these 40 areas, where almost 5% of all Dutch residents live.

The second dimension is the integrative urban renewal policy. On a national scale, several departments have combined strategies in two related policy programmes: the Big City Policy (Grotestedenbeleid, GSB) and Urban Renewal Fund (Investeringsbudget Stedelijke Vernieuwing, ISV). The goals of contemporary Dutch urban renewal policy are differentiation, social mix and housing mix. Integrated policy is a key term, meaning that physical, social and economic issues are considered, as well as issues of integration and safety (see Priemus, 2004).

The third dimension is the necessity of sustainable urban renewal in an ecological way. Until now, a range of smaller initiative is taken, mostly by local governments (like: Rotterdam and The Hague aiming to be a climate neutral city) or housing associations. Initiatives from residents are limited, except of some advance guards, and driven by financial considerations of decreased expenses for energy costs.

Figure 4. *In the Bijlmermeer high-rise district have of the blocks are being demolished and replaced, the reaming are being refurbished.*

Figure 5. *Inhabitants are involved with/in the future of their dwellings.*

The fourth dimension is the shift from government to governance in urban renewal. This results in a decreased role for both national and local governments, and more possibilities and responsibilities for market actors, housing associations and residents. Of these, particular housing associations are worth to mention, as they have a strong position in the country and in the urban renewal areas in particular. For now, we will elaborate on these actors.

Actors

Contemporary urban renewal policy in the Netherlands involves many local players, from the municipality to police officers, from inhabitants to social workers and from shopkeepers to housing associations. Urban renewal is no longer just a government issue or even a municipality issue, but a governance issue, with actors participating and collaborating.

Local governments make agreements with the national government about their share of the state budget for urban renewal, which at present is 1.2 billion for five years (2010-2014). The government has formulated three objectives for urban renewal (ISV): (1) more quality and differentiated housing stock, (2) a better quality of life in the physical environment and (3) a more healthy and ecological sustainable environment. Local governments have to collaborate for both policy making and implementation of urban renewal. The role of local government is no longer the decision-maker, it is now the mediator between local interests.

An important urban renewal policy maker are the housing associations. These own 2.3 million dwellings, a third of all Dutch housing, and three quarters of all rented housing. There are about 500 housing associations in the country, varying from 200 to 80.000 dwellings each. The larger ones are professional and powerful organisations, often better equipped to deal with housing issues than their local government counterparts, especially outside the major cities. Housing associations position themselves as hybrid organisations, social entrepreneurs with a social or non-profit aim. Housing associations have major assets in all 40 appointed urban renewal areas. Although housing association tenants are generally below the welfare average (on many points on the scale), they are not on the whole poor, deprived or stigmatised.

Since 1995, housing associations have offi-

Figure 6. *Refurbishment of low rise flats.*

Figure 7. *Housing mix as a base for social mix, which implicates creating more diverse housing types in monotonous areas.*

cially been independent of state subsidies. No government money goes to housing associations, and since 1995 the government has not paid for any new social housing. Since gaining financial independence their economic position has improved, due to the general rise in house prices, which increase the value of their stock (Ouwehand & Van Daalen, 2002). Overall, the financial position of the housing association sector is strong, although recently weakened by the economic crisis and the decreased possibilities to sell some of their housing stock and generate financing for expensive investments for renovation or social amenities in the neighbourhood.

There is a debate going on about the role of housing associations. This role goes beyond the provision of only (better) housing, but also an improved environment and a better social milieu for the residents. But how far should a housing association go? Should they take the lead in urban renewal, as they own most of the property in the area? Should they invest, take financial risks, and make financially unprofitable investments? What should their role in society be? New suggested roles include caring for the local environment, ecological investments, providing houses for groups other than their traditional clients, which might include the homeless, handicapped, elderly, students or key workers. Housing associations are probably the most important player in urban renewal for policy making and implementation (Boelhouwer, 2007; Wassenberg, 2008). However, the current debate on extended roles for housing associations in times of reduction of financial possibilities makes housing associations reserved to implement several proposed measures, including energy reduction programmes, insulation and energy production.

CONCLUSION: TOWARDS A SUSTAINABLE URBAN RENEWAL APPROACH

A sustainable urban area gradually adjusts to changing needs, uses and preferences of inhabitants and other users. Urban policies can be limited in areas where problems are not present, or at least not dominant, where changes happen without notice. Urban renewal policy is necessary where problems dominate, or, sometimes, where changes of uses ore prominent, like in old brownfield areas. What are success factors for sustainable urban renewal? Four points that contribute to success can be distinguished.

The first factor is the integration of different policy sectors (such as physical, social, ecological and economic policies). The historic overview clearly shows that sectoral solutions for multiple problems generate no final improvements. Then, integration of different policy sectors is necessary.

The second factor is the involvement and collaboration of many local players, from the municipality to police officers, from inhabitants to social workers and from shopkeepers to housing associations. Urban renewal is an issue of 'governance' and requires the active participation of all relevant stakeholders when necessary. This makes urban renewal a complicated process.

The third point is that different problems are attached to different scales, resulting in the need to operate at different levels simultaneously, varying from the direct neighbourhood, the district or the city to the region (a recent advice supports this, VROM-raad, 2009).

The fourth and last factor is a long-term approach accompanied by short-term measures, physical as well as non-physical. Complaining residents can regain their confidence through short-term improvements. Short-term and quick measures can be taken while long-term strategies are being prepared. Drastic measures, such as demolition and new construction, have more local support when daily inconveniences, like the dirt on the streets, the drugs dealer on the corner, the burglaries in the park, or the many unemployed, are dealt with properly and at once. It is important to keep the positive people involved and to keep them within the area, instead of seeing them moving out.

Urban renewal has over time, and most recently around the turn of the century, changed from a technical discipline to a complex process, integrating more aspects and involving more actors. More activities are carried out on different scales, and more strategies and methods are used. Some factors can be recognised as making urban policies improve deprived areas more successfully into sustainable areas, that are vital and able to adjust to the ever changing circumstances. The most important seems to be finding the right balance: the involvement and collaboration between all required actors, a combination of various measures and sectors, working simultaneously at several scale levels, and combining future-oriented policies with today's urban reality. For some this may be a platitude, for others it may just seem impossible. The trick is to look critically, but with open eyes, at successful projects elsewhere and to find out which successful elements can be used in the situation 'back home'.

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COMMUNITY STRATEGIES FOR ENERGY EFFICIENCY
Successful Examples from Austria

Inge Strassl

Abstract

The responsible politician for environment in Vorarlberg spoke at the Energy Gala in November 2002 in Bregenz and said: "It is necessary not only to discuss central regulations but to invest more in decentralised actions". The communities are central players in this field because they can act in various ways: as authority, owner of buildings and as motivator for the people.

Two examples of strategies in Austria are introduced:

e5 - program for energy efficient communities (congruent to the European Energy Award)

This program supports communities with high ambitions on energy and sustainability. The program helps to give structure, tools and a quality insurance system, so that even smaller communities can act in a professional and efficient way. Additionally it is a labelling and awarding system, which is quite important because a lot of work in the communities happens voluntarily and it is important to give approval to these actors.

Energy point system in housing subsidies

In the federal state of Salzburg the energy point system is a subsidy system for energy-saving measures and the use of renewable energy in housing.

Quality points are given, depending on the energetic and ecological quality of a building. Every point increases the subvention that is granted by the government of the federal state Salzburg. Additional points exist, for example, for the use of biomass, solar energy and controlled living space ventilation. Using this simple system, the quality of sponsored housing was increased significantly and the use of renewable energies was successfully introduced into social housing. Today more than 80% of the residential buildings in Salzburg are heated by biomass and more than 60% of the buildings are using solar energy for hot water and heating.

Keywords: *Community Strategies, European Energy Award, Motivation Program, Energy Efficiency, Thermal Solar, Biomass.*

INTRODUCTION

In the mountains of Austria the reality of climate change is obvious,as these pictures show how necessary it is to act (Figure 1a and 1b)

Austria has nine federal countries and a structure with a lot of small communities and municipalities. Issues concerning social housing are in the first place the responsibility of individual federal states. The funding system in social housing has a long tradition and reaches not only the lowest income groups, but also the social middle class. The funding system is different in each federal country, but most have some kind of instruments for stimulating higher energy efficiency of buildings. This kind of subsidised housing has created a high level of quality and has brought a good satisfaction of the people about their homes and also a rather good social mixture. (Oberhuber et al, 2005)

Figure 1a-b. *Grossglockner in 1900 and in 2000 pictures (courtesy of the federal government)*

Spatial planning and building regulation are the responsibility of the federal countries and the mayor is the building authority of each community. This structure has the advantage that local authorities can act in very close proximity to the people and that problems can often be solved in short time. But it has the disadvantage that small communities (with sometimes only a few hundred inhabitants) do not have expertise to handle all specific questions.

Municipalities can have a key role in active energy and climate politic, because they have the unique position to be able to plan, are owner of buildings, act as an authority, but are close enough to the people to inform and motivate directly.

So communities are able to work on the base of participation, to start initiatives, to run and implement projects and to give feedback to the governments and legislator. But the tasks of a community and the issues that arise in daily work are so manifold, that the actors in the communities need a clear strategy and support. To enable communities to profit from their position, structured programs and organised support from experts are important.

The mayor of a municipality has an important role and can be a trendsetter for the development towards a sustainable future. For example: The mayor Rainer Siegel in Mäder (Vorarlberg) proposed in his first meeting of the municipality council to take the decision "that the community must not cause an economic damage". Of cause all members of the council agreed. The next step was, that he started to analyse that all non-sustainable and non-ecological decisions will cause an economic damage in long term sight. So the community Mäder was the first community building an eco-school - with a total ecological and energetic building concept, but also with educational material and special training for teachers and student. Some mayors visiting this school asked if this was not much more expensive than a normal school. Mayor Siegel said: "Yes. But if only one student does not take drugs because of this program for awareness it is much cheaper for the total economy."

Two successful strategies for increasing the awareness and reducing energy consumption have been evaluated:

1) e5 - program for energy efficient communities
2) energy point funding system for housing

THE e-5 PROGRAM

"e5" is a program, which supports municipalities who want to make energy a main theme. e5 helps to define steps towards the overall energy target. If a community reaches 25% of their possible implementation of measurements, it can get the first "e". With 37,5% it is "ee", 50% means "eee", 62,5% is the "eeee" and with 75% of targeted performance a community receives the highest award level of "eeeee".

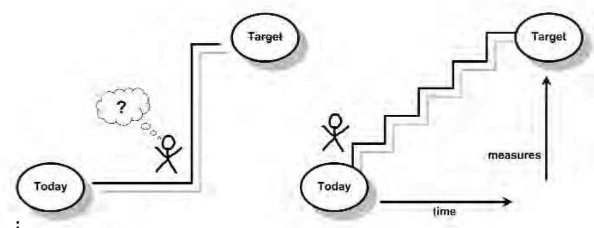

Figure 2. *Step-by-step towards the targets in the e5-program*

The program is stimulating a continuous process and is functioning as a quality management system within the community. It supports the municipalities to set up and improve local structures and frameworks for effective energy policies. In each community, that joins the program a kick-off workshop is organised, an energy team is installed and a work program is being developed.The program management has created a certification, benchmark and labelling system, which helps the communities that follow the stepping-stone-strategy towards their defined aims. Each community is labelled depending on their possibilities and work area: a small community in the mountains has different emphases than a central town.

Within the e5 program the communities are part of an active network, with meetings, excursions and expert talks on specific topics (Buhunovsky, 2007).

The heart of the e5 program is a catalogue of possible actions for communities, which shows 84 measures in 6 different fields of action:

1. spatial planning
2. communal buildings, facilities
3. supply, disposal
4. mobility
5. internal organisation
6. communication, co-operation

The communities use this catalogue to establish their own work plan with the aim to do as much as possible in all these fields. For example: in the field of spatial planning there are actions possible in several fields:

· Select sustainability performance criteria in the communal development planning

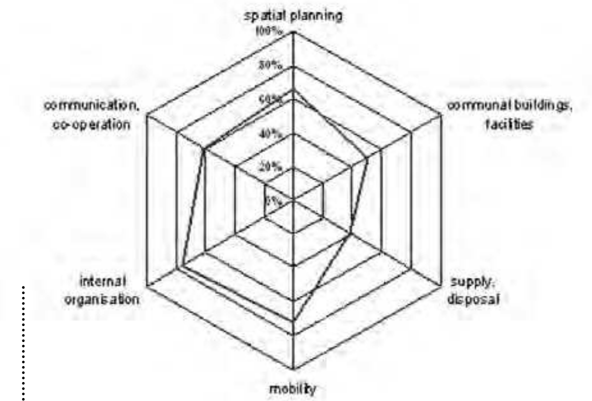

Figure 3. *Representation of audit results*

· Apply innovative urban planning concepts
· Make energy efficiency and energy supply part of the building authority task
· Connect building approval and quality control.

Quality assurance and awarding

Annual examination of the implementation in all six action-fields of the "Catalogue of Measures" takes place through an "internal audit" (balance of all activities, programme of activities) and at least every three years through an "external audit". Depending of the level of realisation in "e" - "eeeee" awards are given. The points reached in relation to the maximum possible points for this community gives the percentage of reaching the goal (Hofer et al. 2005).

In each participating country an award gala is being held, to show the activities and the successful actors. This event is very important because it motivates other communities. A lot of work in the community is done by volunteers, for these people this event is a platform to exchange experience with their activities.

The network of communities ensures an exchange of experience between the energy teams and between the politicians. Themes of common interests are being discussed in workshops, after introduction by external experts or during excursions. Example of these themes are energy efficient street lightning, energy monitoring and planning of traffic areas for mixed uses.

The e5 program is based on the "Energiestadt" in Switzerland (Brandes, 2001). The program started in 1998 in the federal countries Vorarlberg, Tirol and Salzburg and spread to other countries. At the end of 2009 a total of 78 communities in six of the nine federal countries of

Figure 4. *Energie Gala in Salzburg: 50% of potential points have been reached*

Figure 5. *Participants in a network event*

Austria were participating in the e5-program and at that time they had reached 186 "e" together. At the end of 2009 about 700 energy team members were active in working on the implementation of energy relevant measurements. These communities show many good examples which motivate other communities to work in the same direction (Strasser et al. 2001; Stenitzer and Strasser 2005; Strassl, 2008).

The communities with the highest level "eeeee" are: Langenegg (with 86 % percentage degree of performance), Zwischenwasser (86 %),Mäder (85 %), Virgen (80 %), Wolfurt (79 %) and St. Johann im Pongau (78 %).

In 2002 it became a European program "European Energy Award". See: www.european-energy-award.org and www.europeaneneergyaward. Because e5 was already well known in Austria the name "e5" was kept, but the program is based on the same system and tools. The award of "eee" is the "EEA" the "European Energy Award" (Graggaber and Sperka, 2001; Geissler et al. 2008) and "eeeee" is the "European Energy Award in Gold". Now the communities in Germany, Italy, France, Czech Republic, Lithuania, Lichtenstein, Ireland, Switzerland and Austria are joining the European Energy Award.

ENERGY POINT FUNDING SYSTEM FOR HOUSING

Since 1993 the government of the Federal State of Salzburg applies an incentive scheme for energy-saving measures and the use of renewable energy in housing. Energy bonuses are part of the housing subsidy system for the construction of social apartments and provide sponsorship for the buyer of a newly constructed apartment that was built by a property developer. By this means, the reward system reaches a very high percentage of newly constructed houses and flats.

The number of points gained depends on the energy and ecological quality of a building. Every point increases the subvention level granted by the federal state Salzburg. The buildings are divided into 10 classes, ranging from standard to passive buildings. The ten classes (see Table1) are presented on a simple and transparent chart, which is also a positive marketing instrument, giving buyers easy access to the energy quality of a building ("class nine must be better than class five"). This point system was the forerunner of the "Energy Certificate", even before it was part of building regulations in Salzburg. Additional points exist, for example, for the use of biomass, solar energy and controlled ventilation in dwellings. Using this simple system, the quality of sponsored housing increased significantly and renewable energies were successfully introduced into the housing sector.

How the system works

The point system supports an energy-saving construction method, and the performance level is expressed by specific heating load and the "LEK"-value ("Line of European Criteria"). This "LEK"-value designates the thermal insulation of the building envelope in relation to the geometry of the building (Österreichisches Normungsinstitut, 1998).

The specific heating load and the energy quality of the building envelope determine the class of the building (class 1 - 10), resulting in 1 -10 points. The following aspects entail additional points: use of biomass, the use of industrial- or commercial waste heat, the connection to a district heat or a central heat plant, the installation of a solar plant, the use of a heat pump, a heater possessing a return temperature below 40 degree centigrade, the installation of a controlled living space ventilation with heat recovery, and the installation of innovative technologies (photovoltaic, natural insulation, recycling material…). Every point increases the sponsorship credit with 15% per m^2 living space (see Table 1).

In 2002 a second chart was introduced and additional points for ecological measures were given. The ecology of the building materials is evaluated according to the OI3-factor. In this value the primary energy input, the CO^2-potential and the acidification of the soil is measured for each building material (database from the IBO - österreichisches Institut für Baubiologie). Furthermore less sealing and more open surface, water saving appliances, the use of rainwater or energy accounting are awarded with points.

Handling and accompanying measures

Using a special software tool called "GEQ", which stands for "Gebäude Energie Qualität" (energy performance of buildings-software), it is possible to

Awards for energy ecological measures

Sponsorship class	Building envelope Energy index LEK – value [-]	Award points for particular measures: Building envelope Evalulation according to LEK-value	Biomass use Waste heat use	Connection District heat	Heat Pump	Active Solar-Plant	Living space Ventilation with heat recovery	Passive Solar Energy	Sum Energy - Points
	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9	Column 10
1	<28 - 26	1	3	1	-	2	3	2	
2	<26 - 25	2	3	1	-	2	3	2	
3	<25 - 24	3	3	1	-	3	3	2	
4	<24 - 23	4	3	1	-	3	4	2	
5	<23 - 22	5	3	1	1	3	4	2	
6	<22 - 21	6	3	1	2	3	4	2	
7	<21 - 20	7	3	1	2	3	5	2	
8	<20 - 19	8	3	1	2	3	5	2	
9	<19 - 18	9	3	1	2	3	5	2	
10	<18	20	3	1	2	3	5	2	

Table 1. *Energy point system based on LEK value and specific measures*

Awards for miscellaneous ecological measures

Sponsorship class	Building-ecology Kennzahl OI3 Lc - Value	Award points for specific measures: Building Eval. Acc. to OI3 lc-Value	Rain- or Grey Water Use	Surface Sealing	Water-Saving Sensor Armature	Roof-Greening	Energy Accounting Efficiency Surveillance	Controlled Ventilation Including Exhaust-air plant	Sum Ecological Points
	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9	Column 10
1	<28 - 26	2	2	1	1	2	2	3	
2	<26 - 25	4	2	1	1	2	2	3	
3	<25 - 24	6	2	1	1	2	2	3	
4	<24 - 23	8	2	1	1	2	2	3	
5	<23 - 22	10	2	1	1	2	2	3	
6	<22 - 21	12	2	1	1	2	2	3	
7	<21 - 20	14	2	1	1	2	2	3	
8	<20 - 19	16	2	1	1	2	2	3	
9	<19 - 18	18	2	1	1	2	2	3	
10	<18	20	2	1	1	2	5	3	

Table 2. *Energy point system based on LEK value and specific measures*

calculate energy- and ecological points by the input of the building geometry as well as windows, wall- and ceiling superstructure. Additional to this the planner can create the Energy Certificate. The software tool contributes greatly to the overall success of the point system, because of its user friendliness for every planner. It is easy possible for the planner or construction firm to perform energy optimizations. The GEQ requires little bureaucratic effort. The checking of the "energy points" for the whole Federal State of Salzburg is carried out by one single official of the State government. To ensure the effectiveness of the selected measures, precise quality specifications were generated for the particular points. Performance checks are required from the executing companies as guarantee, for example concerning the output of a solar plant.

Since 2006, the input of the Energy Certificate and the checking of the sponsorship go through the internet platform ZEUS (www.geq.at), without any paperwork: the Energy Certificate including point calculation are being posted on the Internet. Planners, house builders and authorities can have access at any time and query the state of progress. After the checking and possibly optimisation, the documents are cleared for sponsorship via a digital signature. Also, ZEUS has a statistical evaluation function for the accounted building projects (https://www.energieausweise.net/homepage).

In the past years the system was also adapted for the general sanitations and the municipal buildings.

To ensure the effectiveness of the used measures, precise quality presets were generated for the particular points and declarations are required by the executing companies as guaranty. In the energy-monitoring database of the federal country of Salzburg 186 thermal solar plants in Salzburg are online, so that everybody can look at the production and the performance of the plants. A green line shows the calculated (prognosis) production and it is possible to see if the solar plant is working efficiently. This transparent system helps to increase the solar gains, because problems or defects are detectable and errors can be corrected very quickly.

RESULTS

About 70% of the whole construction sector in Salzburg is covered by the energy point model. Almost 95% OF large-volume residential building and 80% of the single-family houses are realised according to the point system. The incentive system in Salzburg has led to a real success story and improvement of building standards towards better sustainable performance. The energy points have led to a new way of thinking and awareness in the building business. Technologies for the use of renewable energies became standard solutions in sponsored residential developments (Mair, 2002; Mild, 2009; Oberhuber et al. 2005):

- · The specific heating load (W/m²) for residential buildings reduced from 63 W/m² in the year 1992 to 25 W/m², which signifies a reduction of 60%.
- · The average LEK-Value of buildings was 59% in 1993 and reduced to 20% (minus 65%).
- · The averagel U-Value could be reduced from 0,43 to 0,23 W/m².
- · The use of the solar energy for hot water generation and heating backup in the sponsored residential building increased from 9% to 64%. (667%).

