

Design and sustainable development

what is the contribution that design can make?

A case study of the Welsh Woollen Industry

Angharad Thomas, University of Salford

Abstract

This paper reports on ongoing research examining the contribution that design can make to sustainable development, that is

... development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987, p. 43).

It outlines the need for global sustainable development and its adoption into global and governmental policies. Both of the key concepts of design and sustainable development are discussed, as is the relationship between them (Spangenberg 2001, Walker 2006). The contradictions between design as a stimulator of consumption and its potential contribution to sustainable development are examined.

The context of the research is Wales, one of the few nations to have a legal commitment to sustainable development (Welsh Assembly Government 2004a), and a selected part of the textile industry there. The policy background and the measurement of sustainable development in Wales are discussed. A background is given to the selected part of the textile industry, that is the Welsh Woollen Industry and a classification of it into 'old' and 'new' sectors is proposed.

The methodology of the study is outlined, having a social constructionist philosophy, informed by feminism and interpretivism. The methods developed to explore this relationship are principally qualitative (Rossman and Rallis 1998) within which a case study approach is taken (Langrish 1993, Yin 2003).

Analysis of data collected indicate that the use of design as a recognised activity is uneven, some producers using design strategically to give their work unique appeal and others not using it in a conscious way. In other contexts a design input does not contribute to economic sustainability as might be expected (Lorenz 1986).

Further work is outlined including concepts and tools to be used. More data will be collected from producers in urban areas in order to gain further insights and from key people working in both design and sustainable development at an institutional level.

Keywords

Design; Sustainable Development; Wales; Welsh textile industry; rural producers

This paper reports ongoing doctoral research examining the contribution that design can make to sustainable development, that is, as defined by the Bruntland Commission:

... development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987, p. 43).

The relationship between design and sustainable development is being studied in the context of the Welsh textile industry as the researcher feels that this provides a suitable and accessible range of situations in which to collect data to study: Wales having a national legal remit for sustainable development and the part of the textile industry selected for study being one in which there is production of goods and therefore design of them. The design of the goods is not necessarily done by a trained designer; however, design decisions about the type of goods, their manufacture, appearance, and suitability for the market are all undertaken within the organizations studied. The research takes a case study approach, within a broadly social constructivist philosophy, informed by feminism and interpretivism.

Why is this important? At the start of the 21st century issues of the sustainability of life on earth surround us. Often, sustainability is taken to mean environmental sustainability, but the important difference in using the term sustainable development, is that it links the environmental with social and economic aspects, to form the 'Three Pillars' of sustainable development (Ekins cited in Baker 2006). However, sustainable development is a highly contested concept. What it is, its usefulness and how it is put into practice and assessed are all debated by activists, practitioners and academics (Bell and Morse 2003, Dresner 2002, Luke 2005, Robinson 2004). Despite, or perhaps because, of this openness to interpretation, sustainable development has become widely used and adopted into policies across the world from the United Nations, to the European Union, down to national governments and local communities (United Nations Division of Sustainable Development, European Union Sustainable Development, UK Government Sustainable Development, Sustainable Communities).

It is important to note that the 'development' aspect of sustainable development is crucial to redress the global inequalities of living standard and income that currently exist, currently challenged by the UN's Millennium Development Goals (Millennium Development Goals). However, to be successful, this development will need to be of a different type than that that has enabled countries like the USA and Europe to achieve their standard of living, i.e. it will need to be sustainable.

