

# STRENGTHENING WOMEN'S PARTICIPATION IN CONSTRUCTION RESEARCH IN EUROPE

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Very little is known about the role of women in construction research and the factors hindering the equal presence of men and women, despite wider research addressing women's participation in science and engineering generally. This paper reports on the development of the 'WOMEN-CORE' project, co-funded by the European Commission's Research Directorate General under the Sixth EU Framework Programme (FP6). The project is focused on construction generally because of its important role in economic growth and also its male-dominated nature, with women only representing 10% of the UK construction workforce and 8% of the EU. WOMEN-CORE focuses specifically on construction research because of the sector's poor performance in research and innovation and the cost of 'non-quality' as a proportion of total output. Furthermore, women's growing role as decision-makers and buyers is not reflected by their input into construction innovation and creativity. The primary theme of the research is therefore to strengthen women scientists' participation in construction research across Europe. This paper indicates the significance of WOMEN-CORE against the current climate in the construction sector, the European Commission's position on gender equality and wider research addressing women's experiences in science. It then utilizes this literature to develop the WOMEN-CORE research framework around two key themes: enhancing knowledge and strengthening women's participation in construction research.

Keywords: Europe, gender, research, women.

## INTRODUCTION

Very little is known about the role of women in construction research and the factors hindering the equal presence of men and women, despite wider research addressing women's participation in science and engineering generally. This paper reports on the development of the WOMEN-CORE<sup>2</sup> project, established to address the under-representation of women in construction research. The premise of WOMEN-CORE is to determine whether women are under-represented in construction research and, how women's experiences may differ from those in the construction sector and those in academic and industrial research. Given the nature of both construction sector and scientific research cultures, it may be that construction research represents a 'double hurdle' for women seeking a career in this field. The paper begins by examining the significance of the construction sector, and goes on to discuss women's experiences in the wider spheres of industrial and academic research (due to the lack of existing literature on women in construction research). It also explores existing strategies and policies for gender equality and increasing women's participation in scientific research. The paper then draws on this literature to explain the significance of the

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<sup>2</sup> WOMEN-CORE is an acronym for WOMEN in CONstruction Scientific REsearch

WOMEN-CORE project and to develop a research framework for exploring women's experiences of, and gender equality initiatives in, construction research.

## THE CONSTRUCTION SECTOR

The construction industry one of the most important industry sectors in terms of economic growth and employment. In 2005 the construction in the EU21 totalled 1,065 billion € 10.2% of GDP, and employed 13.4 million operatives (FIEC, 2006). This makes it the largest industrial sector in the EU, representing one quarter of the total industrial output (ENBRI, 2005). However, the indirect impact of the construction sector goes much further. ENBRI (2005) states that the quality and usability of the built environment influences the behaviour and performance of individuals, organizations and society in general, while other indirect effects include, for example, the design of urban areas to discourage anti-social behaviour. Construction is also thought to be central to the achievement of sustainable development. The sector accounts for 40% of resource consumption and for 50% of solid, liquid and gaseous emissions. ENBRI (2005) argues that construction has a crucial role to play in reducing overall use of energy and creating the means of harnessing ambient energy sources. Similarly, Lambert (2004) also suggests that the construction sector needs a 'green' strategy, in order to meet targets for sustainability.

However, the construction sector also faces increasing global competition, tends to have low profit margins, is dominated by small firms and has a bad image and safety record (ENBRI, 2005). At the same time, the construction sector has a low R&D intensity, at less than 1% for the top 20 companies (DTI, 2006) and the cost of 'non-quality' as a proportion of total output is also high, estimated at 5-10% (COM, 1997). It is therefore important for construction to embrace R&D<sup>3</sup> in order to develop new structures, processes and relationships that promote innovation and meet the needs of clients, users and society more effectively (ENBRI, 2005). In the UK, the Fairclough Report (2002) indicated the need for Government support for construction R&D in order to improve all aspects of the industry's performance in terms of productivity, value for money and strategic issues. The report also pointed to the need to attract and retain talented individuals – including widening the sector's appeal to women and other under-represented groups – in order to plug the skills shortage in construction R&D. On a European level, this has also been supported by the establishment of the European Technological Construction Platform (ECTP) in 2005, to promote and shape R&D in the European construction sector.