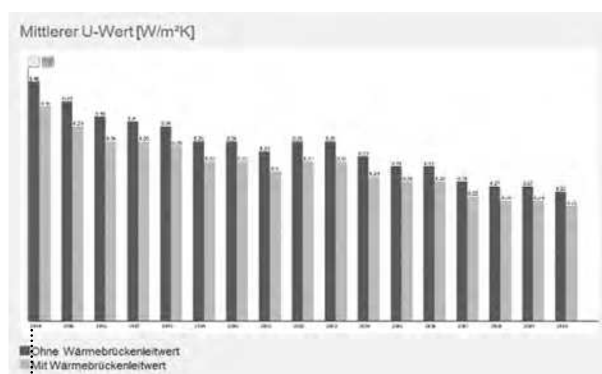

Figure 6. Development of the average U-value

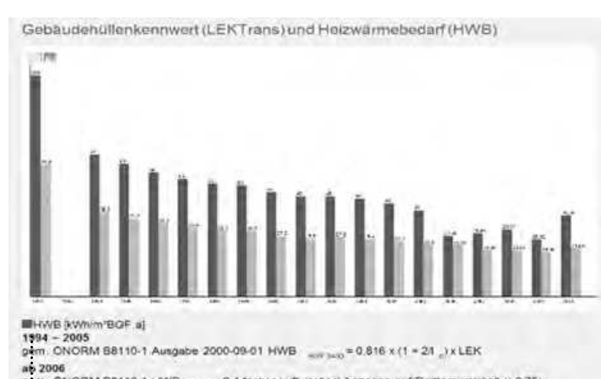

Figure 7. Development of the specific heat load HWB and the LEK-value.

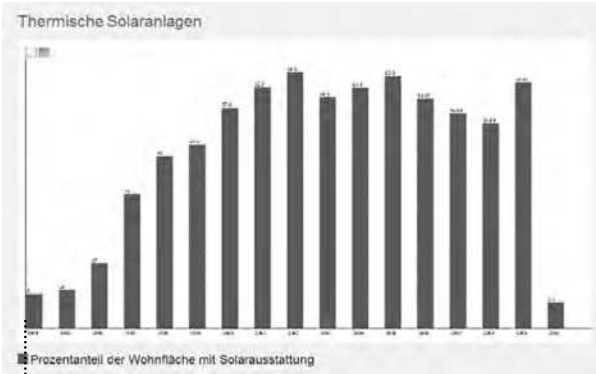

Figure 8. *Development of solar collector systems (in % of total m² living area)*

· The usable living space, which is heated via biomass, even increased from 10% to 83%.

Some examples of projects with high energy performance level

Figure 10. *Gneis Moos in Salzburg*

The whole roof of this house is covered with about 400m² thermal solar collectors. Solar energy covers here about 1/3 of necessary energy for heating and domestic hot water for 60 dwellings. The builder is GSWB. The architect is Georg Reinberg.

Figure 11. *Stieglgründe in Salzburg*

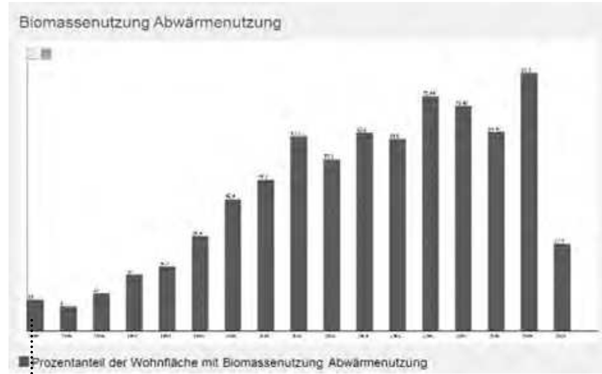

Figure 9. *Development of apartments using biomass-heating systems in % (of total m²) (status until January 2010-disregard last column)*

In this buffer tank the heat of the solar system is stored and heated via a pellet heater for 128 social dwellings. The builder is "Die Salzburg", the architect is Wolfgang Schwarzenbacher

Figure 12. *Samer Mösl*

3 wooden passive houses in Salzburg with 60 social dwellings. The additional necessary heat comes from thermal solar and wood pellets. The builder is Heimat Österreich, the architect is Simon Speigner.

DISCUSSION

In several countries discussion is going on about the need to merge smaller communities into bigger communities. Of course small communities cost money because they aal need their own administration and community buildings, but the experience of countries that have done a community reform shows that in the new bigger communities more social facts have to be administrated (that have been solved in the smaller structures without bureaucracy) and the rural areas have become more deprived and neglected. Especially for motivation purposes in issues of sustainability, the smaller structures have a better position because they are in closer contact with the public. The energy and work done by volunteers in the communities represents important social capital that can help to reach ambitious aims.

The "e5" program or European Energy Award is a program that is flexible enough so that each community can follow their specific necessities and it supports a longer period of a sustainable working program. Especially in the work in communities it is important to give clear long term goals to plan for longer than one period of political stability, but to be flexible enough in details to enable a mayor to promote major projects.

The work in the community depends a lot on active stakeholders and their interests. An advantage of the e5 is its contribution to motivating the community to work first on their main topics (traffic, tourism, school,….) and to integrate this into a process towards improvements on the path of sustainability. The benchmark and competition aspect motivates the communities to go a step further each year to reach the next level. Important is the support by the regional government up to the big yearly event "Energie Gala".

The "energy point model" is an example of an incentive system that has turned out to be a very suitable strategy for the implementation of energy- and environmental objectives and helped to market sustainable technologies into the housing sector. The success of the Salzburg point model is due to concurring factors:

- There was already a financial instrument for social residential building that could be adequately adapted.
- Concerning the pragmatic development, one has first of all concentrated on few easy ascertainable factors for the evaluation and calculation and has expanded the system in the course of time.
- A clear and simple system was chosen, which facilitates the handling process and avoids complex bureaucracy. This also supports a broad acceptation.
- The point model is a simple quality labeling tool for apartments, and a marketing instrument for the private consumer and building-owner as well ("12 points are better than 7").
- Good market knowledge and the cooperation with private commercial stakeholders make the broad introduction of new technology (solar plants, ventilation) at all possible for the social residential building sector.
- Accompanying measures, such as the software-development and the initial educational support were important to make the system successful at a broader level.

Strategies like the e5 and point system help to increase the quality and the energy efficiency with relative low costs for the public and are steps on the way to a sustainable housing sector.

CONCLUSION

A long term increase of energy efficiency and real implementation of renewable energies in the market are not possible only with a number of demonstration projects but need a step by step implementation in existing socio-economic structures. The municipalities are very important players in this field because they are able to act on a strategic important level as authority, owner of buildings and direct information point to the wide public. They are a hotspot between the common people, the economy and the government as legislator. In this position a good structured program can help to start a continuousprocess, to set up work plans and to motivate within a network of equal communities.

The e5 program in Austria (European Energy Award in other European countries) is a successful example, which has supported a good development in about 80 communities in Austria since to last 12 years.

The energy point system is a motivation program to increase the energy efficiency of buildings and implement renewable energies in the social housing sector. The system causes a step by step increase of building quality and helped thermal solar plants and biomass heating to become standard solutions in Austria.

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COOPERATIVE REFURBISHMENT
Inclusion of Occupants and other Stakeholders in Sustainable Refurbishment Processes in Multi-Floor Residential Buildings

Jürgen Suschek-Berger &
Michael Ornetzeder

Abstract
This article deals with the increasing demand for participation in sustainable refurbishment projects. Based on a recently finished study and some conceptual considerations we present a flexible model for involving occupants and other stakeholders in large-volume residential refurbishment projects. The study draws on fifteen interviews with refurbishment experts and three focus group discussions with occupants of recently finished projects. The article shows that in practice it is important to offer approriate opportunities for participation at each phase of the process. Although refurbishment projects in general run through a series of typical phases there is no such thing as a standardized 'ideal' participation process. Rather participation designs for large projects have to be 'tailor-made', taking into account occupants' expectations and abilities, legal requirements, the complexity of projected measures, and finally the often well established 'style of communication' already used by the housing company.

Keywords: *Participation, Sustainable Refurbishment, Multi-Floor Buildings, Occupants.*

INTRODUCTION

At the beginning of the 21st century, housing companies are confronted with a kind of paradigm shift. After five decades dominated by house building, refurbishment of the existing stock will become more and more important. Throughout Europe, nearly 170 million people live in multi-floor buildings on some 80,000 housing estates built in the post-war decades of rapid urban expansion (Eriksson & Dekker, 2000). Given the widely accepted claim for sustainable development, there is huge potential for ecological improvement within the housing sector. At present, about 40% of energy consumption and emission of greenhouse gases originates from the heating and lighting of buildings (Österreichische Bundesregierung, 1995). There is not only huge potential to cut back energy consumption, but water consumption, household waste management and recycling materials also. Recent research on life cycles of buildings shows that refurbishment in many cases is the more sustainable option compared to replacement by new construction (Klunder, 2005).

However, sustainable refurbishment projects should not only consider ecological and energy related aspects, but also take occupants and other stakeholders into account and try to negotiate mutual interests (ISOE, 2001). This is possible only if stakeholders participate in the planning and process of refurbishment.

This article is based on a finished project (Suschek-Berger & Ornetzeder, 2006), which was carried out within the national research programme, 'Building of Tomorrow,' initiated and sponsored by the Austrian Federal Ministry of Transport, Innovation and Technology. The aim of the project was to investigate practical experiences of housing companies with occupant participation on the one hand and to learn more about needs of occupants with refurbishment processes in multi-floor buildings on the other hand. Selected results have been published in an advisory brochure (Suschek-Berger & Ornetzeder, 2007).

Empirically, the article is based on three explored refurbishment projects, fifteen interviews with architects, representatives from housing companies and public administrations, three focus groups with occupants in buildings with recently finished refurbishment activities and a concluding workshop with refurbishment practitioners. Theoretically, it builds on the relevant literature on user participation.

SUSTAINABLE REFURBISHMENT AND PARTICIPATION

Normative concepts for sustainable refurbishments usually claim to consider a wide range of social, cultural, environmental and economic criteria (ISOE, 2001; for an overview see Mickaityte et al., 2008). According to those concepts, refurbishment projects should be seen as opportunity not only to make necessary repairs, increase comfort or improve the energy standard of the building, but also to consider issues like health, education and public awareness, social safety, land use, noise problems, cost-efficiency, cultural heritage or the wider surroundings of the building. As social aspects play an important role in sustainability concepts in general, participation of occupants and other stakeholders could be seen as an integrated part of sustainable refurbishments projects.

'Participation' is a broad-spectrum term covering a diversity of engagements from information to full mutual equality (Mitcham, 1999). In the field of refurbishment of large volume residential buildings, participation means that occupants have the opportunity to be involved in the whole process - irregardless of the extent to which this involvement is put into practice, and whether or not occupants make use of this opportunity. In any case, we could assume that there is one central social actor (e.g. housing association) who is responsible for the refurbishment project. This central actor has also to decide in which phase of the process occupants have to be involved, and to which extent (we will discuss this point in more detail in section 4).

From a more general perspective, Bischoff and colleagues (1995) have emphasised three main arguments for participation in planning processes: legitimation, efficiency and identification. Through a broad process of opinion forming, it is argued, the interests of citizens are taken into consideration and important decisions are democratically authorised (legitimation). The integration of laypeople could also lead to well-informed planning. People are experts of their everyday lives and such knowledge is of high value. It helps to avoid changes afterwards, objections or new planning (efficiency). If citizens are informed and integrated early on, it is more likely that the people concerned will accept and identify with the results (identification).

While democratic arguments stress the rights of those who are effected to have a say the local knowledge of users is at the centre of interest when efficiency is to be achieved. In order to gain as much information as needed, a broad spectrum of viewpoints should be represented in participation processes (Sclove, 1995). Lay knowledge and experience of occupants are indeed of very high value to the management of housing companies. Residents are familiar with problems in their settlement and their own flat so they know the most important areas for the refurbishment process. By using this local knowledge, housing companies are able to spare expensive investigations and planning to a certain degree.

As sustainable refurbishment projects typically are large and broad - covering as much as possible aspects and interdependencies - participation of occupants have to be seen as an integrated part of them. However, involvement of occupants does not lead automatically to the above-described outcomes. To which extent participation will show positive results depends strongly on how the communication process is organised during the whole refurbishment process. Before we will discuss this question in more detail, relevant social players in refurbishment projects and the most important phases of a refurbishment process will be presented in the next section.

THE CURRENT PARTICIPATION PRACTICE IN REFURBISHMENT PROJECTS IN AUSTRIA

In Austria, a large share of multi-floor buildings is owned by not-for-profit housing associations. These associations call on many years of experience regarding refurbishment projects. In the last 15 years, the requirements for refurbishment projects have increased significantly. While in the past it was standard to re-establish more or less the original condition of the building, current projects go far beyond this practice. Currently significant improvements, particularly with regard to energy saving measures (thermal insulation, new windows, efficient heating systems, solar heaters, etc.), are now state-of-the-art. However, projects aiming at comprehensive sustainable refurbishments are still rare.

As we saw in our interviews on ambitious projects, a large number of stakeholders are involved in refurbishment projects in the field of multi-floor buildings. The most important stakeholders are outlined in the following.

The residential housing association

As the owner of the building, the housing association is the central social player. The association is responsible for the whole refurbishment project, which includes the communication to all partners as well as the organisation of the participation process. Internally, the most closely involved departments are the 'building management' and the 'technical department'. In most cases, the building management is the main organiser of the refurbishment process. The technical department is responsible for planning, invitation of tenders and execution of construction work (sometimes specific steps in the procedure of technical processing are contracted out to external partners, e.g. architects).

Occupants

Owners of flats or tenants are effected by refurbishments in any case. To initiate and perform a process of participation, occupants must be willing to take part. At least a certain number of residents are usually interested in selected questions. The offers of the building management to participate have to be mutually agreed upon according to the residents' needs and information. It is often difficult to create space and time for all who are potentially interested in order for each to have a chance to participate. On the contrary, occupants should also have the 'right' to exclude oneself from participating in the process.

Construction companies

The building construction companies play an important role in the process because the beginning of a construction phase is certainly not the end of participation. They have to handle complaints, noise and dirt and safety issues. The companies have to ensure the quality of living during the long lasting construction phase. Professional contact with residents during the construction works, responding flexibly to evolving wishes and needs and conducting professional construction work in cooperation with occupants is an important part of the refurbishment process and must be considered as part of the participation process.

Neighbourhood

The community's surrounding is also important in the case of a refurbishment process. It is helpful to minimize inconveniences to the neighbourhood and inform neighbours about the planned process. This can be very important in terms of the neighbourhood's satisfaction with the refurbishment process.

Funding agencies or arbitration-boards

These institutions are also directly involved in the process because, for example, they are charged with forms of inspection in calls for tenders. They are also indirectly involved because they can influence the arrangement of the refurbishment processes by general guidelines. In some regions of Austria, if someone applies for a specific form of ecological support, the degree to which residents should be included is estimated.

Typically, refurbishment projects run through a series of sequential phases. Some of the above mention stakeholders are involved during the whole process, some others only partly or at a particular stage. In the following we will give a short overview of these typical phases.

In the beginning, the housing association comes to a decision as to which object in the owned stock should be retrofitted. When the decision has been made, the next step is a stock-check for clarifying technical details, followed by a rough planning of the refurbishment process. In this phase, a meeting with occupants is usually held, where the concept and costs of refurbishment are presented. If the residents agree to the concept, detailed planning is made as well as a call for tenders in finding building enterprises who can do the construction work. The best bidder is selected from the tenders. If the residents do not agree with the refurbishment costs the project has to be handled at the circuit court, which decides on a reasonable price for the residents. When this has been completed, the construction phase can begin. When the planned and concerted refurbishment work is finished, the project ends with a revisal of costs.

Concerning the question of ecological and energy refurbishment, we learned that the residential housing companies try to use approved strategies for information for and communication with occupants. On the one hand, they want to avoid the residents' discussions or objections, which could compromise the whole process of refurbishment, and on the other hand they often deny the residents' specialised knowledge, which may be very useful and helpful for the planning.

Based in these findings and a literature review we have developed a model that offers possibilities for participation in all phases of the refurbishment.

FLEXIBLE MODEL OF PARTICIPATION

Participation can take place on different levels and with varying degrees of involvement. Based on Beckmann and Keck (1999) and Wilcox (1994), we can distinguish four levels: information, communication, co-design and co-decision. Depending on the intensity of the occupants' involvement, it can start on any of these levels. These four levels cannot be distinguished selectively and do overlap, but with regard to the discussion on advantages and disadvantages of particular participation methods this classification is of central importance.

The flexible model of participation does not represent an 'ideal' participation process. It is rather a question of taking and using it as a 'tool-kit'. Elements and methods towards a suitable process for all phases of refurbishment and all levels of participation can be taken out, combined and used in order to inform or involve occupants. Based on the flexible model it should be possible to compose a 'tailor-made' process for each project. It is important that the selected elements and methods are in accordance with the occupants, the aims of the refurbishment and the 'style of communication' already used by the company.

In the following we discuss a few examples from the flexible model of participation. The model includes suggestions to design the participation process adapted to the different phases of a refurbishment project. Typical phases not only could represent widely spaced intervals but also request for quite different forms of participation.

Initial decision

In owner-occupied projects it is mandatory to include all occupants in the initial decision-making process (level of co-design). Whereas in projects with rented accommodations participation in this phase may focus to the levels of information and communication. Written information, surveys and excursions to previously retrofitted buildings or developments can be offered in this phase. Occupants should have the opportunity to see examples of successfully refurbished projects and to discuss whether they would like to have their own building retrofitted in a similar way. Small work groups and round tables can be installed to discuss the first steps of the refurbishment process and the potential costs.

Stock check

In this phase, occupants can be included in the form of building or development inspections. Because occupants know their own residential environment best, they can be invited to evaluate and assess it, as well as to make suggestions for improvement. We did such an inspection in cooperation with a housing association in our project, which brought a number of valuable suggestions for the forthcoming refurbishment process. As there is nothing to decide most methods appropriate for involving occupants in this phase aim at communication or co-design.

Rough planning

In this phase, participation should be offered on all levels using a mix of different methods. Here, the whole range of possible aspects of sustainability - from necessary repairs and ecological improvements to issues like health, social safety or the wider neighbourhood of the building - could and certainly should be addressed for the first time. It is important to provide sufficient information material and to run a two-way communication process during the whole planning. And at some certain points there is also a need for methods to make some important decisions including all or a majority of occupants. Appropriate methods include meetings for all residents and written questionnaires. Important information should be given in advance using oral presentations. Experts are needed to inform occupants about possible ecological options (e.g. selection of ecological construction materials, new heating systems, etc.) in a balanced and comprehensive way. Working groups focusing on specific issues can be organised for a smaller number of interested occupants. In this phase it may also be adequate to invite a broader range of participants, including not only technical experts and occupants but also representatives of the neighbourhood.

Detailed planning and call for tenders

Detailed plans are worked out on the draft agreed in the previous phase. Although detailed planning primarily is done by architects and energy technology experts, methods for communication and forms of co-designs would be possible. A proven but still rarely used method is the occupants' advisory board. This board - made up of a smaller number of named or elected occupants - supports the housing association with the views and meanings of and serves as information agent for occupants. Moreover, members of the board could be consulted when the call for tenders is evaluated and construction companies have to be selected.

Decision

The decision to commission construction companies is a crucial step in the whole process. In Austria it is mandatory to legitimate this decision with a voting procedure (simple majority of occupants). It is common practice that housing associations inform occupants about the results of the call for tenders including total construction costs in a meeting. The voting is done directly thereafter using written questionnaires. In Austria occupants have the right to submit a written objection if the estimated total cost for the refurbishment works exceed a certain limit (which could cause serious delays). Therefore a comprehensive communication and information policy is of crucial importance in this phase.

Construction phase

With the beginning of the construction works the context for organising a participation process changes again. A new partner, the construction company has to be integrated. Moreover it could be necessary to intensify the communication with the neighbourhood. Similar to the detailed planning phase an occupants' building committee could be installed, which accompanies and controls the construction work. A permanent on-site presence of the housing company is another option. It can be guaranteed by establishing a site-office, with regular consultation hours.

Reflection

After the construction works are finished occupants should have the opportunity to check accounts. Also, there should be room for reflection (What was done well in the process? What could have been done better?). As a method to get qualitative feedback a number of focus groups with selected occupants can be applied. This was done with one of our housing association partners to get a deeper feedback regarding the finished refurbishment process, and to get input and proposals for improvements for further activities of the housing association.

As we saw in our project, Austrian residential building associations are interested in tools and possibilities of participation as presented in the flexible model. In rare cases some of the presented methods are used already, such as excursions, working in close connection with elected occupants, small working groups and evaluation of the existing stock together with occupants, the installation of an occupants' advisory board, consultation hours and an office on-site during the construction phase or reflection on the refurbishment process with the involved occupants. However, in a typical refurbishment project only a few methods are used in a standardised way.

CONCLUSION

In this article, we have argued that sustainable refurbishment of buildings and participation of occupants is becoming more and more important. An early and systematic involvement of occupants could help in avoiding problems concerning the lack of support for extensive refurbishments currently encountered by housing companies.

Main participants in the refurbishment process are the residential building association, occupants, the social environment, construction companies and support institutions. They play an important role in a refurbishment process which includes a number of distinct phases. It is not necessary to involve occupants in all phases of a refurbishment process to the same extent, but it is important to offer appropriate methods of participation in all of these phases. We have shown that it is important to consider methods on four levels of participation (information, communication, co-design and co-decision). Levels and methods should be selected in accordance with the occupants, the requirements of the building, the components of the refurbishment and the 'style of communication' used by the housing company.

In the second part of the article, we have presented a flexible model of participation covering all phases of a refurbishment process and all levels of participation. The basic assumption was that housing companies have a kind of well-established 'tradition' of how to communicate with occupants. If more participation is needed in the future - e.g. because refurbishments will be larger and more comprehensive due to their sustainable character - it is important to build on these well-established communication practices.

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ADOPTION OF HIGHLY ENERGY-EFFICIENT RENOVATION CONCEPTS

Erwin Mlecnik

Abstract
More significant reductions in residential primary energy consumption and in space heating in particular, can contribute to achieving climate change and energy efficiency objectives. Project information from demonstration projects is now becoming available for highly energy-efficient renovation concepts.

The goal of this research is to understand how owner-occupants can be persuaded to apply far-reaching energy-saving renovations of single-family houses. To this end, the research examines drivers and barriers of owners to adopt highly energy-efficient renovation concepts. Theory on decision processes in innovation diffusion is used, in order to examine the adoption of integrated concepts to achieve high energy performance. Belgian case studies (different building typologies) were examined. Adoption drivers and barriers perceived by owner-occupants are analysed. This leads to improved understanding of characteristics that can persuade future adopters. Possible measures are discussed to overcome barriers in the introduction phase of innovation diffusion, and are illustrated more in detail with a case study. The research shows that especially expectations of improved comfort provide an opportunity for the market entry of integrated concepts. Owners, architects and contractors could benefit from increased attractiveness, competitiveness, affordability and availability of highly energy-efficient renovations. Holistic approaches (stronger coordination and clustered renovation concepts), higher skill competence (education) and improved communication (actor networks, significant economic incentives) are recommended.

Keywords: *Renovation, Energy Efficiency, Adoption, Innovation Diffusion, Demonstration Projects.*

INTRODUCTION

Highly energy-efficient renovation

Promoting energy efficiency in the existing building stock is essential to achieve the goals of the United Nations Framework Convention on Climate Change and its Protocols, for example Kyoto. Reducing energy use in buildings is considered to be one of the most important and affordable means to mitigate climate change (IPCC 2007). Buildings represent the largest end-energy use, since they account for approximately 40% of the world's total energy use (Laustsen, 2008). Despite signs of improvement, Europe's buildings are still a large energy consumer comprising 40% of final energy use and 36% of EU CO2 emissions (Ace et al., 2009; Itard et al., 2008). There are considerable differences between different European countries, but on average the residential stock, consisting of households, is responsible for 30% of the total final energy consumption, where consumption is proportional to the useful floor area. On average, domestic hot water and space heating are responsible for over 60% of the final energy consumption in both residential and non-residential stocks (Itard and Meijer, 2008). Given the considerations mentioned above, it is obvious that significantly reducing residential primary energy consumption and space heating in particular, can contribute towards mitigating climate change and to energy efficiency objectives.

European practice shows that it is technically feasible to renovate houses to a limited energy demand for heating of less than 15 to 30 kilowatt hour per square meter net floor area and per year (kWh/m2a), and a total primary energy demand of less than 120 kWh/m2a (E-retrofit-kit, 2008; IEA SHC Task 37, 2010). These projects make use of integrated renovation concepts, such as the passive house concept, and use innovative technologies, such as triple glazing, thermally insulated window frames and doors, thermal bridges, and air tightness solutions, and mechanical ventilation with heat recovery (see also: Guschlbauer-Hronek and

Grabler-Bauer, 2004; SenterNovem, 2007). Measurements confirm that these technologies, particularly when clustered together in an integrated concept (IEA SHC Task 37, 2010; Mlecnik et al., 2010), can lead to a significant reduction in energy demand for existing buildings after renovation. If a reduction of energy use in the building stock is to be achieved, owner-occupants need to consider the adoption of energy efficient renovation concepts. One can try to influence decision making processes of housing owners in such a way that an energy efficient renovation concept presents an attractive solution. Since highly energy-efficient renovations are still in a demonstration phase in many countries, there is a lack of empirical data derived from decision processes in demonstration projects. Innovation adoption

Innovation adoption

Already in the sixties, Rogers (1962) defined leading research about innovation diffusion. Rogers (2003) defined 'innovation' as an idea, practice, or object that is perceived as new by an individual or other unit of adoption. For renovation of houses, Buijs and Silvester (1996) also interpreted innovation in this broader sense that includes not only products, but also techniques, methods, services and abstract ideas or notions in parallel and closely related to product development. Rogers' diffusion of innovations theory (Rogers, 1962; 2003) has been applied to the diffusion of demonstration projects (Silvester, 1996; van Hal, 2000), or the diffusion of energy saving or environmental technologies (amongst other: Dieperink et al., 2004; Egmond et al., 2006; Alkemade and Hekkert, 2009).

The innovation-decision process was defined by Rogers (2003) as the process through which an individual (or other decision making unit) passes from first knowledge of an innovation, to forming an attitude towards the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision. According to Rogers' model, communication channels, and prior knowledge and conditions, can influence adoption. In the persuasion phase, the decision making unit can be influenced by the perceived characteristics of the innovation. From the communication perspective, Rogers (2003) defines five perceived attributes of an innovation, which can help explain the better adoption of an innovation. Different studies have shown each of these attributes to be relevant for residential energy use (Wilson, 2008).

Decision making in renovation has scarcely received scientific attention, although similar decisions as in new built constructions might play a role (Thissen, 2008). With environmental innovations in mind, Alkemade and Hekkert (2009) defined, amongst other, the creation of legitimacy as one of the basic functions of innovation systems development. Thissen (2008) has formulated some decision selection criteria with a relative importance suggested by industrial participants. Wilson (2008) investigated why and how homeowners decide to renovate their home, using different research models.

RESEARCH DEFINITION

Research goal

The goal of this research is to understand how owner-occupants can be persuaded to apply highly energy-efficient renovation concepts in renovations of single-family houses. Therefore the paper detects drivers and barriers in innovation-decision processes.

Selection of case studies

The research focuses on owner-occupant residential buildings. Belgian demonstration projects were selected for the study: In Belgium the majority of the housing stock is in private ownership. In Belgium, in rural areas, 81,8 % of dwellings are owned by the inhabitants; in city agglomerations, this percentage drops to 66,7 % (Hilderson et al., 2010). In order to obtain representative results for Belgium, reference buildings were chosen according to building typologies, which were defined on the basis of a statistical analysis of the Belgian residential sector (Mlecnik et al., 2010). The Belgian building stock is relatively old compared to other European countries: 15 % of the housing stock dates from before 1919 and 17 % from between 1919 and 1945, compared to European average values of 11% and 12% respectively (de Meester, 2010).

Research questions

The main research question is:

What can we learn from the adoption process within demonstration projects, in order to facilitate the

Building typology according to (De Herde, 2010)	Project number and heating demand after renovation
Vernacular house: often rural detached house from the 18^{th} to early 20^{th} century, patrimonial value; various forms, large habitable volume, traditional construction methods (local resources), usually no gas provision.	1: SHD_PHPP: 32 kWh/m^2.a 2: HD_EPB: 31,55 kWh/m^2.a
Average urban house from the beginning of the 20^{th} century: row house/ semi-detached, single-family dwelling, 5-6 m façade, average-large living area (min. 3 storeys + annexes), high ceilings, vaulted cellars, ornamented details (balconies, stonework, plaster), traditional and industrial materials, often lacking natural daylight, gas generally available.	3: HD_m: 110 kWh/m^2.a 4: SHD_m: 65 kWh/m^2.a 5. SHD_PHPP: 32 kWh/m^2.a
Interbellum village house: medium to large house (min 3 storeys), partially caved, simple elongated volumes sometimes with new annexes on the side, simple one-layered walls with industrial materials (concrete, brick), steel or wood, few ornaments, gas partially available.	6: SHD_PHPP: 34 kWh/m^2.a
'Modest' workman's house: row house dating before 1945, small volumes, relatively low ceilings, entrance hall often missing, 2 floors, small cave, simple construction often in bad state, frequently coal heating.	7: SHD_PHPP: 23 kWh/m^2.a 8: SHD_PHPP: 10 kWh/m^2.a
'Villa' first urban extensions: medium/ large houses from the 30'ies and 50-60'ies, detached/ twin, 'first generation' cavity walls (frequent thermal bridges), various volumes, play with materials, often fuel-based central heating.	9: SHD_PHPP: 15 kWh/m^2.a 10: SHD_PHPP: 43 kWh/m^2.a
Apartment building type 'Etrimmo': multi-storey building with balconies and elevator, dating from the 60'ies or 70'ies, often mixed ownership. Roof often flat, concrete and/or steel skeleton, single glazing, often important thermal bridges, frequent electrical heating.	11: HD_EPB: 75 kWh/m^2.a
Detached house in new neighbourhood: single-family house with 4 façades, dating from the 70'ies to early 90'ies, first in suburban areas, later diffusion to rural areas, often 2 storeys (one partially under the roof), with or without caves, conventional construction materials (brick, concrete, cavity walls), gas sometimes missing.	12: HD_EPB: 86,32 kWh/m^2.a; HD_m: 57,50 kWh/m^2.a
Apartment in a building divided in several living units: different configurations and ages, often rented from private ownership.	13: HD_EPB: 41 kWh/m^2.a 14: SHD_m: 40-60 kWh/m^2.a
Industrial or service building: different configurations and ages, often renovated to single-family houses, lofts or residential living units.	15: SHD_PHPP: 14,7 kWh/m^2.a

Legend:
SHD_PHPP: Space heating demand, value calculated with specialized Passive House Planning Package
SHD_m: Space heating demand, measured value
HD_EPB: Heating demand, including hot water, value calculated with Belgian energy performance regulation software
HD_m: Heating demand, including hot water, measured value

Table 1. *'Examined Belgian projects in the LEHR project according to Belgian building typology.*

further diffusion of highly energy-efficient renovation?

Three sub questions are derived from the main question:

1. How does a motivated owner-occupant adopt a highly energy-efficient renovation concept (case study)?
2. What were detected owners' drivers and barriers from all LEHR projects?
3. What can we learn from the adoption process in order to eliminate critical barriers for further diffusion?

Method

The research presented is restricted to an analysis of the owner-occupants' adoption in the Belgian demonstration projects studied within the framework of the Belgian Federal Science Policy Project: 'Low Energy Housing Retrofit' (LEHR). Realised demonstration projects were chosen according to the relevance of certain building typologies for the Belgian building stock. In these examples owner-occupants have chosen for integrated concepts, and not for single measures like roof insulation, window replacement, and so on. In many cases the decision to apply an integrated concept led to the involvement of an architect; we remark that this is not usually the case when individual measures are applied. Core information about the design, construction and performance of these renovations was systematically collected. The empirical data were gathered by means of interviews with owners, occupants and architects, both during renovation and after renovation, using a questionnaire focussing on perceived attributes of innovations, with both open and closed questions. In some cases, hard data were also gathered from measurements (see the associated references in Table 1 for further details). The questionnaire addressed amongst other:

- Characteristics of the decision-maker: social and economical background variables of the interviewees (4 items).
- Felt needs and problems: general satisfaction (12 items), quality of housing (12 items), construction (11 items), installations (10 items).
- Possible barriers to adoption of innovation: Perception of heating/ temperature (35 items), air humidity (18 items), ventilation/air quality (71 items), health issues (11 items).

One can define many other factors influencing social and individual attitudes and behaviour related to the decision process, but this was not the focus of the study.

To answer the first question, a case study in an urban setting is discussed in detail. This illustrates how all projects were analysed. To answer the second question, the results from all projects were assembled, as well as the empirical data from interviews. Where applicable, the interviewees were contacted to provide additional details about persuading factors, the use of communication channels (e.g. mass media or interpersonal), the position of the innovator in the social system (e.g. norms, degree of network interconnectedness, etc.) and the extent of innovation efforts.To answer the third question, the paper discusses the detected drivers and barriers in order to facilitate innovation diffusion.

DETAILED CASE STUDY

This case study (number 8 in Table 1) is an example of an integrated highly energy-efficient renovation concept with a specified energy savings target. This section illustrates how projects, in this case a renovation of a 150 year old terraced house in the village of Eupen, were studied in detail in line with Rogers' perceived innovation characteristics (Rogers, 2003).

Initially, the owner wanted to reduce energy consumption by a factor of 10, since he had seen what was possible from these kinds of renovations in other countries. During the process, the owner specified a goal to reduce heating demand below 15 kWh/ m2.a. We remark that during the course of this project, grants and fiscal incentives for low energy housing retrofit were gradually introduced, particularly to support the passive house concept. However, these incentives were not available at the start of this project. Finally, a measured heating demand of 12 kWh/ m2.a was achieved in the first year, and the annual cost of energy consumption was reduced from €2149/ year before renovation, to €150/ year after renovation. It can be remarked that the owner also behaves very consciously regarding energy use.

The renovation comprised a modified arrangement of spaces and the demolition of existing annexes, while a new annex and roof structure with a wooden frame construction were installed. Innovative solutions were provided for thermal insulation of the building shell (continuous inside insulation of the façade), building air tightness, elimination of thermal bridges, outer joinery with triple glazing, mechanical ventilation with air-air heat recovery including a ground-air heat exchanger, and the use of a pellet heater and external sun protection using solar collectors.

The innovator's desire to build a demonstration renovation project was inspired by the relative advantage of this kind of project. Instead of only replacing the worn-out roof and glazing, the owner was driven by the desire to increase the habitable area and to add an up-to-date extension. Another major factor that played a role was an asthmatic child. He reasoned that the old convectors and damp walls would certainly give rise to dust, moisture and lead to health problems. Therefore, the owner decided in an early stage of the design process to have mechanical ventilation with filtering and heat recovery. Renovation was preferred to a new built construction because of substantially lower VAT.

The observability of the project further played an important role. The owner, an architect involved in the promotion of passive houses, was aware of the opportunity to increase social prestige by opting for a passive house standard, since extension, roof and glazing had to be replaced to obtain the transformation goal anyway, and the orientation of the building was suitable. In conclusion, the owner was driven by relative advantage, i.e. financial advantage, comfort improvement, and social prestige factors, and achieving the passive house standard only required a few additional minor measures, as the next logical step for the owner. The economic and environmental impact was studied on completion of the project, and the intuitive decision of the architect could be confirmed by a scientific study on the economic and environmental impact (Vrijders and Delem, 2010).

The project proved to be complex and not particularly compatible with the contractors' prior experience, but it did present the owner-architect and the contractors with an opportunity to learn by

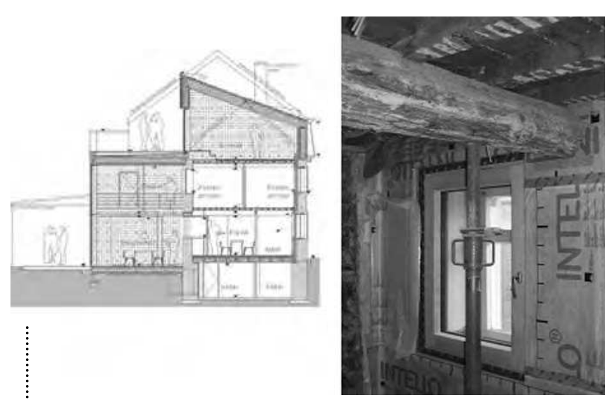

Figure 1. Case study: integrated approach towards passive house standard resulted in 90% energy reduction for heating. Section of the row house in Eupen (before and after renovation, left) and detail of interior insulation, air tightness and cutting through carrier beam (right). Source: PHP, FHW architectes (IEA SHC Task 37).

doing. Being the first demonstration project of a renovation towards the passive house standard in Belgium, the owner had to find all the technological solutions at regional level. In the design stage, extra care had to be taken with the evaluation and solution of thermal bridges. The city did not grant a permit to insulate the façade on the street side, so a solution for interior insulation on the front façade needed careful study and development. The architect had to find this know-how from demonstration projects abroad. Making the building airtight was a technological challenge (see Figure 1), as was careful dimensioning and control of the ventilation system. An additional ground-air heat exchanger was installed for summer comfort.

ANALYSIS

Detected drivers

Similar drivers and barriers were detected in many projects. Table 2 provides an overview of the most important detected drivers derived from the questionnaires. Clustering innovative technologies was observed as something obvious by owner-occupants in the demonstration projects. In several cases interviewees were thinking in integrated approaches. For example, one interviewee mentioned that the look of the building, air quality, and noise levels can be changed through renovation, for example by dealing with façades, ventilation systems and taking acoustic measures. For physical reasons, thermal insulation solutions were often combined with air tightness, thermal bridge solutions and the provision of adequate ventilation (except one case). Façade insulation was combined with window replacement (expect one case). Connecting insulation components led to innovative solutions (several cases). In most cases ventilation systems with heat recovery were chosen to provide for air quality. If we take a closer look at Table 2, we observe a number of important adoption parameters:

a) Increase of living area.

A prominent adoption parameter is to extend the living area or to rearrange spaces and functions. Transition to owner-occupancy usually involves extension. In many cases, an integrated concept was considered because of a wish to extend a small house or a wish to relocate the domestic functions of the property. For more recent houses and for houses that had urban restrictions this criterion was less important.

b) Structural improvement.

A second important adoption parameter is the wish to improve the structure of the residence and the basic amenities. The projects with the lowest perceived basic 'quality' had higher ambitions for energy saving and upgrading. Those owner-occupants were easier convinced to apply an integrated renovation concept. There was still room-based coal, fuel or electrical heating in some buildings before renovation. In most projects, interviewees did not wish to reuse these systems.

c) Comfort improvement.

A third important parameter was the wish to improve the comfort of the residence. Important comfort parameters include thermal comfort (winter and summer), air quality, elimination of draught because of air leakages, visual quality, and, in some cases, elimination of outdoor noise. Interviewees also relate the comfort of residences to satisfaction with the living environment. The cases show that a lack of comfort prior to renovation can be related to the pre-World War heritage of old industrial and rural areas. On average, houses built more recently tend to have slightly higher comfort levels before renovation.

d) Energy saving.

During the decision process, the implementation of energy saving technologies is usually only considered after the previous considerations. Most interviewees linked comfort improvement directly with energy saving by mentioning specific innovative technological solutions. Very motivated owner-occupants often link energy saving with increased personal status or an increase in future property value. The choice for renewable energy systems was also popular, although not considered essential to achieve highly energy-efficient buildings.

The sheer will of the actors involved to save energy appears to be an important driver to reach overall good energy performance. In contrast, the existence of grants for energy saving measures did not appear to be a very important driver for the owner-occupants, except in the Brussels Capital Region, where the grants are substantially higher than in other regions.

Important detected drivers	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Project number														
Extension of living area	o	+	-	-	o	+	+	++	++	+	++	-	++	+	o
Rearrangement of spaces	++	o	-	-	+	o	o	++	++	o	++	-	++	+	++
Structural improvement	+	++	+	+	++	+	++	++	++	+	++	o	++	++	++
Improvement of thermal comfort	+	+	++	+	+	+	+	+	+	++	+	+	+	+	+
Improvement of air quality	+	-	o	+	o	o	+	++	o	+	+	-	o	+	+
Improvement of daylight/ views	+	+	o	+	-	++	++	+	+	+	+	-	o	o	+
Elimination of air leakages	+	o	+	+	+	+	+	+	+	+	+	+	o	+	+
Elimination of outdoor noise	o	-	-	+	o	o	o	+	o	o	+	o	o	o	o
Wish to save energy	+	+	+	+	+	+	+	+	+	+	++	+	+	+	+
General environmental concern	+	+	+	+	+	++	+	+	+	+	++	o	+	+	+
Health/ecological concern	++	o	o	+	+	++	+	+	o	++	o	o	+	+	o
Wish to apply best technologies	o	++	-	+	o	+	o	+	-	+	+	+	o	+	+
Wish to learn	+	+	-	++	o	+	o	+	o	+	++	o	o	++	+
Aesthetical reasons	+	o	+	o	o	+	+	o	+	o	+	-	o	+	o
Eliminate old heating systems	o	+	-	o	o	o	++	+	+	+	+	-	+	o	o
Grants for low energy measures	o	-	+	o	++	-	o	-	o	++	+	o	o	o	o

Legend:

++	*very important*
+	*important*
o	*not mentioned*
-	*not important*
1,2	*vernacular house*
3,4,5	*average urban house, beginning of the 20th century*
6	*interbellum village house*
7,8	*modest' workman's house*
9,10	*villa' first urban extensions*
11	*apartment building type 'Etrimmo'*
12	*detached house in new neighbourhood*
13,14	*apartment in building divided in several living units*
15	*converted industrial building*

Table 2. Detected drivers in Belgian projects in the LEHR project.

e) Environmental concern.