## WOMEN IN SCIENTIFIC RESEARCH

The ETAN Report (EC 2001) states that the wealth and quality of EU citizens are dependent, to a significant extent, upon the successful development of excellence in science<sup>4</sup>. Despite Europe's strong tradition in research and innovation, gender plays a disproportionate role in the likelihood of being able to enter, remain in, and succeed within the scientific community. Historically and currently, women play a very

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<sup>3</sup> The Frascati Manual defines R&D as that which comprises 'creative work undertaken on a systematic basis in order to increase the stock knowledge, including knowledge of man, culture and society, and the use of this stock knowledge to devise new applications' (OECD, 2002: 30).

<sup>4</sup> 'Science' here refers to science in the broadest sense: any systematic methodology which attempts to collect accurate information about reality and to model this in a way which can be used to make reliable, concrete and quantitative predictions about future events and observations. In this sense, science encompasses not only the natural sciences, but also social and mathematical sciences.

limited role in decision-making around science and technology, and relatively few pursue scientific careers. Gender plays an unwarranted role in the allocation of positions and resources in science and technology. At the same time a more diverse workforce is needed in order to release potential, foster innovation, create markets and reach diverse consumers (Rübsamen-Waigmann *et al.* 2003). However, social, economic and demographic changes in Europe mean that the potential workforce is shrinking, while the need for industrial researchers is growing. Rübsamen-Waigmann *et al.* (2003) argue that employers across Europe need to become more competitive by investing in staff for R&D, and by using staff more effectively. This means that it is vital to retain women at every stage of their career. Similarly, Mitos (2001) has argued that there is a need to recognize the promotion of women in science as crucial to improving the relationship between science and society, in order that science better reflects the diversity of the entire population. Logue and Talapessy (1993) suggest that the lack of women in science poses a threat to a number of aspects:

- Equity – gender discrimination is a violation of human rights;
- Excellence – the under-representation of women threatens excellence;
- Efficacy – the ageing population and the shrinking pool of young scientists makes it essential to target both genders;
- Efficiency – it is wasteful to educate and train women scientists but then not use their skills in employment.

The Council of Europe (1999) identified 3 goals in relation to women in science and technology:

- To improve our information on the place women occupy in science and technology;
- To improve girls' access to scientific and technological studies and careers;
- To achieve greater equality in the relations between men and women throughout society.

In 1999, the Helsinki Group on Women and Science was established to learn about initiatives occurring in the name of women and science and, to benchmark policies and practices designed to promote gender equality in the culture of scientists and in scientific careers. The Helsinki Group (Rees, 2001) established that:

- There is a lack of harmonized sex-disaggregated statistics on women and science;
- There is a lack of gender-balance in decision making;
- There is a 'leaky pipeline', whereby there is a disproportionate leak of women from science careers at every stage of the academic hierarchy;
- There is a need to modernize human resource management policies in universities and research institutions.

### **Barriers facing Women in Scientific Research**

Numerous research studies have addressed the barriers women face in both academic and industrial research and many of these factors may be transferable across disciplines, including the construction sector. In summary, the main barriers identified in the research include:

- *Sexualized cultures*: Women are often equated with biologically determinist definitions of their gender, which mean they are perceived as women first and scientists second (see for example, Benckert and Staberg, 2000; Etzkowitz *et al.*, 2000; and Faulkner, 2006). The sexualized culture expressed in science is therefore a key force that works against women's acceptance in male-dominated fields.
- *Organizational cultures*: Despite an increase in policies designed to tackle inequalities in the workplace, there is often an inconsistency between organizational policies and workplace cultures. Etzkowitz *et al.* (2000: 84) found that in academia, 'despite a formal and at times a strongly stated commitment to non-discriminatory treatment of women, discrimination can be manifested informally.' See also, Devine (1992), Elvitigala *et al.* (2006) and Bagilhole (2006).
- *Long hours culture*: The dominant culture in scientific research is long working hours and the expectation of total availability. Etzkowitz *et al.* (2000) found that long hours spent in the laboratory were positively interpreted regardless of how the hours were spent. This culture is particularly significant for women, given that they usually have more domestic responsibilities than men and, that there is often a lack of flexible working arrangements, such as part-time work, working from home or working flexible hours. See also, Davis (2001), Grant *et al.* (2000), Gupta *et al.* (2004) and Murray (1993).
- *Gender stereotyping*: Gender stereotypes that exist in wider society pervade in scientific research, and the association between masculinity and technology (see for example, Cockburn, 1985) can mean that women are pushed into 'softer' research areas, which are deemed more suitable for women, but which often have less opportunities for career advancement.
- *Gendered Networking*: Despite the significance of networking for career success, women in science are often excluded from existing social and professional networks (Davis, 2001; Faulkner, 2006; Moore *et al.*, 2005; Etzkowitz *et al.*, 2000). Linked to this, there is also a lack of mentoring programmes for women, and a lack of female role models. In part, this is a result of the limited number of women choosing a scientific research career, and the high attrition rates of those that do, which results in few women reaching senior positions (WomEng, 2005).