Some owners were driven by general environmental concern and especially the will to provide or demonstrate sustainable solutions for their children, or for clients (in cases where the owners were also architects). Some interviewees linked environmental concern directly with the use of ecological and healthy materials, and accepted energy saving merely as a partial solution in a more general future-oriented framework. Many interviewees were concerned about health issues of concepts and materials. The lower focus on energy saving sometimes resulted in lower final energy performance, since owner-occupants preferred to primarily invest in ecological or healthy materials.

Detected barriers

In all cases technological problems had to be solved, but the owner or the architect usually found a suitable technology available on the (international) market. The cost barrier proved to be less significant for the innovators, although significant grants were a driver in the Brussels region. Most owners thought they were not well informed at the outset, and almost all of them engaged in some form of self-education. In most cases, the integrated concept approaches required consulting an architect since the renovation activity had to be declared to the local community. In a few cases, existing urban policy led to more complex solutions. For example when local policy did not allow outside façade thermal insulation, owners had to choose for inside thermal insulation.

The difficult adoption by architects and contractors was detected as a very important barrier. In three cases architects were not involved or trusted and the owner did the whole coordination of the renovation. The owners of one other project had difficulties finding an architect willing to think in an integrated approach. In one case, the owner preferred to commission a specialized consulting agent to determine the best available technologies instead of an architect. Many owner-occupants stated that they had to check that the contractors were doing their job properly. Most interviewees had to look for suitable contractors themselves. Some interviewees suggested compiling a list of contractors specialized in highly energy-efficient renovations. Adoption problems by contractors occurred in very ambitious passive house renovations, but also 'more easy' low energy renovation concepts were sometimes experienced as cumbersome by contractors. For example, one roof contractor was not familiar with the carpentry for extending a roof border, and had to learn by trial-and-error. Some interviewees complained about diminished comfort for a long time, because many rooms in the house could not be used for months.

In one case the interviewees mentioned that this was due to contractors not sticking to the agreed time schedule. The resulting project was consistent with the required comfort and financial needs of the adopters, but the interviewees would not easily recommend others the same experience.

In general, a high ambition level of the owners, architects and contractors involved resulted in better performance achieved. Project with no specific energy savings target defined in advance, also reached less energy saving. The owners who wanted to spread their financing and who opted for phased retrofit, achieved lowest energy saving.

DISCUSSION

The previous adoption research is discussed in the process of innovation diffusion. Innovation diffusion can be defined as the processes by which an innovation is communicated through certain channels over time among the members of a social system (Rogers, 2003). In these terms, diffusion is mainly explained in terms of communication (attractiveness). Obviously, adoption is also constrained by situational factors such as lack of resources (project number 3: this lead to partial retrofit and only limited energy saving), or access to technologies (e.g. project number 2: passive house technologies were wished for, but not yet available on the Belgian market). A general overview is given of what all cases teach us about the perceived attributes that can lead to persuasion to implement highly energy-efficient renovations.

Relative advantage: we can expect that the greater the perceived advantage of the renovation idea, the more rapid its rate of adoption will be. What matters is not so much energy saving advantage, but whether an individual (owner-occupant, architect etc.) considers a highly energy-efficient renovation to be better than other traditional options. Increased space, structural improvement and improved comfort are more important drivers than pure energy saving. Also, provision of better health and environmental conditions can be considered as an advantage. Mainly non-energy and non-financial factors can drive the renovation: social prestige satisfaction (see detailed case study), convenience and comfort expectations. An important barrier is that many architects prefer to focus on new built construction, which is perceived as easier.

Compatibility: energy saving can be compatible with other main adoption criteria, such as structural and comfort improvements, general environmental concern, and even investment cost. The more energy motivated owner-occupants opted for high energy standards, leading to high involvement and finally also to better energy quality. People who had already renovated in the past can be convinced to take additional building-related measures to improve comfort (e.g. project number 3). In theory, this provides an opportunity for the market increase of innovative technologies for highly energy-efficient renovations, and for addressing new target groups. However, there is a risk that only partial renovations are performed, leading to lower energy saving.

Complexity: we can expect that when more convenient innovations are on offer e.g. with less intervention in the interior space, they will be adopted more rapidly. In most cases, the interviewees perceived renovation projects as difficult to understand and implement, requiring personal education. Internal thermal insulation in particular proved to be complex to implement. But also for low energy renovation, the architect and contractor sometimes do not have standard solutions for common problems. Continuous educational effort appears to be necessary to overcome this barrier, particularly for architects and contractors, and even for owner-occupants to self-educate. Also, standard solutions for renovation can be provided through public information sources (e.g. Zelger and Waltjen, 2009). Currently, the architects involved generally tried to make the best choices from a budget imposed by the client, while their know-how needed to be upgraded. The contractor often remained the executor of a task that the design team had specified in plans and often during informal discussions.

Trialability: the actors involved in all the demonstration projects had to learn by doing. When traditional actors were involved, this sometimes happened by trial and error. Almost all interviewees stated clustered approaches as a trial. Peer experience or social feedback for integrated concepts was often found in new built constructions, for example passive houses, or from architects' recommendations. The implementation of thermal insulation or mechanical ventilation with heat recovery in highly ornamented façades or interiors proved to be a challenge, but not unachievable.

Observability: interviewees reported that the proposed ease for individuals to see the demonstration project (in the LEHR project files) facilitated the process to obtain motivated architects and contractors. Indeed, market actors perceiving good relative advantage from their involvement in demonstration projects, documented as high quality projects, can be expected to be proud of their project and be willing to demonstrate it to other actors. In some cases, the actors involved increased visibility by referring to project leaflets, and easily accessible internet information. Therefore, a way forward for diffusion might be media campaigns, the recognition of quality buildings, and the explicit mentioning of the associated actors and change agents in listings and documentation.

CONCLUSION

In pursuit of the stated goal, a decision model based on Rogers' innovation diffusion theory has been tested on a limited number of single-family owner-occupant case studies.

Demonstration projects in Belgium show that owner-occupants and architects alike can take a leading role in realising demonstration projects and achieving highly energy-efficient renovation. For all kinds of building typologies high energy-efficiency was achieved through clustering of energy-efficient solutions in integrated concepts. Renovation projects using clustered innovative passive house technologies led to the highest energy saving. In Belgium, the passive house concept in particular provides an opportunity for owner-occupants to negotiate a well-defined target with executing parties. The LEHR project now provides structured information according to building typology, so that potential adopters can try out similar concepts and learn from these demonstration projects.

The demonstration projects indicate that owner-occupants are motivated to adopt highly energy-efficient renovation concepts by the promise of structural improvement, increased surface area, and improved comfort. Especially a concern for comfort improvement can lead to energy-saving solutions that cluster comfort oriented technologies in innovative concepts, like the passive house renovation concept. But also, owner-occupants can be driven by a more general concern for the environment and for improved health conditions. These issues should also be addressed in the further development of energy-saving innovations, since for some owner-occupants this criterion is more important than energy saving.

To date, only a few planners, consultants, building companies and suppliers of building materials, have adopted highly energy-efficient renovation concepts. In theory, the adoption problems by, amongst others, architects and contractors can be overcome by increasing the attractiveness, competitiveness, affordability and availability of highly energy-efficient renovation concepts for these target groups. Since eliminating barriers requires considerable effort both for low energy renovation concepts and more advanced concepts like passive house renovation, it is recommended to focus on providing competences and resources for the realisation of highest energy saving targets for existing building typologies.

It is not expected that demonstration projects alone will guarantee the associated market development required. Holistic approaches, higher skill competence and tighter coordination in the planning and construction phases are particularly important for highly energy-efficient renovation concepts. When it comes to the lack of knowledge among the actors involved in demonstration projects, social strategies can be recommended, for example setting up peer-to-peer knowledge exchange networks for owner-occupants, architects and contractors. To go beyond the demonstration project, dissemination and education are necessary to improve skills and competences. Consequently, communication plans, and possibly also quality assurance systems, have to be put in place to maximize the impact of the knowledge gained. The attractiveness of highly energy-efficient renovations could also be increased by providing reference networks, suitable tools and significant economic incentives for both customers and executing parties, in order to improve the relative advantage and observability of the actors involved.

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LONDON HOUSING AND CLIMATE CHANGE: Impact on Comfort and Health - Preliminary Results of a Summer Overheating Study

A. Mavrogianni, M. Davies, P. Wilkinson & A. Pathan

Abstract
Climate change presents potential increased threats to the comfort and health of urban populations as a result of higher summer temperatures. This paper reviews recent research on the climate change adaptation potential of urban environments and focuses on a major conurbation, London. Recent work relating to the impact of exposure to heat on population health is also noted. Data obtained from a pilot monitoring study carried out in a subset of 36 dwellings (from a total of 110 dwellings in the overall study) across London during the summer of 2009 is then discussed. Preliminary results illustrate the need to quantify the net impacts of individual building characteristics and the location of each dwelling within the London heat island. During a hot period, more than 40% of the monitored bedrooms failed the recommended overheating criteria during the night time. There was some indication of purpose built flats being more prone to overheating. The potential use of such data as the basis of a heat-related health risk epidemiological model for London is discussed. Such a tool would help health policy makers to target the most vulnerable building types and areas.

Keywords: *Climate Change, Urban Heat Island, Domestic, Overheating, Health Risk.*

SCOPE

The rise in external summer air temperatures due to combined climate change and urban heat island effects could potentially pose a future threat to the comfort and health of urban populations. In the recent past, extreme heat events, such as the European heat waves of 2003 and 2006, led to a significant number of excess deaths and economic losses. The present study reviews recent research on the impact of heat exposure on population health and the climate change adaptation potential of urban environments by focusing on a major conurbation, London. In addition to the study of external ambient temperatures, there has been an increasing interest in assessing the impact of indoor temperatures on occupant health during a heat event and the varying degrees of thermal protection offered by urban building structures.

The analysis of recent evidence of overheating in a small sample of dwellings during the UK 2003 heat wave (Wright et al., 2005) highlighted the importance of summer monitoring of larger domestic building samples in urban environments by adopting a case study approach. Indoor overheating is a complex phenomenon likely to be influenced by a number of parameters. The risk of overheating is a function of a) the location of a building within the urban heat island, b) the microclimatic characteristics of the specific site and c) the thermal quality of the individual dwelling (e.g. insulation levels, heat loss parameter, glazing ratio, orientation, ventilation regimes etc.). A research question to be further explored is the quantification of the relative importance of the above factors. The testing of this combined hypothesis is the subject of an ongoing extensive study. In this paper, an initial set of indicative results is presented from temperature measurements undertaken during the summer months of 2009 in a number of London dwellings.

BACKGROUND

Global warming trends

There is clear scientific and political consensus that anthropogenic global warming is the greatest challenge facing humankind (IPCC, 2007). According to current predictions, the frequency and severity of extreme weather events such as heat waves, droughts and floods will increase in the future. Despite the fact that developing countries are expected to be harder hit by climate change effects (The World Bank, 2009), industrialized countries are also projected to experience the detrimental effects of changing weather patterns. For instance, European populations currently living in temperate climates are expected to suffer from an increase in heat wave occurrence and severity (Meehl & Tebaldi, 2004); hot summer temperatures like the ones experienced during August 2003 in London and Paris, the warmest August ever recorded in the northern hemisphere, are expected to be common by the 2050s (GLA, 2006). As a result, a large and growing body of literature has investigated the impact of extreme heat events on heat-related morbidity and mortality (WHO, 2003; Baccini et al., 2008; WHO, 2009). As is demonstrated in a series of recent studies (Haines et al., 2009), appropriate action to tackle global warming worldwide will not only lead to climate change mitigation but also result in important public health co-benefits.

Urban Warming: The heat island component

The impact of heat waves is expected to be exacerbated in urban areas. This is important given the trend of continuing urbanization: in 2008, for the first time, more than half of the world's population was living in urban settlements compared to one third in 1960 (UN, 2007). The 'urban heat island' phenomenon (UHI) consists of a series of 'inadvertent' local and regional climatic modifications caused in urban environments due to alterations of the land surface form and physical properties (Landsberg, 1981; Oke, 1987). In brief, temperatures tend to be systematically higher in built up environments compared to adjacent rural areas due, in part, to geometry related reduced radiant losses. Low albedo artificial surfaces and air pollution in dense conurbations tend to trap and retain the heat produced from solar radiation and anthropogenic activity (Ichinose et al., 1999; Sailor & Lu, 2004; Hamilton, 2009). In addition, limited heat dissipation takes place due to reduced night ventilation resulting from lower wind velocities in the urban canyons. Moreover, urban surfaces are characterized by limited latent heat flux due to the lack of cooling vegetative or other water impervious surfaces (Grimmond & Oke, 1999; Grimmond & Oke, 2002). Importantly, the UHI is predominantly a night time phenomenon which is accentuated on calm cloudless nights following a day with similar conditions (Basu & Samet 2002a; de Donato et al., 2008).

The London climate

The London urban heat island is probably one of the best documented instances of urban climate modification (Howard, 1833; Chandler, 1965; Lee, 1992; Graves et al., 2001; Jones & Lister, 2009). According to Graves and colleagues (2001), the mean peak temperature differential between the British Museum and a rural reference station located 30 km west (Langley Country Park) was 3 °C over the summer of 1999. The location of its thermal centre varies with wind speed and direction.

London forms a distinct case of regional climatic modification due to a number of reasons (LCCP, 2002):

(a) As of 2008, London had a population of 7.7 million which was projected to reach 8.1 million by 2016 based on past growth rates (Bulkeley & Shroeder, 2008). With a population density twice as that of other UK cities, the climate change impacts on the built environment, transport system, air pollution and natural resources are exacerbated.

(b) The indoor overheating effects will tend to be intensified in London due to the particular characteristics of its building stock. Of the 3.1 million dwellings currently existing in London as of 2002, 60% were owner-occupied and around half of them were flats (LCCP, 2002). This is a much higher percentage compared to the rest of the UK. The percentage of flats rises to 75% in inner London. Given that flats, in general, are more susceptible to overheating (Vandentorren et al., 2004), a London case study is of significant importance.

(c) Owing to its diverse social structure and higher disparity of income, it is highly likely that London's vulnerable social groups will be affected disproportionately by climate change impacts. For example, the underprivileged could be more acutely affected by overheating in structurally unfit and overcrowded houses during a heat wave due to their inability to pay for an appropriate adjustment of their immediate environment (WHO, 2003).

Furthermore, as a global city, London indirectly exerts a major influence on the international climate policy framework. Thus, it has the potential to function as an exemplary non-nation state actor for several other cities worldwide in terms of domestic climate politics (Bulkeley & Shroeder, 2008). For instance, tackling building summertime overheating in the future should not rely on mechanical means e.g. air conditioning, as this would compromise London's current challenging targets to curb its CO_2 emissions by 60% by 2050 compared to the 1990s as set out in the revised Mayor's Action Plan (GLA 2010).

Health impacts of heat waves

A range of epidemiological studies using time-series analysis have been undertaken in order to investigate the impact of heat stress on morbidity and mortality (WHO, 2003; Baccini et al., 2008). Heat-related death is defined as death in which exposure to a high ambient temperature either caused or contributed to death (Donoghue et al., 1997; Armstrong et al., 2010). Excess mortality is defined as the number of deaths above the average historic mortality figure recorded in a given period and region (Basu & Samet 2002b).

Several studies (WHO, 2003; Kovats et al., 2006) suggest that the high temperature-related health risks are higher in urban areas than in surrounding rural areas. In England and Wales, an excess mortality of 619 extra deaths (a 9% increase) was attributed to the 1995 heat wave, much of which was concentrated in London and the South East, where temperatures were highest. The heat-related increase in mortality in London was around 16% (Rooney et al., 1998). Similarly, 2,139 excess deaths were recorded during the 2003 heat wave (a 17% increase in England and Wales). The excess mortality in London was 42% (Johnston et al., 2005; Kovats et al., 2006) (Figure 1). Those at greatest risk were the elderly.

Vulnerability risk factors

Vulnerability to heat stress may be considered in relation to three factors: exposure to heat, sensitivity and ability to adapt (WHO, 2009). Several studies have highlighted the potential determinants of high-risk population groups, mainly focusing on sensitivity factors such as age and fitness (people aged 65 and over as well as children and less fit people, WHO, 2003), chronic illnesses and other

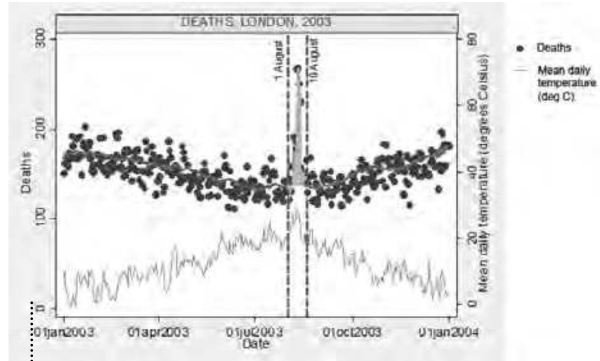


Figure 1. *Ambient temperature and summer mortality relationship in London during the 2003 heat wave*

medical conditions (diabetes, fluid/electrolyte disorders and certain neurological disorders, WHO, 2009) and social isolation (Kovats & Hajat, 2008). It is also understood that lower income groups are characterized by a lower adaptive capacity to changing weather as they might be unable, for example, to purchase air conditioning units or do not have access to 'cooler' or outdoor spaces.

With regard to exposure, there is insufficient evidence on how housing quality and indoor temperatures, influence the risk of heat-related morbidity and mortality of residents (WHO, 2009). Despite the fact that so far there has been a wealth of literature examining the relationship between outdoor temperatures and mortality, far too little attention has been paid to the indoor conditions. This is a research question of great importance, given that Europeans tend to spend the majority of their time indoors, either at home or in the office.

Adaptation and mitigation policies

As suggested in the EU White Paper on "Adapting to Climate Change, Towards a European framework for action" (Commission of the European Communities, 2009), adaptation and mitigation measures should be closely interlinked. Current public health policies and guidelines vary significantly in terms of scale and time span. In the short term, immediate public health responses will minimise the adverse health impact of heat waves by targeting the most vulnerable individuals and enabling them to better cope with extreme weather conditions. In the mid- and long-term, however, more radical adaptation strategies will be required at the building, neighbourhood and city wide scale.

A particular emphasis is placed on urban planning and policy making worldwide not only because climate change impacts are expected to be harder felt by the urban poor, but also because cities have the potential to function as centers of innovation for exemplary showcasing of low carbon technologies and sustainable urban design (UN Habitat, 2009). In recent years, green programs have triggered a series of climate change action plans in some of the largest world cities. For instance, the Clinton Climate Initiative (CCI, 2010) has partnered with 40 'global' cities (C40) including London, New York, Paris, Beijing, New Delhi and Sydney, to initiate local urban adaptation and mitigation plans and facilitate the exchange of information and best practice (C40 Cities, 2010). With regard to heat island management in particular, 13 'areas for action' were charted by city planners during the 2008 C40 Conference on Climate Change held in Tokyo (C40 Cities Tokyo, 2008a). Best practice short term heat wave planning for urban areas were provided through hot weather warning systems developed by Hong Kong and Toronto (C40 Tokyo Cities, 2008b). A number of long term urban planning measures to mitigate the urban warming effects were also showcased. These included design interventions at roof level, e.g. green and cool roofs, and at ground level, e.g. low albedo paving materials, shading and extensive planting of public spaces, enforced by policies such as the Paris Climate Protection Plan (Mairie de Paris, 2007) and the Toronto Green Roof Bylaw and Eco-Roof Incentive (City of Toronto, 2010). Efficient cooling systems such as cooling towers and district cooling systems are applied in Honk Kong (C40 Tokyo Cities, 2008c) offering an alternative to conventional air conditioning systems. Additionally, a key measure to alleviate overheating is anthropogenic heat management through initiatives such as the Energy Efficiency in Public Buildings in Buenos Aires (C40 Cities Tokyo, 2008c). Flooding is also a particular concern for Delta Cities such as Copenhagen, Rotterdam, London, Madrid, New York, Los Angeles, Hong Kong, Jakarta, Lagos, Shanghai and Tokyo. The Rotterdam Climate Proof climate change action plan offers a number of flooding defense solutions through the construction of canals, floating parks and domestic complexes (Rotterdam Climate Initiative, 2010). The New York Climate Change Initiative also focuses on the development of 'toolkits' able to identify vulnerable neighbourhoods and develop community-specific climate adaptation strategies (New York City, 2010). Relevant measures and policies to be implemented in London are described in more detail below.

a) Short-term action

The 'London's Climate Change Adaptation Strategy' (GLA 2008) lists a series of short-term emergency actions to deal with overheating in buildings and reduce the heat stress of Londoners indoors and outdoors through a heat-health warning system (HHWS: WHO, 2009). Through the establishment of a number of collaborative mechanisms (e.g. Greater London Authority, the Met Office, Health Protection Agency), an alert system will be set up to disseminate information and increase public awareness on heat-related health risks following timely meteorological warnings (HPA, 2006) with a special focus on the most vulnerable population groups. To reduce the individual and community exposure to heat, the public's access to 'cool' buildings will be facilitated.

b) Mid- and long-term adaptation

London has adopted a multidisciplinary, proactive approach in order to limit the exposure of its dwellers to heat which involves urban planning and building design decisions. Generally, the main problem associated with any attempt to create a climate change resilient city is that existing urban patterns are difficult to reconfigure. The physical structure of most cities worldwide is predefined to a large extent given that the existing building stocks are characterized by comparatively long physical lifetimes and low turnover rates (approximately 1% per annum in the UK: DCLG, 2006). According to recent estimates based on current growth rates, two thirds of the UK domestic stock likely to exist in 2050 has already been built. Importantly, London's 'hardware' (LCCP, 2002), its existing infrastructure and building stock fabric characteristics were shaped by the requirements of considerably different (past) climatic conditions and are, therefore, unprepared to cope with the stress exerted to it by extreme weather events. However, there is still significant refurbishment potential of the existing stock, as well as for change in the major redevelopment areas (e.g. Thames Gateway, East London).

Managing London's UHI during the summertime plays a key role in any strategy to minimise the health impacts of overheating in London. The draft

'London's Climate Change Adaptation Strategy' set out the plan for the creation of an 'Urban Heat Island Action Area' within the central London boroughs where 'new development must contribute to offsetting the urban heat island effect' (GLA, 2008). It is suggested, therefore, that all major new developments: a) have a green or 'cool' (low albedo) roof, b) vent their potential waste heat using mechanical ventilation or cooling systems above the roof level and c) plant and maintain additional street trees. In addition, an 'Urban Greening Programme' was initiated through which London local authorities are encouraged to apply their Open Space Strategies to identify opportunities for planting. Urban greening will be prioritized and the land cover will be enhanced in the most vulnerable areas.

GLA (2008) offers the following London-specific urban planning guidance to reduce the summer UHI:

a) Optimising the orientation, width-to-height ratio and, as a consequence, the sky view factor, of London street canyons (though the net benefit of such an intervention on the UHI needs to be assessed during both the cooling and heating season: Graves et al., 2001, Kolokotroni & Giridharan, 2008)
b) Providing seasonally variable shading of the roads, such as deciduous trees
c) Reducing the heat gains produced by anthropogenic activities (traffic, industry, building maintenance)
d) Adjusting the physical properties of the urban surfaces e.g. increasing their overall reflectivity (albedo) or their water permeability (vegetated and/or water bodies, Kolokotroni & Giridharan, 2008)

While, as mentioned above, it is very difficult to alter the existing urban form, an attempt should be made at the building scale to reduce the sensitivity of the building envelopes to high temperatures. It is expected that the cumulative benefits of such an adjustment will contribute significantly to the energy balance optimisation and UHI mitigation at the city wide scale (GLA, 2008). Hacker and colleagues (2005) grouped the principles of overheating mitigation design strategies under the following headings:

a) *Switch off:* Eliminate the solar and internal heat gains by using e.g. external shading, reflective materials, energy efficient lights and appliances.

b) *Absorb:* Increase the thermal inertia of the structure e.g. high internally exposed thermal mass.

c) *Blow away:* Apply intelligent ventilation strategies e.g. night purge ventilative cooling through strategic openings in conjunction with high thermal mass materials.

d) *Cool:* It should be ensured that the cooling needs of new buildings are minimized and, whenever these occur, they are met by passive or low energy technologies rather than air conditioning systems (Pathan et al., 2008).

Figure 2. Location and type of monitored dwellings

MONITORING STUDY

Characteristics of the study sample

The initial sample consisted of 110 householders who were recruited through a call for participation in the study that was sent out to the University College London (UCL) staff mailing list. The announcement was subsequently forwarded to construction companies and uploaded to a number of eco-awareness websites. To encourage participation, a free Energy Performance Certificate (DCLG, 2010) was offered to each participant. The majority of the participants were members of the UCL academic or administrative staff, or graduate students. As a consequence, the subjects fall within a narrow socio-economic range and, thus, do not form a representative sample of the London population. However, an attempt was made to select a varied sample of different house types across London i.e. at least one flat, one mid terrace, one semi detached and one detached house for each

Type of room	Time	Air Temperature (oC)			CIBSE performance criteria	
		Mean	Min	Max	Operative temperature for indoor comfort in summer*	Benchmark summer peak temperature**
Living room	Day (8 am - 8 pm)	25.7	23.6	29.1	25.0	28.0
Bedroom	Night (8 pm - 8 am)	25.1	22.9	29.5	23.0	26.0

*Sleep might be impaired above 24 oC.

**Overheating occurs when the indoor temperature remains above the suggested operative temperature for more than 1% of the occupied hours

Table 1. *Indoor air temperature (in oC) averaged across the whole study sample of dwellings (29th June to 3rd July 2009)*

postcode area where that was possible. In addition, to enable the UHI effect to be accounted for, the selected dwellings were distributed as evenly as possible within the Greater London Area (Figure 2). Unfortunately, the only hot spell occurred early in the summer (29th June - 3rd July) when only a limited number of loggers had been set up. Therefore, results from only 36 houses are analyzed in the present paper. Data from the whole sample of 110 dwellings will be used, however, in the ongoing study aiming to rank dwellings according to their overall indoor thermal performance.

Data collection methods

The participants were asked to install two HOBO U12-012 data loggers in convenient locations at approximately eye level and away from sources of direct light and heat, one in the main living area and one in the main sleeping space. The loggers recorded dry bulb air temperature (accuracy ± 0.35 °C from 0 to 50° C) and at 10-minute intervals during the summer months (mid June to mid September 2009). A visit was then paid to each house to collect the loggers and carry out the energy survey. Detailed data was collected on the building form and fabric characteristics, as well as the heating and cooling systems of each house. Simultaneously, the occupants filled in an extensive questionnaire which included questions on their ventilation systems operation and energy consumption habits during the monitoring period.

External conditions

The summer period of 2009 was not typical of UK conditions and slightly cooler than normal. It was characterized by unsettled weather, with a number of cold spells and very wet days. According to the Met Office (Met Office, 2010), July 2009 was the wettest July on record (in a series from 1914). However, external temperatures above 25 oC were also recorded on a number of days. This study focused on the indoor thermal performance of the houses during the five-day and particularly hot and cloudless spell that was recorded between 29th June and 3rd July. The average external temperature during this period, as recorded in London Heathrow, was 23.1 oC (maximum 31.0 oC, minimum 15.0 oC). It is worth noting that relatively high temperatures were also maintained during the night: the mean daytime temperature (8 am to 8 pm) was 26.4 oC whereas the mean night time temperature (8 pm to 8 am) was 19.7 oC. This could have potentially limited the night ventilative cooling potential of building structures to alleviate overheating through the intake of external cooler air.

Summary of results

The overall thermal performance of the monitored rooms, averaged across the whole sample, is summarized in Table 1 below.

CIBSE Guide A specifies both the summer operative temperature for indoor comfort and the benchmark peak temperature for naturally ventilated domestic spaces (CIBSE, 2007; Table 1). The design comfort temperature is 25 oC for living rooms and 23 oC for bedrooms. Overheating is defined as occurring when indoor operative temperatures are more than 3 oC above the design comfort temperature i.e. above the given 'hot' benchmarks (28 oC for living rooms, 26 oC for bedrooms) for more than 1% of the occupied hours. In addition, it is suggested by CIBSE Guide A that sleep might be impaired at temperatures above 24 oC. Mean radiant temperatures were not measured during the monitoring study and, therefore, for the purposes of this study (as in Wright et al., 2005) it was assumed that operative temperature was broadly equal to the air temperature.

In the daytime, the average living room temperature rose above 28 oC only in three dwellings out of 36 (including a corner SW facing top floor flat located in Kings Cross and a house conversion of a highly glazed old industrial building). However, air temperatures peaked above 28 oC at least once in one third of the living rooms (12 out of 36). In addition, the average indoor air temperature in 53% of the living rooms (19 out of 36) was above the operative temperature for indoor comfort in summer (25 oC). The most important result to emerge though from the data is that no relief from high daytime temperatures occurred at night: the average night time temperature remained above the summer comfort temperature (23 oC) in the majority of the monitored bedrooms (in 34 out of 36). Sleep impairment due to temperature rising above 24 oC might have been caused in 86% (31 out of 36) of the bedrooms. Current evidence does not indicate what additional risk to health may be associated with these high night-time temperatures, but lack of relief from heat at night may be an important determinant of risk. The average night time temperature rose above 26 oC in 42% (15 out of 36) of the dwellings. With regard to maximum temperatures, however, bedroom temperatures peaked at above 26 oC at least once in 78% of the houses (28 out of 36).

To compare the differences in the indoor thermal conditions of dwellings located in inner and outer London, indoor temperatures were plotted against the distance of the dwellings from the London UHI thermal centre (the average location is commonly taken as the area around the British Museum). As is illustrated in Figure 3, the evidence of UHI effects is inconclusive though this could be partly attributed to the small sample of dwellings examined. Nonetheless, this lack of correlation between overheating and distance from the centre suggests that although the UHI effect may be a component of overheating levels, it is not necessarily the dominant one. Interestingly, the scattering increases significantly as we move from the outskirts to the centre of the city; this variability might be an indication of the heterogeneity of urban microclimates the influence of which could potentially override the UHI effect (Kolokotroni & Giridharan, 2008).

Certain types of dwellings are more prone to overheating. It is apparent from Table 2 that overheating levels are overall significantly higher in purpose built flats with average temperatures above 23.9 oC in all monitored spaces.

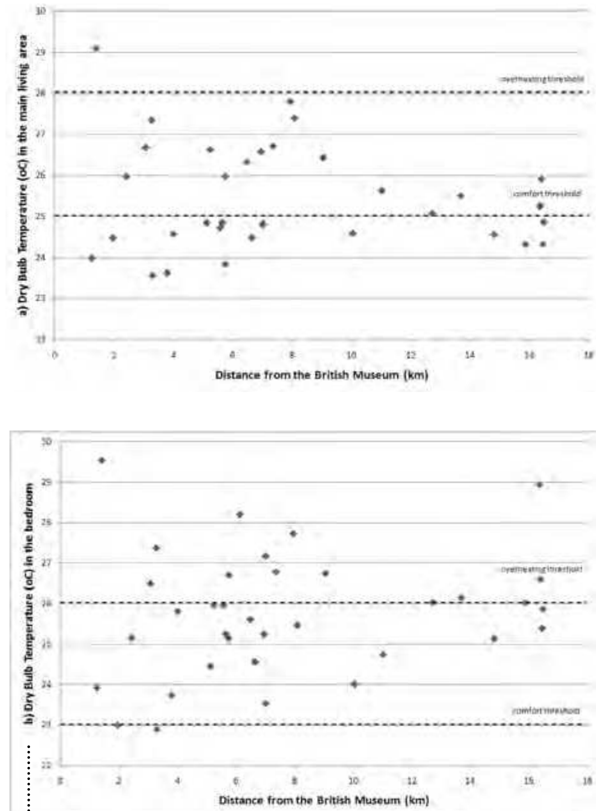


Figure 3a-3b. *Average indoor air temperature (in oC) during a five-day hot spell (29th June to 3rd July 2009) plotted against the distance of the dwelling from the centre of the London urban heat island (British Museum, in km) a) in the main living area in the daytime (8am - 8pm) and b) in the bedroom in the night time (8pm - 8am)*

Figure 4 illustrates the difference in the thermal performance of two different constructions located in central London:

a) a top floor SW facing highly glazed corner purpose built flat, a type which according to recent evidence from France (Vandentorren et al., 2004) is at a higher risk of overheating

b) a three storey mid terrace built in the 1930s, an older construction commonly met in London

Ambient air temperatures are on average 4.9 oC

Type of room	Time	Purpose built flats (13 houses)	Mid terrace (10 houses)	End terrace/ semi detached (9 houses)	Detached (3 houses)	Converted house - old industrial building (1 house)
Living room	Day (8 am - 8 pm)	23.9 - 29.1	23.5 - 26.7	23.8 - 26.3	24.8 - 28.6	30.0
Bedroom	Night (8 pm - 8 am)	23.9 - 29.5	22.8 - 27.1	24.5 - 28.9	23.5 - 27.3	28.1

Table 2. *Temperature ranges (Dry Bulb Temperature in oC) recorded in the study sample of dwellings (29th June to 3rd July 2009) by building type*

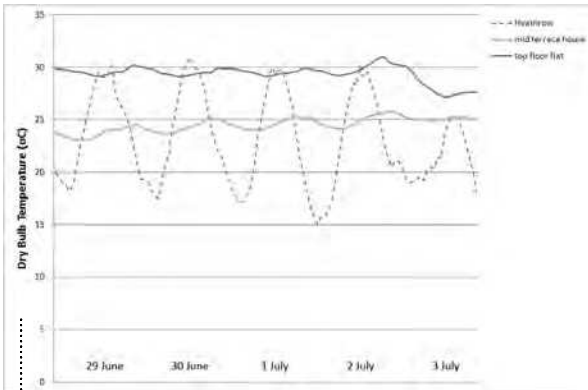
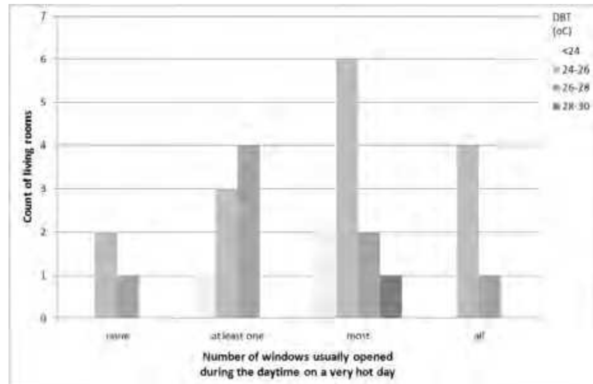


Figure 4. *Indoor air temperature in the living room in the daytime (8am - 8pm) during a five-day hot spell (29th June to 3rd July 2009) in central London (within a 2 km radius from the British Museum) in two different house types: a) a 1930s purpose built flat and b) a Victorian mid terrace house*

higher in the flat. The absolute difference reached its peak during the morning hours, possibly due to the high solar gains through the large glazed facade of the flat.

An attempt was also made to track the ventilation behavior of the occupants and subsequently assess the effectiveness of daytime rapid ventilation and/or night ventilative cooling. The occupants were asked to report on the number of windows that would be typically open during a very hot day in their house. Their responses are summarized in Table 3 and Figure 5 below. Unfortunately, the effect of night time flushing by leaving all windows open against keeping windows shut cannot be assessed with confidence due to the small sample of houses that fall into the former category (mainly due to security reasons). However, the recorded bedroom air temperatures were more than 1 oC lower in houses where the occupants tended to leave 'most windows open during the night time' compared to houses where the occupants left 'at least one window open during the night time'.



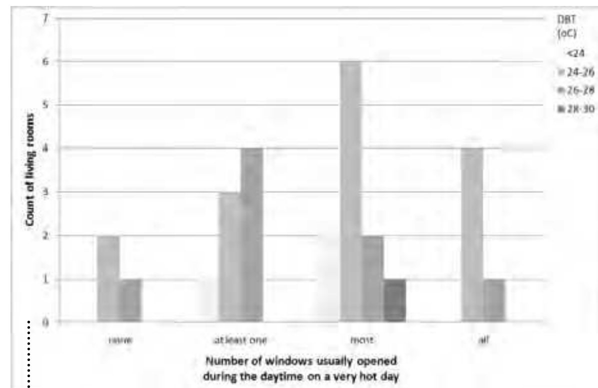


Figure 5a-5b. *IIndoor thermal performance of living rooms and bedrooms during a five-day hot spell (29th June to 3rd July 2009) against self-reported occupant controlled ventilation*

CONCLUSIONS AND FUTURE WORK

This paper has discussed potential heat-related adverse effects on health and the variation of those risks in relation to urban heat island effects and dwelling characteristics. Current evidence on heat-related vulnerability risk was examined. It is recommended that further research is needed on the impact of the indoor environment and other situational factors on heat-related morbidity and mortality. Relevant adaptation and mitigation strategies were also reviewed. Both mid- and long-term urban planning and building design strategies are

number of living rooms	3	8	11	5
windows open during the daytime	none	at least one	most	all
mean living room temperature	25.9	25.7	25.3	25.0
number of bedrooms	8	10	4	2
windows open during the night time	none	at least one	most	all
mean bedroom temperature	25.6	26.1	25.0	26.9

Table 3. *Indoor thermal performance of living rooms and bedrooms during a five-day hot spell (29th June to 3rd July 2009) against self-reported occupant controlled ventilation levels*

required in order to address the combined effect of climate change and the urban heat island phenomenon.

A key step for such interventions at the neighbourhood and individual building scale will be the identification of the most vulnerable indoor spaces. Preliminary findings from a pilot monitoring study, conducted in 36 London household spaces during the summer of 2009, were presented. The evidence from this study suggests that at night, 42% of the bedrooms failed the CIBSE overheating criteria, a large proportion of which were in purpose built flats. In addition, it is likely that sleep impairment might have been caused in 86% of the monitored rooms during the night. There are also some indications that the construction type and site-specific microclimatic conditions are possible determinant factors for overheating which might be greater in magnitude than city wide UHI effects.

The balance of these factors, as well as their potential linkage with heat-related health risk, are being explored and quantified in an ongoing study. Research will focus on the analysis of the monitoring data obtained from the full sample of the 110 dwellings. Multiple regression analysis will be used to build a simplified statistical model that generates an overheating index via the input of a set of simple parameters (e.g. insulation levels, heat loss parameter, glazing ratio, orientation etc.). The value of this element of the work will be to replace the need for relatively time consuming thermal modelling with the simplified statistical model. Finally, the indoor thermal performance profiles of London dwellings will be mapped across the Greater London Area and then linked to summer mortality rates. The potential influence of these parameters on the risk of heat death during a hot period will be examined. The model could be used to inform urban-scale policies relating to the identification and protection of heat-vulnerable population groups across London. In the future, further data collection from hotter summers could be used to refine such a model and establish a higher degree of accuracy. However, only through a parallel assessment of potential winter benefits (e.g. reduced heating needs, potential decrease in cold-related deaths) will the net year-round effects of climate modification on health be understood.

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SHIFTING THE FOCUS FROM DEFECTS TO THE EFFECT OF DEFECTS

David Ormandy

Abstract

After ten years of development, the English government adopted the Housing Health and Safety Rating System (HHSRS) as the prescribed method for assessing housing conditions. Prior to 2006, the assessment was based on the condition of the building and the presence of necessary facilities. Being 'building focussed', the basis of the severity of the condition was the extent and cost of any remedial works considered necessary to make the dwelling 'fit for human habitation'. The HHSRS shifts the focus to the potential threat to health and safety from any defects and deficiencies. The assessment takes account of the likelihood of a hazardous occurrence, and the probable severity of harm that could result from such an occurrence. This approach acknowledges that defects that would be relatively inexpensive to deal with can pose a serious threat to health and/or safety.

Work on the development of the HHSRS included matching data on housing conditions with data on health outcomes. The analyses of the matched database provided information on, among other factors, the range and severity of harm outcomes associated with particular hazards. As the health data used was that available from hospitals and general practitioners, it meant that the health outcomes were those serious enough for the victim to seek medical attention. It has now been realised that it is possible to compare the one-off cost of works to remove or reduce housing hazards with the estimated annual saving to the health service. Using this approach, it has been estimated that poor housing in England is costing the health service around £600 million a year. This cost to the health service is estimated to be around 40% of the total cost of poor housing to society.

Keywords: *Housing Conditions, Assessment, Health Benefits, Cost Savings.*

INTRODUCTION

During the mid 19th Century the appalling living conditions of the labouring population was highlighted and it was argued that there was a link between those conditions and health (see, for example, Chadwick, 1842 and Wohl, 1983). While the theories were basically unsound - that disease was spread by miasma - the results were positive. Reducing crowding, and providing sanitation, sewerage, and ventilation all contributed to healthier living conditions. Fears that diseases could spread from the crowded tenements housing the labouring population encouraged the English government to pass legislation placing duties and responsibilities on the burgeoning local authorities to require landlords to remedy unsatisfactory housing conditions.

This paper reviews the development of the means for assessing housing conditions and of determining whether a dwelling is or is not satisfactory from the 1860s to the current day. In 2006 there was a radical change in the approach and this has made it possible to estimate the cost to the health sector attributable to poor housing conditions.

DEVELOPMENT OF A STANDARD OF FITNESS FOR HUMAN HABITATION

It was the Artizans and Labourers Dwellings Act of 1868 that first required English local authorities to identify and deal with dwellings that were 'in a Condition or State dangerous to Health so as to be unfit for Human Habitation". However, the Act did not give a definition of the term 'unfit for human habitation' and local authorities interpreted it by reference to local Building Byelaws - codes adopted by the authorities to control the design and construction of new dwellings. As these Byelaws differed from area to area, so did the interpretation of unfitness.

In 1919, a national definition of 'fitness for human habitation' was proposed (Ministry of Health, 1919) being a minimum standard that all dwellings should satisfy. This standard was clearly based on health principles, stating what should and what should not be present. It stated that a dwelling should be regarded as unfit if it was unsatisfactory in certain respects including dampness, lighting, ventilation, repair, water supply, washing accommodation and facilities for the storage, preparation and cooking of food. However, this proposed standard had no legal force and was advisory only. It wasn't until 1954 that a statutory Standard of Fitness was introduced by the Housing Repairs and Rents Act of that year. While this first national standard was somewhat weaker than that proposed by the Ministry of Health 35 years earlier - it had no reference to washing accommodation and limited the requirement for lighting to 'natural' lighting - it followed a similar approach listing what should or should be present for a dwelling to be considered fit. Between 1954 and 1990 there were only minor changes, one removing the requirement for food storage facilities and one adding that there should not be poor internal arrangement (such as steep stairs and bedrooms entered through another bedroom). In 1990, the statutory definition of fitness was revised, introducing for the first time requirements for the provision of heating, for artificial lighting, for hot water, and for personal washing facilities (see Table 1). Although said to be a major revision, the phrasing of the standard followed previous definitions.