### **Gender Mainstreaming**

As a result of these arguments, the European Commission (EC) has adopted gender mainstreaming as its main strategy in the struggle for gender equality at an international level. Rees suggests that gender mainstreaming is about 'the integration of gender equality into all systems, structures, strategies, policies, projects, processes, programmes, into organizations and their cultures, into ways of seeing and ways of doing things' (2001: 54). The ETAN Report (EC, 2001) maintains that gender mainstreaming can help identify the subtle ways in which the status quo is effectively designed with men in mind, and to open systems up to accommodate men and women equally. For example the promotion system is predicated upon a model of an uninterrupted career (EC, 2001). It is difficult for women who have had a career break to compete with men on an equal basis. Selection and promotion procedures need to ensure that women are not disadvantaged by career breaks. This means a more sophisticated measurement of quality and productivity than longevity of service. Counting a candidate's number of publications may in effect be a measure of years' service and access to unlimited time, rather than productivity.

Gender is a key organizing principle in scientific institutions to the detriment of science. The ETAN report (EC, 2001) suggests the issue needs urgent attention and that 'waiting' for equality will not work, arguing that the position of women is worsening in some areas. The ETAN report maintains that good male scientists should have nothing to fear from transparent, fair and effective recruitment and promotion practices. While positive action is essential, as indicated above, policy initiatives alone are not sufficient. A conscious effort needs to be made by employers to address the underlying structures and systems which disadvantage women. These include acknowledging how 'merit' and 'productivity' are social constructs predicated upon male patterns of working, and making institutions less reliant on male networks to secure succession plans (EC, 2001).

## **WOMEN IN CONSTRUCTION RESEARCH**

Against this backdrop, the construction sector is also one of the most male-dominated industries with women representing 10% of the UK construction workforce and 8% of the EU. This is despite women's growing role as decision-makers and clients. At the same time, support for gender desegregation has been an increasing concern for the EC, forming one of the main parts of its equality framework (see above and also, Clarke *et al.* 2004). Clarke *et al.* (2004) also suggest that perhaps because of their nominal nature, national equality policies are often not brought into play in order to structurally change the construction labour market. Gender equality issues have been taken up only minimally by the national social partners in the EU construction sector, even though they are core players in the formation of the social and equal opportunities agenda at European level. In general, employers' appear to choose preserving the present position above more progressive policies to help the industry deal with its changing context (Clarke *et al.* 2004). At the individual company level, the discrepancy with the national debate and policies is also apparent (Beck *et al.* 2004). Clarke *et al.* (2004) found next to no evidence of construction companies adopting an active approach to equal opportunities policies or being sufficiently convinced by a 'business case' argument for equality to transform the situation.

## **WOMEN-CORE AIMS**

Building on the current climate of the construction sector, the situation of women in scientific research and the EU drive for gender mainstreaming, WOMEN-CORE has been established to address the unequal representation of men and women in construction research in Europe by strengthening women researchers' participation. The specific objectives of WOMEN-CORE are to:

- Enhance the knowledge of women and strengthen their involvement in construction research;
- Identify the main research areas that are attractive from women's perspectives;
- Identify and assess the gender-specific needs of R&D in the construction sector;
- Explore new opportunities, anticipate tendencies and provide recommendations for empowering women in construction research;
- Establish a network of women researchers in construction research, including those in industry and academia.

The project identifies a number of core disciplines as construction research, including those listed in Table 1. In addition it is recognized that construction research can be

conducted in a number of peripheral areas such as: physics, geology, history, psychology, sociology and geography.