PROBLEMS WITH THE HOUSING FITNESS STANDARD

There were at least three problems with the Housing Fitness Standard. First, that the phrasing was building focussed; second, that it followed a pass/fail model; and third, that it did not cover some of the major hazards that can be found in dwellings.

For a dwelling-house to be fit it must –
(a) be structurally stable;
(b) be free from disrepair;
(c) be free from dampness;
(d) have adequate provision for lighting, heating and ventilation;
(e) have an adequate piped supply of water;
(f) have satisfactory facilities for the preparation and cooking of food, including a sink with hot and cold water supplies;
(g) have a suitably located water closet for the exclusive use of the occupants;
(h) have, for the exclusive use of the occupants, a suitably located fixed bath or shower and wash hand basin, each with a supply of hot and cold water;
(i) have an effective system for the draining of foul, waste and surface water.

Table 1. *The 1990 Housing Fitness Standard (based on s604, Housing Act 1985 as amended in 1990)*

Building Focus - Although there were health principles behind the Fitness Standard, the phrasing focused on the building and the facilities somewhat obscuring those underlying principles. Adding to this, the associated enforcement regime, recognising that a dwelling is a private (and national) financial asset, required that the cost of any remedial works necessary to ensure the dwelling satisfied the Fitness Standard was to be related to the value of the dwelling once the works were completed. Over the years, the building and economic focus (of this 1990 and the previous Standards) resulted in the severity of unsatisfactory conditions being judged in terms of the cost and extent of the remedial works, and any health consequences were ignored.

Pass/Fail Models - The Fitness Standard, like other pass/fail models, drew a line so that a dwelling was judged either Fit or Unfit without any ranking of the degree of fitness or unfitness. A dwelling judged Unfit could be either marginally unfit or grossly dangerous, and this lack of ranking was a gap in the information necessary to set meaningful housing policies and priorities both locally and nationally. The pass/fail model also meant that there was no real encouragement to improve a dwelling when all that was necessary was to just pass the line into fitness.

Gaps and Omissions - In 1992, the UK government commissioned research to investigate how local authorities were interpreting and applying the Housing Fitness Standard. This study (HMSO, 1993) reported that authorities considered that some significant housing problems were not covered by the Standard - these included cold (poor energy efficiency), fire safety, radon, and fall hazards (from dangerous features). These findings were confirmed by separate research carried out by the UK Building Research Establishment (Raw & Hamilton, 1995; Cox & O'Sullivan, 1995; Cox & Smithies, 1995), which reviewed reported research into the relationship between the state and condition of buildings, including dwellings.

A. Physiological Requirements	C. Protection Against Infection
Damp and mould growth etc	Domestic hygiene, Pests & Refuse
Excessive cold	Food Safety
Excessive heat	Personal Hygiene Sanitation & Drainage
Asbestos (and Manufactured Mineral Fibre)	Water supply
Biocides	
Carbon Monoxide & Fuel combustion products	**D. Protection Against Accidents**
Lead	Falls associated with baths etc
Radiation	Falling on level surfaces
Uncombusted fuel gas	Falling on stairs etc
Volatile Organic Compounds	Falling between levels
	Electrical Hazards
	Fire
B. Psychological Requirements	Flames and hot surfaces
Crowding and Space	Collision and entrapment
Entry by intruders	Explosions
Lighting	Position and operability of amenities
Noise	Structural collapse and falling elements

Table 2. *The 29 HHSRS Potential Housing Hazards*

DEVELOPING A NEW APPROACH

A further study reviewed the legal controls on housing standards (LRI, 1998). This study suggested that there were two options - relatively minor amendments to extend the existing Fitness Standard, or major reform. It favoured the second, that of developing a system that would allow conditions to be ranked by the severity of the threats to health and/or safety, so shifting the focus away from the physical attributes of the building. The major reform could also address the other two problems associated with the Fitness Standard. In 1998, the government accepted the recommendation and commissioned the development of the Housing Health and Safety Rating System (HHSRS) as an approach to rate the effects of defects. There were two distinct but inter-related parts to the development, one to provide the background evidence to support the HHSRS and the other to create a practical risk-based methodology for the assessing conditions.

THE BACKGROUND EVIDENCE

First, an extensive literature review to identify evidence of the links between housing conditions and the health and safety of occupiers. This included searches of the medical, architectural, engineering and building related sources. Second, from this review, potential housing hazards were identified, linking health outcomes to those hazards. The result was a list of 29 potential hazards (see Table 2), each to a greater or lesser extent attributable to

Class I covers the most extreme harm outcomes including – Death from any cause; Lung cancer; Mesothelioma and other malignant lung tumours; Permanent paralysis below the neck; Regular severe pneumonia; Permanent loss of consciousness; and 80% burn injuries.	**Class II** covers severe harm outcomes, including – Cardio-respiratory disease; Asthma; Non-malignant respiratory diseases; Lead poisoning; Anaphylactic shock; Crytosporidiosis; Legionnaires disease; Myocardial infarction; Mild stroke; Chronic confusion; Regular severe fever; Loss of a hand or foot; Serious fractures; Serious burns; Loss of consciousness for days.
Class III covers serious harm outcomes, including – Eye disorders; Rhinitis; Hypertension; Sleep disturbance; Neuro-pyschological impairment; Sick building syndrome; Regular and persistent dermatitis, including contact dermatitis; Allergy; Gastro-enteritis; Diarrhoea; Vomiting; Chronic severe stress; Mild heart attack; Malignant but treatable skin cancer; Loss of a finger; Fractured skull and severe concussion; Serious puncture wounds to head or body; Severe burns to hands; Serious strain or sprain injuries; Regular and severe migraine.	**Class IV** includes moderate harm outcomes which are still significant enough to warrant medical attention. Examples are – Pleural plaques; Occasional severe discomfort; Benign tumours; Occasional mild pneumonia; Broken finger; Slight concussion; Moderate cuts to face or body; Severe bruising to body; Regular serious coughs or colds.

Table 3. *The Four HHSRS Classes of Harm with Some Examples*

housing conditions (ie, none were solely attributable to occupier behaviour). Then, data were gathered from hospital and doctor records, records from Accident and Emergency departments, and the Office of National Statistics, on health outcomes, illnesses, injuries and other health conditions that could be attributed to the hazards. Finally, through the English post code system, this health data was matched to data on housing conditions from the English House Condition Survey (a sample survey carried out every five years) and commercial datasets from the insurance and retail industries. Analyses of the matched data provided information on the prevalence of each hazard in the English housing stock.

The 29 potential hazards differ widely - some can result in physical injuries, other in illnesses, and others may cause or exacerbate health conditions; for some such as Excess Cold or Dampness, harm will only result from a period of exposure, while for others such as Falling on stairs, harm can result from a single event. The differing health outcomes were grouped into four Classes of Harm (see Table 3) based on the degree of incapacity caused whether the outcome was an injury, health condition, or illness. The Classes of Harm were taken from other work (BRE 2000) that developed seven Classes, but only the top four were used for this system as these were serious enough for victim to seek medical attention and so provide the records used

		Class of Harm Weightings		Likelihood		Spread of Harm (%)
S1	=	10,000	X	$\frac{1}{L}$	X	0_1
S2	=	1,000	X	$\frac{1}{L}$	X	0_2
S3	=	300	X	$\frac{1}{L}$	X	0_3
S4	=	10	X	$\frac{1}{L}$	X	0_4
				Hazard Score = (S1+S2+S3+S4)		

Where: S = the row product for each Class of Harm
L = the likelihood of an occurrence over the next twelve months
0 = the outcome expressed as a percentage for each Class of Harm

Table 4. The HHSRS Formula (taken from the Housing Health and Safety Rating System (England) Regulations 2006)

to support the HHSRS.)

The underlying principle of the HHSRS is that -"Any residential premises should provide a safe and healthy environment for any potential occupier or visitor." (ODPM, 2006). To satisfy this principle, a dwelling should be constructed and maintained with non-hazardous materials, and should be designed and maintained as hazard-free as possible. But no dwelling, even a new one, can be completely free from hazards - we want and need some potential hazards, such as gas, electricity, cooking facilities, stairs, windows, and doors. So these necessary and unavoidable hazards should be as safe as possible.

To allow for comparison of the widely differing hazards and the health outcomes, a numerical score seemed the obvious solution - the higher the score, the greater the risk. To generate a score a formula was devised (see Table 4) using three sets of figures -

a. A weighting for each Class of Harm to reflect the degree of incapacity for each health outcome - 10,000 for Class I, 1,000 for Class II, 300 for Class III, and 10 for Class IV (based on the weightings suggested by BRE (2000).

b. The likelihood of a hazardous occurrence over the next twelve months, expressed as a ratio. The twelve-month period takes account of the differences between an event and a period of exposure, and also of the effect the seasons will have on certain hazards (such as Dampness and Excess Cold).

c. The spread of possible harms resulting from an occurrence, expressed as a percentage for each of the four Classes of Harm, the highest percentage being given to the most probable outcome. For example, the most probably outcome from a fall out of a window on the ground floor will be bruising, then perhaps a fracture, but such a fall will not be fatal; whereas a fall from a window on the fifth floor will probably be fatal.

Analyses of the matched data allowed national averages to be calculated for each hazard. Average likelihoods, spread of harm outcomes, and, using the formula, average hazard scores (see Figure 1) were calculated for a range of dwellings to provide bench-marks (for further details see ODPM, 2003). As can be seen from this Figure, falling on stairs is more likely in older houses (1 in 218 compared with 1 in 256) and the most probable outcome from a fall is Class IV, such as severe bruising, and the least probable is Class I - death or permanent paralysis.

Based on the literature review and the analyses, for each of the 29 hazards, profiles were produced (ODPM, 2006). These gave -

- a definition of the individual hazard
- a summary of the potential for harm, including the typical health outcomes, the prevalence of the hazard, and the national averages (see Figure 5)
- the causes and in particular the dwelling features and conditions that could contribute to the likelihood of a hazardous occurrence and severity of the outcome
- what was currently considered to be the ideal, that is the safest condition that would mitigate the hazard.

THE ASSESSMENT PROCESS

Before the implementation of the HHSRS, housing inspections and assessments were generally made by trained officers (previously named public health

Falling on stairs
Average likelihood and health outcomes for all persons aged 60 years and over, 1997-1999

Dwelling type & age		Average likelihood 1 in	Spread of health outcomes Class 1 %	Class II %	Class III %	Class IV %	Average HHSRS scores
Houses	Pre 1920	218	2.2	7.7	22.1	68.0	170 (F)
	1920-45	226	2.1	7.4	20.5	70.0	156 (F)
	1946-79	256	1.6	6.6	21.6	70.2	116 (F)
	Post 1979	256	1.4	6.3	25.3	67.0	112 (F)
Flats	Pre 1920	214	3.9	8.0	19.3	68.8	249 (E)
	1920-45	283	1.6	2.8	20.1	75.5	97 (G)
	1946-79	410	2.8	5.3	17.7	74.2	96 (G)
	Post 1979	409	2.6	5.2	19.4	72.8	92 (G)
	All	**245**	**1.9**	**6.7**	**21.7**	**69.7**	**134 (F)**

Figure 1. Example of National Averages (source - ODPM, 2006) Falling on Stairs

Hazard Bands	Hazard Score Range
A	5,000 or more
B	2,000 to 4,999
C	1,000 to 1,999
D	500 to 999
E	200 to 499
F	100 to 199
G	50 to 99
H	20 to 49
I	10 to 19
J	9 or less

Table 5. *The HHSRS Hazard BandsRegulations 2006)*

inspectors, now environmental health practitioners) relying on their informed professional judgment. The traditional approach to assessing housing conditions involved a full inspection, the aim of which was to gather details about the design, construction, and condition of the dwelling and to identify any defects and deficiencies. Any defects and deficiencies would then be attributed to the nine matters listed in the Fitness Standard (see Table 1) and a judgment made as to whether the dwelling was Fit or Unfit.

For the purposes of the HHSRS the idea was to change the process as little as possible while shifting the focus to the effects of defects. As before, the assessment is based on a full inspection to identify any defect or deficiency to any element or facility, whether it results from the original design, construction or manufacture, or from deterioration and a lack of repair or maintenance. Once complete, the surveyor determines whether the deficiencies identified contribute to any of the 29 HHSRS hazards, and if so, to which ones (a single deficiency can contribute to more than one hazard, and several deficiencies may contribute to a single hazard). The next step is to assess the severity of the hazards. First, the surveyor judges whether the hazards identified are average for that type and age of dwellings - ie, are they average for that age and type of dwelling (see Figure 1 and ODPM, 2006) or significantly worse. If average, there is no need for further assessment of that hazard, as the hazard score is known. For those hazards the surveyor considers to be significantly worse than average, she or he uses her/his professional judgment to assess the severity of those hazards. This is a two-fold assessment - first the likelihood of an occurrence over the next twelve months, and then the most likely and other potential outcomes.

This two-fold approach is considered more logical than merely attempting to judge a hazard on a linear scale. It ensures that the severity of a threat which is very likely to occur but will result in a minor outcome can be compared with one which is highly unlikely to occur but if it did would have a major outcome. It also allows differentiation between similar hazards where the likelihood may be the same, but the outcomes very different.

The weightings given to the Classes of Harms are fixed, while the likelihood and the spread of outcomes are used to reflect judgments made by the surveyor inspecting the dwelling. Surveyors are not expected to be exact in their judgments, but to give a figure that represented a range - for example 1 in 10 represents the range from 1 in 7.5 to 1 in 13, and 1 in 180 represent the range of 1 in 130 to 1 in 240. This representative figure is used in the HHSRS formula to generate a score. The numerical score generated by the HHSRS formula can appear very specific and falsely imply that the score is a precise statement of the risk, rather than a representation of the surveyor's judgment. To overcome this, the scores have been put into Bands (see Table 5), Band J being the safest possible, and Band A the most dangerous.

The result of this inspection and assessment process is a hazard profile for the individual dwelling, giving the Bands for those hazards identified by the surveyor as significantly worse than the average for that type and age of dwelling.

HHSRS IN PRACTICE

Initially, there was scepticism about whether practitioners would be able to judge likelihoods and outcomes, but this was simply shifting away from assessing the severity of a defect in building terms to that of assessing the potential effect on users of the dwelling. There were also doubts that they would be able to use numbers to reflect their judgments, such as giving a ratio to represent the likelihood of an occurrence. However, trialling with practitioners during the development process showed that they were soon gained confidence in their judgments, and, subsequent trials with surveyors involved in the English House Condition Survey showed that there was consistency of assessments.

Before the HHSRS was introduced, the government funded training for those local authority officers who would be using the System on a day-to-day basis, approximately 3,000 environmental health practitioners. As these officers were already undertaking housing inspections, the training was relatively short - being over two days and involving practical exercises to promote consistency. Also, Worked Examples were made available to give model answers illustrating the assessment process(see http://www.communities.gov.uk/publications/housing/housinghealthsafetyrating)

The HHSRS was introduced in April 2006 as the prescribed method for assessing housing conditions as the first stage in deciding whether action should be taken under the Housing Act 2004 to require remedial works. It had been suggested that the introduction of the HHSRS would reduce the enforcement activities of local authorities. However, a study (CIEH, 2008) of 130 authorities (about 41% of English authorities) revealed very little change - 1,539 Notices requiring works served under the last 12 months of the previous regime, and 1,501 in the first 12 months under the new system; of these 1,121 and 1,066 respectively were complied with.

The HHSRS is also incorporated into the English House Condition Survey providing information and monitoring the prevalence of hazards in the housing stock (see CLG, 2009). The HHSRS is part of the government's Decent Homes Standard, a target standard all public owned housing is expected to meet by 2010 (see CLG, 2006).

THE COST OF POOR HOUSING

The HHSRS focuses on the potential health outcomes from housing hazards, and because of this it has been possible to estimate the cost of poor housing to society, in particular the cost to the health service. As the HHSRS is incorporated into the English Housing Condition Survey (CLG, 2009) it has provided information on the health outcomes from the hazards present in the housing stock. Using these data, estimates have been made of the cost to the National Health Service of dealing with those health outcomes. A report on the development of the methodology adopted (Davidson et al., 2009) estimates poor housing - housing with HHSRS hazards in Bands A, B, or C (see Table 5) - costs the health service in excess of £600 million each year.

Only costs to the health service were used in these calculations as these costs were in the public domain. However, there will be other costs to society - such as time away from employment, state benefits, and diminished quality of life - but estimating such costs is problematic and so were not included in the methodology. However, Davidson and colleagues (2009) estimate that the cost to the health service is about 40% of the total cost to society. If this is correct, then poor housing may be costing the English society more than £1.5 billion each year.

A recently completed project in the North-West of England (4NW, 2010) used the methodology developed by Davidson and colleagues (2009) to compare the one-off cost of works to mitigate a hazard with annual cost benefit to the health sector. This was possible by comparing the pre-works hazard assessment with the post works assessment to give the reduction in likelihood and outcomes and so the reduction in the demand on the health service. This showed that low cost interventions, such as fitting a handrail to stairs, often produced the best cost benefit - for example, a one-off cost of £53 gave an estimated annual saving to the health sector of £353.

CONCLUSIONS AND PERSPECTIVES

The HHSRS has proved to be practical in its application and has highlighted that housing interventions can have health benefits. It has overcome the three main problems of the previous approaches - it has shifted the focus away from building matters and put health at the centre of housing policies nationally and locally; it grades the risks and so avoids the problems of a simple pass/fail model; and it is comprehensive including all the potential housing hazards.

It has also shown that money spent on housing improvements is money invested in health. Although devised as a risk-based approach to the assessment of housing, it is becoming clear that it has opened the door to ways of estimating the cost benefit of housing interventions. It is expected that there will be further work in this area and further development of the HHSRS and its applications.

The HHSRS has attracted interest in other countries, although so far it is not clear if it can be adapted for their use. It has informed work in New Zealand on the development of a Healthy Housing Index (Keall et al, forthcoming), and the Conseil d'État of France invited a contribution on the HHSRS and its application for its 2009 public report (Ormandy, 2009). There has also been interest from the USA, including contributions to expert panels and to the 2008 National Healthy Housing Conference.

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SOCIO-ENVIRONMENTAL DIMENSIONS OF PRIVATE OUTDOOR SPACES IN CONTEMPORARY PALESTINIAN HOUSING

Muhannad Haj Hussein, Aline Barlet & Catherine Semidor

Abstract
Traditionally, in Palestine, outdoor spaces played a crucial role in organizing and improving the living quality of the living units, while this important role in modern housing design is lost by a stark separation between internal and private external spaces (balconies, verandas and yards). This separation is disconnecting private inside and outside spaces whereas in the traditional courtyard houses there was a continuity between the inside and the outside. This paper investigates the socio-environmental criteria and characteristics of private outdoor spaces that could play an improving role in the living quality of future housing design. So, a comparative study between contemporary and traditional outdoor spaces characteristics was carried out in two different cities in two different climatic zones of Palestine. The contemporary housing was evaluated by conducting a survey over 300 dwellings of different housing typologies (detached houses/apartment flats), while the characteristics of traditional design were analyzed from the old historical part of these cities. The results of this paper demonstrate that the private outdoor space is a major contributor to enhance housing sustainability. It presents the distinctive qualities of courtyard concept, which ought to be reintroduced consciously into the design of future housing in order to improve the living quality. The paper also identifies the most important factors that ensure those qualities and forms the basis for further research.

Keywords: *Socio-Environmental Quality, Private Outdoor Spaces, Courtyard, Housing Building, Palestine.*

INTRODUCTION

A good housing development should not concentrate only on the physical aspects of design but also on the human needs (Lee et al. 2004). Although housing typologies depend on multiple determinants; climate and culture are the two most important ones (Rapoport A.1969). In this perspective, outdoor space, which is a buffer zone between the building and the outside space, could provide a safe place where inhabitants can organize their socio-cultural activities under favorable climatic conditions. Thus, houses are not only physical spaces in which people live, but also spaces where social interactions and rituals can take place (Ozaki, 2002).

Jacobs identified the social quality of a place in terms of the quality of human interactions (Tzonis, 2006). Triana considered the social aspects in the project decision making by; minimizing construction accidents and designing to maximize the well-being of the occupants; access of sunlight in the living areas as well as to open up the private space in residential units and give visual privacy from the exterior in the main areas of the residential units (Triana et al. 2006).

After the foundation of the Palestinian National Authority (PNA) in 1994, the Palestinian cities have been witnessing a significant and rapid development in the residential sector in order to mitigate the local housing shortage. High-rise and free-standing apartment blocks have become the current housing typology, replacing the traditional low-rise courtyard houses. Moreover, outdoor spaces in this housing are largely restricted to peripheral and small balconies, verandas and yards, abandoning the traditional courtyard concept and its former socio-environmental role.

In fact, private and public investors have misled those contemporary constructions by focusing on costs, forms and aesthetic issues rather than on environmental and on Palestinian socio-cultural values (Ghadban, 1998). In 1997, the Ministry of Public Works and Housing (MPWH) has conducted, in Gaza city, an assessment research on the residential towers higher than five stories. The study showed that these towers, besides lack of open spaces, have failed to provide the appropriate housing environment due to the low level of natural lighting and ventilation (Mushtaha, 2006).