**Table 1: Core construction research disciplines**

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Architecture	Geotechnics and underground studies
Building physics	IT
Construction and economic management	Transport organization and structures
Construction technology and organization	Urban planning
Environmental engineering	Water management and structures
Heating, cooling, ventilation, electricity and networks	Mechanics, including fluid mechanics and dynamics

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## DEVELOPING A RESEARCH FRAMEWORK

WOMEN-CORE will achieve its objectives in two key ways: by enhancing the knowledge of women in construction research in order to inform and shape policies and attitudes and, by strengthening the participation of women in construction research.

### Enhancing Knowledge

The Women in Industrial Research study stressed the need for more statistics, monitoring, scoreboards and benchmarking of women's position (EC, 2003). The WOMEN-CORE project has therefore started to enhance the knowledge of women in construction research by compiling relevant statistics from the European R&D survey, the Community Labour Force Survey, national earnings data and the education database. These statistics will enable the researchers to build a picture of:

- Gender education segregation, including analysis of women's current and historical presence among graduates in construction-related fields;
- Women's and men's working conditions, including gender analysis of personal, familiar and working condition for the past ten years;
- Gender transitions from higher education to work, including an in-depth study of school to work transitions for recent graduates in the fields most closely related to construction research;
- Gender pay gap, including comparing the gender pay gap of scientists and engineers in the construction sector and in the rest of the industrial sector;
- Gender segregation in R&D personnel in construction research.

The research will also collect and analyse statistical data on:

- Women's participation in EU funded projects in construction research;
- The role of women as patent originators in the construction sector;
- Women's construction scientific research publications and citations.

In addition to the analysis of existing data, WOMEN-CORE will also explore new sources of data, particularly through surveys and interviews with construction research organizations and construction research employees. Data collection will allow WOMEN-CORE to compare the experiences of women in construction research with those of women in scientific research generally, including those in both academic and industrial research. In addition, surveys and interviews with construction research

organizations will enable WOMEN-CORE to analyse institutional practices on gender issues, as well as the identifying numbers of construction researchers and employment trends (such as field of study, tenure and hierarchical position). The interview data will also obtain a deeper analysis of institutional initiatives employed to promote gender equality and enable WOMEN-CORE to build examples of best-practice to show how organizations can benefit from investment in women's careers. Surveys and interviews with individuals will cover two target populations: actual and potential researchers in construction. A survey of potential researchers will include those who have studied a construction-related field, but pursued a career outside research. This will enable WOMEN-CORE to address the attrition of women (and men) from construction research careers. In the case of those employed in construction research, data collection will cover issues such as R&D field, career path, research funding, publications and patents, personal experiences of gender issues, networking and mentoring. It is also hoped that interviews with individuals will help to recognize different ways in which women can develop a successful professional career in potentially adverse environments and to develop a more thorough understanding of existing inequalities.

### **Strengthening Participation**

In addition to collating and analysing existing and new data, WOMEN-CORE intends to define and develop driving forces, new opportunities and recommendations to empower women in construction research. Two specific aspects of strengthening women's participation will be mentoring and networking. Mentoring is the process of building a relationship in which a more experienced mentor can assist in sharing knowledge and skills and assisting with the development of a less experienced mentee. WOMEN-CORE will identify and evaluate existing mentoring programmes for women in science, before establishing a mentoring programme for women in construction research. WOMEN-CORE will also establish a network of construction researchers, which may or may not be women-focused, depending on feedback received through European seminars and through the data collection phases.

Networking is also an important opportunity for strengthening women's participation because existing research indicates both the significance of networking in career development and women's exclusion from both formal and informal networks. Networks are considered to be an opportunity to build and increase social capital, increase understanding and knowledge, ease career transitions, establish collaborative work, develop personal connections and friendships and support each other regardless of location. The network is expected to provide a forum for exchanging information, to raise awareness and collate best practice around gender equality, to promote equal opportunities, role models and mentors, and to organize workshops and face-to-face networking opportunities.

## **CONCLUSIONS**

In summary, this paper has highlighted the significance of the construction sector to society in general and specifically in developing sustainability. Nevertheless the industry has a poor track record in R&D which needs to be improved in order to improve its development and success. At the same time, research addressing women's experiences in the wider spheres of scientific research (both industrial and academic) indicate that women face particular barriers in their career progression. Against this background, the WOMEN-CORE project has been established to address the under-representation of women working in construction research. Using the

literature described, WOMEN-CORE has developed a research framework to explore women's experiences and equality initiatives in construction research, with a particular focus on enhancing the knowledge available (through statistical analysis and data collection) and strengthening women's participation (through developing best practice and a network of construction researchers).

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