This paper suggests that new thinking about outdoor spaces in the future housing can improve its living quality and design concept in terms of social sustainability. Sustainable building means minimizing the consumption of resources (i.e. water, energy and materials) and maximizing the health, safety and life quality of residents (Raman M.2005). The efficient use of resources is generally an environmental concern and the safe, healthy, productive and usable spaces are social, economical and functional concerns. Moreover, Tzonis states that sustainable social quality is interested in the spatial structure of the environment as communicator, which enables the interaction without neglecting the individuality and identity, whereas designing sustainable ecological environment looking for choosing the efficient materials, orientation, dimensions and proportions of spaces, of solid and voids, etc. (Tzonis A.2006).

This paper intends to study the significant design characteristics and social criteria of outdoor spaces that could have a role on the living quality of the future housing in terms of social and environmental qualities. Which are the qualities of the traditional courtyard concept that could be defined as sustainable and could be used in future designs?

METHODOLOGY AND CASE STUDIES

The methodology of this study consists of crossing three sets of data: climatic characteristics of sites, spatial analysis of dwellings and results from questionnaires aiming to identify the significant characteristics and criteria that could influence the residents' quality of life inside their house units. Based on this identification, a comparative study between traditional and contemporary outdoor spaces will be conducted in the discussion part.

The characteristics of the traditional housing were derived from an analytical study of the old historical part of these cities. Plans, elevations and sections of different traditional houses have been studied and analyzed in terms of conceptual, functional and environmental qualities.

This comparison provides a method of assessing the role of these spaces in improving the

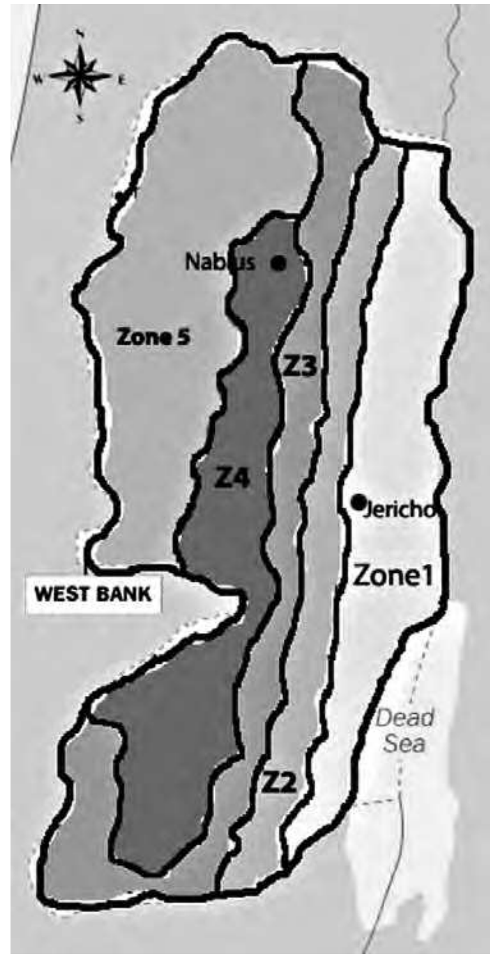

Figure 1. The five climatic zones of West Bank.

future housing in terms of social sustainability. This paper deals with the application of this methodology to two cities in Palestine: Jericho and Nablus.

Climatic characteristics of sites

In order to assess the influence on the housing buildings morphology, typology and residents' satisfaction, the case-study cities were selected on their different socio-demographic and topographic characteristics on the one side and their different climatic characteristics on the other.

Palestine is a Mediterranean country, where the Palestinian territories (6100km2) represent 23.11% of the total area of Palestine. Seven climatic zones were defined in this small area (i.e.; five in West Bank and two in Gaza) (ARIJ.2003). Moreover, Jericho and Nablus where taken as representative case studies for two climatic zones (see Figure1).

Jericho, located in Jordan Valley, is characterized by a hot-dry summer and a warm winter, and Nablus, located in the mountain region, is characterized by a warm sub-humid summer and a

	Monthly Main Temperature		Relative Humidity	Prevailing Winds		Precipitation
CITY	January	August		Speed	Direction	
Zone 1 "Jericho"	8.2°C	38.8°C	54.6%	3.4km/h	E & N	125mm
Zone 4 "Nablus"	5.3°C	30°C	61%	5.5km/h	W & NW	715mm

Table 1. *Location and type of monitored dwellings*

cold winter (see Table 1).

Questionnaire

The questionnaire used in this research is elaborated by researchers from the GRECAU laboratory. It aims to evaluate the socio-cultural and environmental responses of the contemporary housing, and the role of private outdoor spaces, in addition to determine the significant criteria that could guide the future housing typologies and the outdoor spaces concept design in terms of social sustainability. It is structured around 56 closed and open-ended questions, related to three themes.

1. The socio-demographic and housing characteristics: age, sex, family size, income level, profession, general housing characteristics, housing facility characteristics, future inhabitants' priorities and needs.
2. The outdoor spaces characteristics: typology, area, spatial relationship, social activities, periods of use, inhabitants' satisfaction, individual modifications and future priorities.
3. The interior spaces characteristics: spatial distribution, orientation, spaces area, window size, natural lighting, ventilation, heating, air conditioning, future inhabitants' priorities and needs.

The interpretation of the questionnaire data was based on the method of frequency distribution.

This study will only explore those questions related to the purpose of this paper (i.e. the concept of private outdoor spaces).

Population

The research samples were selected randomly from different neighbourhoods and covered different housing typologies (detached houses, apartment blocks). The fulfilled questionnaires (i.e. 240 questionnaires in Nablus and 60 questionnaires in Jericho) were collected one day after distribution, 40 Questionnaires were excluded from this study by incomplete filling in, or absence on the collecting date. The average non-response varied from 3 to 25 respondents per question, depending on the type of questions (closed or open ended) and the topic. This could be due to a misunderstanding of the questions, but also to other, more individual reasons (cultural, educational, not having time etc.).

CONTEMPORARY HOUSING CHARACTERISTICS

Socio-demographic and Housing characteristics

In average, the respondents in both case studies were mostly young men (40 years old) living in families of 5-6 persons, confirming the statistics of Palestinian Central Bureau of Statistics (PCBS), where the family size is 5.6 persons in Jericho and 5.4 in Nablus (PCBS-2, 2008). Our respondents belong to middle income families.

General housing characteristics are shown in

Figure 2. *Examples of contemporary apartment blocks in Jericho and Nablus.*

		Total (%)	
		Jericho	Nablus
Ownership status	Owner	41(73.2)	208(81.9)
	Rent	15(26.8)	33(13)
Housing type	Villa	1(1.8)	3(1.2)
	Detached house	34(60.7)	30(11.8)
	Apartment blocks	21(37.5)	209(95.3)
Time of construction	Before 1967	1(1.8)	22(4.7)
	1968-1980	7(12.5)	17(6.7)
	1981-1996	22(39.3)	71(28)
	After 1997	26(46.4)	140(55.1)
Length of residence	Less than 5 years	23(41.1)	86(33.9)
	5-10 years	10(17.9)	75(29.5)
	10-15 years	10(17.9)	33(13)
	Over 15 years	13(23.2)	46(18.1)
House's area	Less than 100m2	7(12.5)	17(6.7)
	101-150m2	17(30.4)	88(34.6)
	151-200m2	15(26.8)	107(42.1)
	201-250m2	14(25)	18(7.1)
	Over251m2	1(1.8)	8(3.1)
No. of building floors	Less than 2 floors	8(14.3)	9 (3.3)
	2 floors	18(32.1)	28(10)
	3 floors	13(23.2)	17(6.1)
	4 floors	_	19(6.8)
	5 floors	5(8.9)	42(15:1)
	6 floors	_	32(11.5)
	7 floors	_	31(10.1)
	More than 7 floors	_	59(21.2)
No. of aprt./floor	One apartment	19(33.9)	38(15)
	2 aprts.	20(35.7)	73(28.7)
	3 aprts.	1(1.8)	56(22)
	4 aprts.	2(3.6)	44(17.3)
	More than 4 aprts.	2(3.6)	21(8.3)

Table 2. *General housing characteristics*

Table 2. The majority of respondents (70%) in the two cities own their houses. In Jericho, about 60.7% of inhabitants lived in detached houses, whereas in Nablus the apartments units dominate (see Figure 2). Most of the dwellings investigated have been constructed after 1996 (i.e. after the foundation of the PNA). Respectively 41.1% and 33.9% of the occupants in Jericho and Nablus, lived in their dwellings for less than 5 years.

The findings of the survey reveal that 47% of the investigated buildings in Nablus have five to seven floors and 55.3% in Jericho only have two or three. According to the urban planners interviewed, those percentages seem to be a representative sample of the real urban environment of the case studies. In Nablus, 50% of those houses have two to three apartments per floor, while in Jericho for 69%, this is one to two apartments per floor. Respectively in Jericho and Nablus, over 25% and 40% of the housing units have an area of 151-200m2, which is larger than the standard house's area defined by the International Federation for Housing and Planning (IFHP) on the basis of 90-120m2 for the middle-income families (Yousef, 2002). It also exceeds the standards' area of the Palestinian Housing Council (PHC) of approximately 90m2 (Kurraz and Ziara 2007). On the other hand, this area (151-200m2) is suitable for the high middle-income families where they need a house's area more than 120m2 (Yousef, 2002).

Housing facility characteristics are summarized in Table 3. The dominant usage of the ground floor in these buildings is in the first place residential. This the case in Jericho and Nablus for 87.5% and 42.1% respectively. Secondly, especially in Nablus (29.1%) against 3.6% in Jericho, it is being used as a parking place. In both cities, over 50% of housing buildings have parking facilities in their context, while less than 35% of those building have kid's playground or commercial facilities. Most 70% of the investigated housing in Nablus didn't have a common space for their residents. Touffaha attributed the lack of communal activities within the residential context to new urban regulations that neglected the obligation to create a common open space around and between buildings. (Touffaha, 2009)

From the inhabitants point of view, the investigation of the desired building characteristics and needed facilities for improving the social and environmental qualities in the future housing buildings reveal that over 35% of inhabitants in the two cities recommend an overall building height of maximum four stories, each with one or two apartments. Moreover, kids' playgrounds represent the first priority for more than 75% of inhabitants, as it may enhance the social interactions between the neigh-

		Total (%)	
		Jericho	Nablus
Ground floor's usage	Residential	49(87.5)	107(42.1)
	Parking	2(3.6)	74(29.1)
	Kid's playground	1(1.8)	28(11)
	Commercial shops	2(3.6)	24(9.4)
Existing Housing facilities	Common outdoor space	23(41.1)	67(26.4)
	Kids' playground	20(35.7)	90(35.4)
	Parking	33(58.9)	151(59.4)
	Commercial shops	1(1.8)	69(27.2)

Table 3. *Housing facility characteristics*

		Total (%)	
		Jericho	Nablus
Attached spaces	Guest	28(50)	67(26.4)
	Living	26(46.4)	51(20.1)
	Kitchen	29(51.8)	129(50.8)
	Bed Room	11(19.6)	91(35.8)
	Dining Room	1(10.8)	16(6.3)
Preferable attached spaces	Guest	34(60.7)	80(31.5)
	Living	39(69.6)	95(37.4)
	Kitchen	41(73.2)	171(67.3)
	Bed Room	17(30.4)	99(39)
	Dining Room	3(5.4)	32(12.6)

Table 4. *General Outdoor spaces characteristics*

bours. More parking spaces is the second priority in both cities.

Outdoor spaces characteristics

Most of outdoor spaces are less than 10m2 in both cities. Verandas and balconies are the most frequently found form in Jericho and Nablus (71.4% and 81.5% respectively). Private yards or gardens are mostly created on the remained space of building plot in the case of detached houses (51.8% in Jericho).

The findings show that the west orientation for outdoor spaces was more frequently used, 53.5% in Jericho and 40.3% in Nablus. Moreover, most outdoor spaces are connected to only one indoor space and the connection of two or three indoor spaces with the same outdoor space is rarely observed. Over 45% of outdoor spaces are respectively connected to the kitchen, or the guest room, or the living room, in the case of Jericho, whereas in Nablus, the kitchen or the bedrooms are the most connected with the outside spaces, see Table 4. As hospitality is highly valued in the Palestinian culture, the guest room, which is usually the best-decorated room, has been designed especially for receiving the formal, male or female guests without any violation of family's privacy. Connecting outdoor spaces to the living room in the future housing is more preferable than connecting them to the guest room (over 65% in Jericho and 35% in Nablus), see Table 4.

In Jericho, the most practiced outdoor social activities concern gardening and guest welcoming respectively. Gardening is still a reflection of the agricultural image of this oasis settlement (Nazer S.2006). In Nablus, sitting outside with family members is the common social activity in these small spaces, and also hanging clothes. Receiving guests outside was classified as a third activity although the guest room is more connected to the exterior spaces than the living room.

Furthermore, the study shows, in exploring the climatic effect on the preferred times to use outdoor spaces that 80.4% of the inhabitants of Jericho prefer being outside in summer, during the evenings and during the winter the whole day. In the case of Nablus, the inhabitants prefer to be outside during the warm and sub-humid summer in the afternoons and the evenings (respectively 68.5% and 42.5%) and 35% of the inhabitants prefer using these spaces in winter at noon time, in order to enjoy the sun's warmth.

Inhabitants' satisfaction with the outdoor spaces is shown in Table 5. A 5-point scale, with 1 being most dissatisfied and 5 being most satisfied was adopted for the satisfaction score. The most satisfying characteristics for the inhabitants of Jericho were the possibilities to sit outside (3.27), to garden and put flowerpots (3.48), and orientation toward sun and wind (3.52 and 3.22 respectively), while in Nablus the scores of satisfaction were slightly lower. The Nablusi inhabitants where slightly more dissatisfied with the dimension of the outdoor spaces (2.51), the location, the interconnection with other spaces (2.88), the privacy vis-à-vis

		Total (%)					
		Most D 1	D 2	Neutral 3	S 4	Most S 5	S. Score
Dimension	Jericho	6(10.7)	15(26.8)	4(7.1)	23(41.1)	4(7.1)	2.86
	Nablus	32(12.6)	70(27.6)	31(12.2)	83(32.7)	8(3.1)	2.51
Location	Jericho	5(8.9)	11(19.6)	11(19.6)	21(37.5)	4(7.1)	2.92
	Nablus	8(3.1)	58(22.8)	37(14.6)	114(44.9)	8(3.1)	2.88
Privacy vs. surrounding Neighbors	Jericho	6(10.7)	17(30.4)	8(14.3)	21(37.5)	0	2.65
	Nablus	56(22)	62(24.4)	32(12.6)	62(24.4)	12(4.7)	2.3
Privacy vs. Street	Jericho	3(5.4)	9(16.1)	10(17.9)	29(51.8)	1(1.8)	3.08
	Nablus	26(10.2)	55(21.7)	43(16.9)	81(31.9)	18(7.1)	2.67
Sitting	Jericho	3(5.4)	8(14.3)	6(10.7)	29(51.8)	6(10.7)	3.27
	Nablus	15(5.9)	41(16.1)	28(11)	112(44.1)	29(11.4)	3.05
Eating	Jericho	3(5.4)	8(14.3)	10(17.9)	27(48.2)	4(7.1)	3.16
	Nablus	30(11.8)	56(22)	37(14.6)	89(35)	12(4.7)	2.63
Planting	Jericho	2(3.6)	6(10.7)	4(7.1)	31(55.4)	9(16.1)	3.48
	Nablus	18(7.1)	30(11.8)	32(12.6)	113(44.5)	31(12.2)	3.08
Orientation toward sun	Jericho	0	4(7.1)	2(3.6)	42(75)	3(5.4)	3.52
	Nablus	4(1.6)	20(7.9)	18(7.1)	147(57.9)	35(13.8)	3.39
Orientation toward wind	Jericho	1(1.8)	9(16.1)	6(10.7)	32(57.1)	3(5.4)	3.22
	Nablus	12(4.7)	26(10.2)	26(10.2)	136(53.5)	23(9.1)	3.15
Exterior noise	Jericho	6(10.7)	20(35.7)	8(14.3)	16(28.6)	1(1.8)	2.48
	Nablus	49(19.3)	73(28.7)	30(11.8)	64(25.2)	9(3.5)	2.3
Views	Jericho	7(12.5)	18(32.1)	6(10.7)	17(30.4)	4(7.1)	2.66
	Nablus	27(10.6)	69(27.2)	38(15)	62(24.4)	28(11)	2.63

Ref: D=Dissatisfied, S=Satisfied, S. Score= Satisfaction's Score

Table 5. *Inhabitants' satisfaction of outdoor spaces.*

the neighbours (2.3), the level of exterior noise (2.3) and the outside views (2.63) than the inhabitants of Jericho.

Most outdoor spaces in Nablus are less than 10m2 and 44.6% of the Nablusi dwellers prefer to reduce their inside space in order to have a larger outside space. This shows the importance of these spaces.

The cross-tabulation on the periods of usage and the privacy issue concerning the outdoor spaces showed that most of the inhabitants are dissatisfied with privacy and prefer the evening periods for their social activities. Most of the women (66%) are dissatisfied with the issue of privacy. In order to ameliorate the privacy of their inside spaces the residents modified their outdoor spaces with window boxes, canopies and enclosed the outdoor spaces with aluminium windows, which also has some environmental benefits (see Figure 3).

Interior spaces characteristics

More than 55% of the living rooms in both cities don't have a direct connection to the outdoor spaces of their housing units. Moreover, 43% of the living spaces in Nablus are isolated in the center of the housing units' plan. Natural lighting and ventilation in these central spaces have in both cities a satisfaction score of only 1.9 (slightly less than the medium level) on a 3-point scale. In order to improve both the low lighting level and thermal discomfort inside these central living spaces, 62% of the housing units in Jericho and more than 45% in Nablus were designed according the western open space design concept, although this is in contradiction with the Palestinian ideal of family privacy (see Figure 4).

In order to improve the environmental quality of the inside spaces, 96% of the occupants in Jericho and 57% in Nablus use mechanical and electrical cooling devices in summer, and 65% of the respondents in Jericho and 78% in Nablus need heating equipments inside their living spaces in winter time, though these devices are known as costly and greedy in energy.

In summary, in order to improve the quality in the housing units from the inhabitants' point of view, different aspects are classified in Table 6. The interior design and natural ventilation are the most significant priorities and need to be resolved in the future housing of Jericho. In Nablus, the interior and the exterior design are a priority and natural lighting is secondary.

Figure 3. *Individual alterations on the new outdoor spaces.*

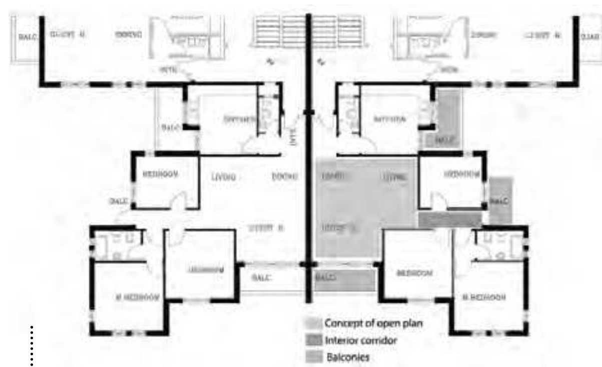

Figure 4. *Example of contemporary apartment building.*

TRADITIONAL COURTYARD HOUSING CHARACTERISTICS

The courtyard, which is an open sky space, is locally called by Hosh or wast ed-dar, (Canaan, 1933). Besides environmental considerations (e.g. solar radiation, ventilation etc) (Evans, 1980), Bassiouni states that the privacy (i.e social criteria) was one of the main motivations for choosing the courtyard as a crucial architectural element in Arab house planning (Azab, 2008). The courtyard was the heart of

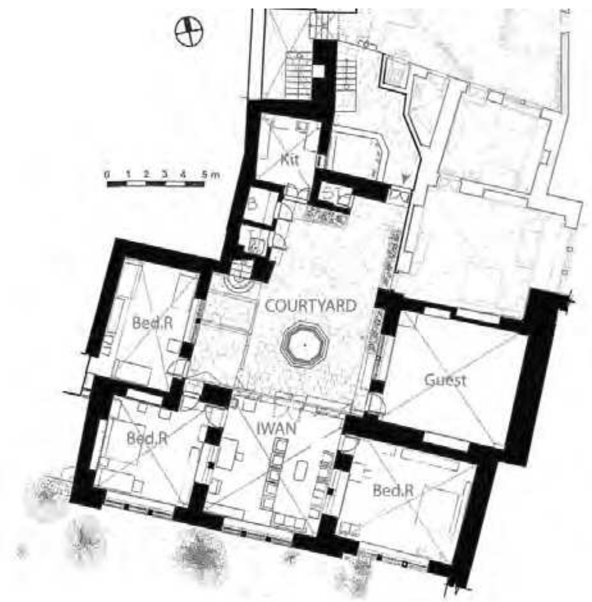

Figure 5. *Traditional houses: a) in Nablus, b) in Jericho: (Treated by author by kind permission of NAZER S.)*

the house, where the living, service spaces and additional peripheral wall exceeding the eye's level, have defined its enclosure, (see figure 5a and 5b). This open space occupied mostly 20% of the total area of the house, and waslarger than the largest room in the house.

Unlike in Jericho, where houses have one floor, the historical Nablus downtown consists of clustered courtyard houses of three floors maximum. The ground floor is being used for commercial facilities (Ahmad, 2008).

The spatial analysis of the courtyard houses shows that the inward-looking character of this concept enhanced the privacy of the living spaces and successfully ensured the separation between the interior (private) and exterior (public) realms; the house spaces opened into the courtyard, whereas the openings onto the exterior were reduced to a minimum. Moreover, for indoor privacy reasons, the guest room was located close to the entrance. There was continuity between the courtyard and the living room (Iwan).

Furthermore, the courtyard had a vital function in the house as it was a multi-functional space and used for different official social celebrations like wedding and funeral ceremonies, but also for the daily and domestic activities such as eating, collective cooking, sleeping, entertaining, and as playground and meeting-place for family members and women.

The traditional courtyard was distinguished by its landscaping, where trees (palm and citrus), plants and fountains help to moderate its inner

		Total (%)	
		Jericho	Nablus
Future envi. Improvements	Exterior design	6th	1st
	Natural ventilation	2nd	3rd
	Exterior odors	4th	5th
	Solar radiation-winter	5th	7th
	Noise	3rd	6th
	Natural lighting	8th	2nd
	Interior design	1st	1st
	Solar radiation-summer	7th	4th

Table 6. *Classification of future requested improvements.*

Figure 6. *Landscaping inside the courtyard and the fluid relationship with the Iwan.*

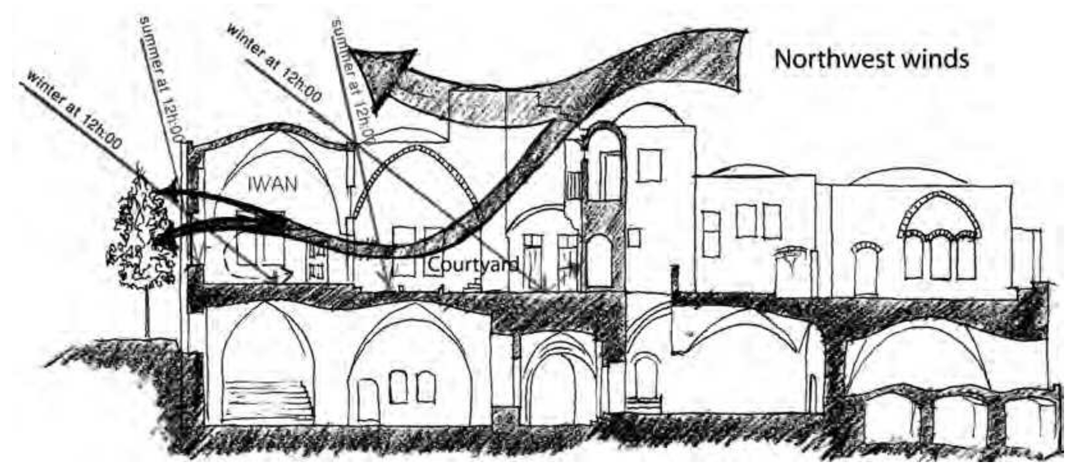

Figure 7. Environmental concept of the courtyard and Iwan, the solar angles were identified by the Solar Tool program.

microclimate by evaporative effect and providing shaded area in this open space, (see Figure 6).

The courtyard's function as circulation space is influenced by the precipitation rate, especially in Nablus. However, such spaces were used more in Nablus than Jericho, where this architectural element is highly recommended (Haj Hussein, 2005). This reflects the importance of the socio-cultural dimension in the traditional context.

DISCUSSION

Based on two approaches, a comparative study between the contemporary and traditional outdoor spaces has been made.

Social quality approach

The analysis of the living quality in the Palestinian housing showed that improving the privacy inside the dwellings has a high priority. The privacy issue is also important for the private outdoor spaces. The traditional interiorized courtyard design concept successfully ensured the privacy in these open spaces. The low satisfaction level for the current open spaces (2.48 in Nablus and 2.65 in Jericho) is mainly due to the lack of privacy from outside. The western open plan concept for contemporary housing is in contradiction with the stark separation between private and public space of the courtyard concept and reduced the privacy significantly. 60% of the respondents are against this open concept in their housing units.

The spatial and visual relationship between the courtyard and the different private indoor spaces, particularly the living room, creates strong family bonds and encourage various family activities. Nowadays, the outdoor spaces are mostly connected to only one indoor space limiting the social activities in the outdoor spaces to sitting, laundry services, putting flowerpots for privacy and aesthetic purposes and to receive guests.

On the scale of the residential area, the social networks and communal life are another contributing criteria of social life quality. The shaded streets and commercial facilities on the ground floor of the traditional settlements enhanced this quality. Although it could be developed on the open spaces around the new building blocks, in 70% of the contemporary housing many of these facilities (i.e. common space, playgrounds and commercial facilities) are lacking.

Environmental quality approach

The spatial analysis of traditional housing, especially in Nablus, showed that besides the northern openness of the living room (Iwan) into the courtyard in order to make use of the northwest cool summer winds gathered in the courtyard, it has been oriented towards south for more solar radiation in winter, (see Figure 7). This interrelationship (courtyard - Iwan) encourages the nomadic movement inside the house, where inhabitants select the more comfortable place for doing their activities, according to the climatic conditions (Rapport A.1972).

In contrast, this interrelationship is missing in the AL-Yarmouk courtyard housing in Jericho. Service spaces (W.C & bathrooms) were opened onto the courtyard, while living rooms gave onto the outside limiting the potential of cross ventilation

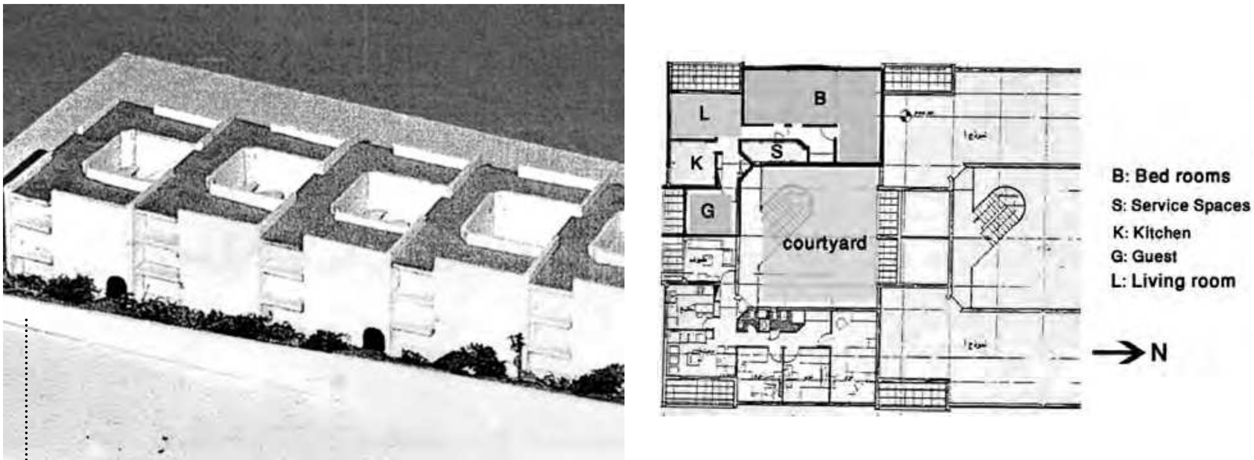

Figure 8. AL-Yarmouk courtyard housing in Jericho. (Treated by author by kind permission of Palestinian Housing Council).

inside the house, (see Figure 8).

More than 70% of modern housing use mechanical and electrical tools for improving visual and thermal comfort inside, especially the central living room, which lacks natural light and ventilation. The compactness of traditional settlements reduced the facades exposed to sun to the minimum for thermal protection objective, in contrast to the spread and detached modern housing where exterior walls are fully exposed to different climatic conditions.

Over 40% of current outdoor spaces have a west orientation. This orientation could be useful for tackling the summer overheating problems, especially in Nablus, where the dominant winds come from the northwest direction, but not in the case of Jericho where east and north winds are the prevailing summer winds. Moreover, diurnal ventilation is not recommended due to the high air temperature that could deteriorate the thermal comfort in houses (Haj Hussein, 2005).

Potential of vegetation in the modern outdoor spaces was one of the most satisfactory characteristics, while it is mostly limited to potted plants comparing to trees and water used in the courtyard. However, it is still important for improving the outdoor quality.

CONCLUSION

This paper presents the socio-environmental dimensions of outdoor spaces in the Palestinian housing design. Based on a satisfaction survey it examined the current housing and its outdoor spatial and social characteristics. The survey's results show that outdoor spaces could play a significant role in the improvement of the living quality in the future Palestinian housing.

New thinking about the use of modern construction technologies, improving and changing certain housing characteristics (number of floors, number of apartment, etc.) and the integration of certain distinctive qualities of the traditional courtyard architecture in the design of future housing will be appreciated.

Configurations, spatial organization, orientation, size, privacy and function are the most important characteristics that helped the traditional outdoor spaces, the "courtyard", to attain its social and environmental qualities. Neglecting such characteristics in future outdoor spaces design can lead to their under-performance. These spaces, in terms of passive solar heating and cooling, could have, according to their climatic zone, an important role in the houses.

In this paper only qualitative aspects have been discussed. Further, more quantitative studies will be necessary in order to evaluate the current housing typologies characteristics and to develop new approaches that create a satisfying effect on the quality of inside and private outside spaces.

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EDITORIAL EVALUATION - Henk Visscher

From whatever perspective we look upon the sustainability and health quality of housing, the quality improvement of the housing stock will be of major importance. To achieve the goals of reduction of fossil energy use, large scale refurbishments programs will have to be carried out. This goes together with the necessity to prevent the ageing stock from deterioration and to improve the physical quality of neighborhoods and dwellings for livability reasons.

Although the range of topics presented in this special issue of Open House International is broad, they all contribute with relevant insights into the challenges of the next decades. Physical improvements of dwelling for the purpose of reduction of energy use for heating have a direct impact on the quality of the indoor health conditions. To address the ecological sustainability in a broader perspective than the reduction of greenhouse gas emissions in the use phase alone, we should make a more holistic consideration of the effects of the use of various materials and the impact on a range of environmental aspects. The expected 'life span' of an improved dwelling is a crucial factor in the required Life Cycle Assessment methods that can be used to compare the environmental impact of different options. This brings us to the field of social aspects of sustainable housing and neighbourhoods. It is of no use to improve the energy quality of dwellings without considering if the type, size and place of the dwellings still match the demands of today and during the next period of the expected lifespan. Also financial considerations play an important role. The bills for rent and for energy are mostly considered as separate entities. For financing sustainable investments it seems essential to consider all housing costs. And if we know what has to be done in terms of refurbishments or maybe demolishing and replacement by new dwellings, then the question arises: are home owners and occupants motivated enough to take the initiative to invest and use the house and heating services and other appliances in the right and energy economic way? Are financial incentives or command and control regulations needed from the governments? And even when we have tackled these barriers there remains a challenge for the building industry to produce what is needed. The focus has to shift from new construction to refurbishments, which has a considerable impact on construction methods and project management and cooperation between parties. New methods and processes will be needed to work adequately and to provide enough quality. New forms of building control and quality assurance will be needed as well, shifting from avoiding large failures and risks concerning safety and health to assuring high performance levels. This context of change creates a large puzzle to which this special issue ads some small pieces. The gigantic transformation starts with awareness and knowledge. Therefore it is essential to start with the question how a sustainable built environment can be educated at an academic level. But since there is no time to loose, we cannot only make plans and think out new techniques, processes and regulations for the future, we should also act today.

To realize the aims for a sustainable and healthy housing stock, innovation is needed on many levels in the maintenance, refurbishment and building industry. This starts with innovation in design concepts, in the renovation and building processes, in the interaction with the users of dwellings. And there is a major role for national and local governments to innovate policies, regulations and financial conditions (taxes, rents) that allow and stimulate this innovation in the building sector. Many innovative techniques, processes, management approaches and policy instruments are used in a fragmented way on local levels and in particular in renovation projects. The dissemination of this knowledge is therefore essential and that is also the contribution of this special issue.

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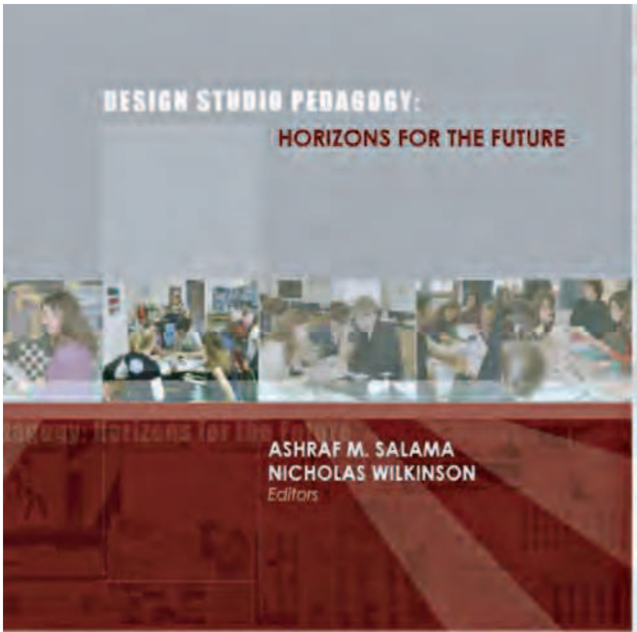

DESIGN STUDIO PEDAGOGY: Horizons for the Future
Ashraf M. Salama & Nicholas Wilkinson (editors).

This groundbreaking book is a new comprehensive round of debate developed in response to the lack of research on design pedagogy. It provides thoughts, ideas, and experiments of design educators of different generations, different academic backgrounds, who are teaching and conducting research in different cultural contexts. It probes future universal visions within which the needs of future shapers of the built environment can be conceptualized and the design pedagogy that satisfies those needs can be debated.

Addressing academics, practitioners, graduate students, and those who make decisions about the educational system over twenty contributors remarkably introduce analytical reflections on their positions and experience. Two invited contributions of N. John Habraken and Henry Sanoff offer visionary thoughts on their outstanding experience in design pedagogy and research.

Structured in five chapters, this book introduces theoretical perspectives on design pedagogy and outlines a number of thematic issues that pertain to critical thinking and decision making; cognitive and teaching/learning styles; community, place, and service learning; and the application of digital technologies in studio teaching practices, all articulated in a conscious endeavor toward the betterment of the built environment.

Contributing Authors:
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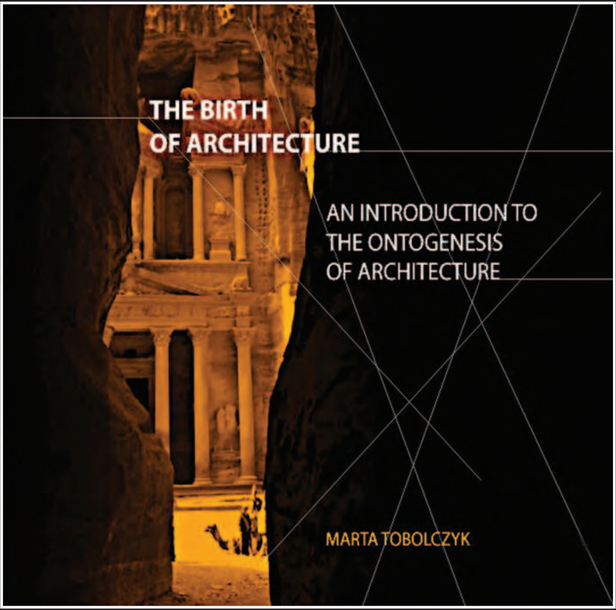


Dr. Hab. Marta Tobolczyk, architect and academician: Department of Architecture, Warsaw University of Technology (since 1976), Visiting Asst. Prof. in the U.S.A: Iowa State University, Ames, IA, (1989-1990), North Dakota State University in Fargo, ND (1991-1993), and in N. Cyprus: Eastern Mediterranean University, Famagusta (2003-present). The idea of the book emerged during the author's travels across the deserted lands of the South Western states of the U.S. The appearance of monumental rocky forms, which resembles the eroded ancient temples and ziggurats, raised a question about the genesis of the earliest architecture. The initial thought that the tectonics of the ancient architecture might be explained by the more direct than nowadays contact of Man with Nature, led to more profound research, based on archaeological and anthropological assum-ptions.

The book offers the new outlook at architecture, by presenting its evolution, initiated in Prehistory, as the gradual solving of the more and more complicated spatial and structural problems, which followed the successive development of the human ability to think in symbolic and abstract terms. Such an anthropological and a-historic point of view allows, according to the author, the formulation of the general principles and regularities of the development of architecture within the new branch of knowledge: the ontogenesis of architecture. Until recently, the interpretations of architecture concentrated on orders and styles, and the theory of architecture was applied mainly to design and the relationship between the work of art and the creator. However, the truth on architecture appears to be more complex: the researching its development as the constant oscillation between chaos and order seems to be more exciting.

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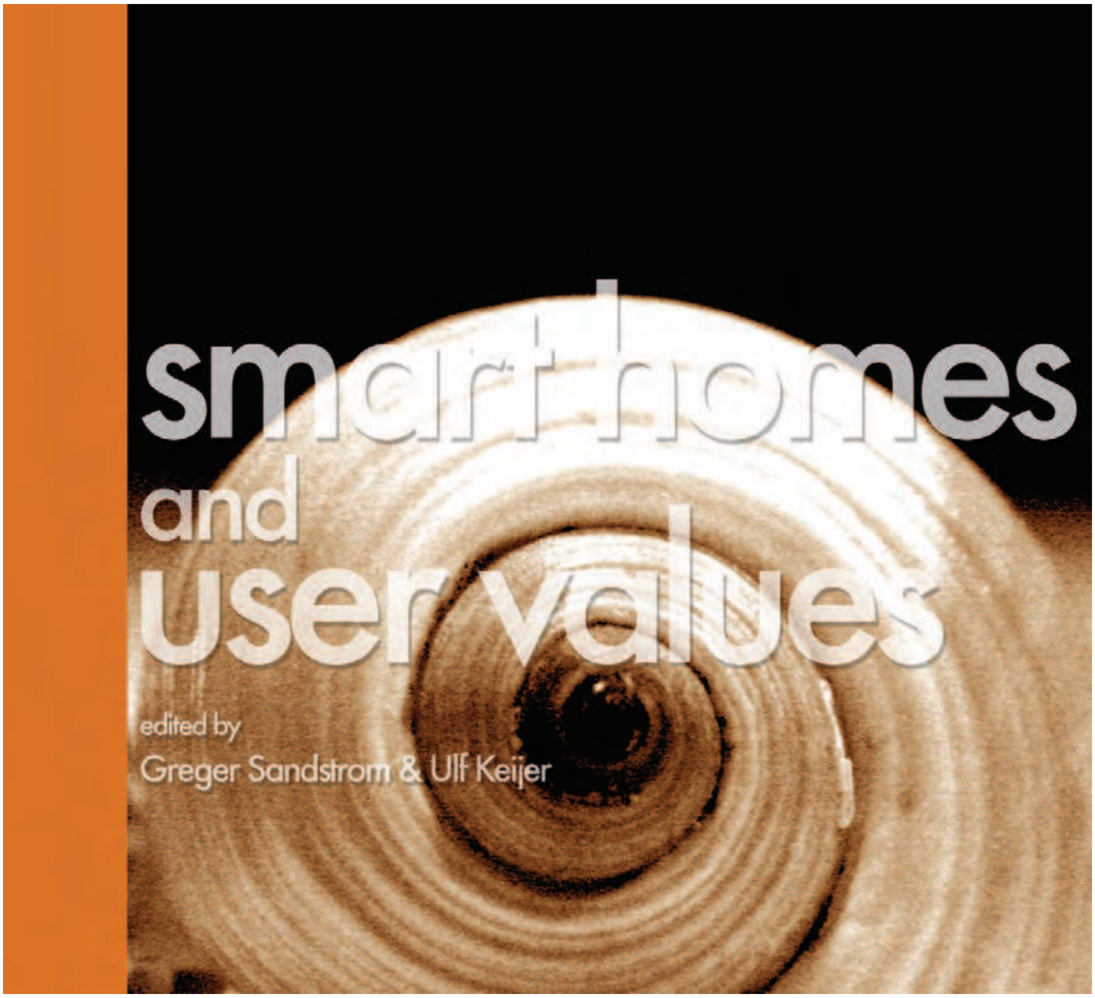

SMART HOMES & USER VALUES
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This book discourses upon Smart homes and User values. Its aim is to contribute to bridging the gap between technology and user values in the home setting. Most smart home projects address technology development, albeit often with some application of the technology in mind. In the book the other view is taken, starting with the users' experiences and bringing it back to technology, organisation and service delivery. Evaluations of smart homes in use are presented. User perspectives on, i.e. ordinary residential living, assistive living and digital services are covered. Presented results indicate how society, the real estate industry and the individual residents may benefit; and the prerequisites for it. The book contains evaluations of smart homes in Europe, Asia and North America. The book constitutes the state-of-the-art in the field, indispensable for the construction and the real estate industry, developers of the systems and technology, other professionals in the field, institutions, students and everyone interested in new technology for homes and everyday life.

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