A brief overview of design and sustainable development

Design has a literature that theorises what it is, what it can do, how it does it, what it produces and how designers work and think (Archer 1974, Cooke 1992, Heskett 2002, Jones 1970, Lawson 1980) while sustainable development has large body of work seeking to describe, measure and understand it (Baker 2006, Bell & Morse 1999, Elliott 2006, Purvis & Grainger 2004, Redcliff 1987, United Nations Conference on Environment and Development 1992, WCED 1987). Different types of design taking account of the environment have

emerged in the last two decades including green design (Burrall 1991, Mackenzie 1991), design for the environment (Lewis & Gertsakis 2001), eco design (Brower, Mallory & Ohlman 2005, Fuad Luke 2004), design for sustainability (Bhamra & Lofthouse 2007, Birkeland 2002, Thorpe 2007), sustainable design (Chapman & Gant 2007, Datchefski 2001, Walker 2006), and the cradle to cradle concept (McDonough & Braungart 2002). However, little has been written specifically about design and sustainable development. Reasons for this might include the apparent contradictions inherent between design as a producer of consumer goods and a stimulator of consumption and its potential contribution to sustainable development. The sustainable development 'world' consists of political scientists, development workers, economists or environmental scientists with little or no appreciation of what design is or can do, beyond being part of making or selling goods or services in a consumer driven way.

The writers who have looked at the linkage between design and sustainable development specifically are Spangenberg (2001) and Walker (2006), while Bhamra and Lofthouse (2007) include a chapter on sustainable development. Spangenberg outlines the history and definitions of sustainable development and then discusses sustainable production and consumption. He concludes his discussion with the idea that designers may be able to contribute as follows:

'If identifying the patterns of consumer preference and perception and the shaping of goods and services to make them "digestible" to citizens are some key qualifications designers might have a key role to play. This would include not only the shaping of products and services but also communicating sustainability demands to the business sector, engineers and investors. Thus designers would act as a translator between disciplines, as the spider weaving the sustainability web. To do this effectively, however, would also require that the other actors take the contribution of designers serious (ly) enough to accept them in this role of increased importance' (2001, p. 47).

Walker (2006) discusses design and sustainable development, suggesting the need to reconsider the 'creation of functional objects in the context of sustainable development' (p. 37) and goes on to say that there is a need to develop 'a better sense of what sustainable development means for material culture' (p. 38). The research in this paper hopes to contribute to that understanding.

The context for the research

Wales has been selected as the location of the case study as one of the few nations globally to have a legal commitment to sustainable development (Welsh Assembly Government 2004c). There is a need for development even in mature economies as poverty continues to be a problem in parts of Wales following the loss of much heavy industry and coal mining (Kenway & Palmer 2007). There is also extensive environmental damage and rural problems include affordable housing and erosion of the Welsh language. These problems are being tackled through Welsh Assembly Government policies (WAG 2003).

Sustainable development in Wales is the subject of policy documents, annual progress reports and is measured through a series of indicators (WAG 2004a, 2004b, 2004c, 2005, 2006a, 2006b). However, in these, design, apart from building design and architecture is not specifically mentioned although concepts such as sustainable consumption, production and procurement are included and these have obvious design implications which are not articulated. The progress being made towards sustainable development is measured against a set of indicators including economic measures e.g. employment; environmental e.g. wildlife; and social, e.g. Welsh speakers. The 2006 set has 23 indicators; the UK as a whole had 68 (DEFRA 2006).

The Welsh apparel, footwear and textiles sector employs about 11,000 people (Skillfast 2005, p. 3) in approximately 1000 companies (Kelday 2006, p. 15), 95% employing 50 or fewer (Skillfast 2005 p. 4). The part of this industry selected for this research is geographically specific and of historic and cultural significance, being part of, or related to the Welsh Woollen Industry.

The Welsh Woollen Industry dates back to the Middle Ages and was for many centuries a rural industry producing knitted and woven textiles for local use and export (Jenkins 1969, 1987, 2005a, 2005b, Sutton 1987). It has been in decline since the early twentieth century, the number of mills in Wales given as 90 in 1955, 17 in 1992 (Jenkins 1992 p. 41) and about a dozen in 2008. The products of these mills are typically woollen, plain, striped or checked cloth and blankets, those with the technical capacity also producing a geometrically patterned cloth, inaccurately known as Welsh tapestry. A selection of these products can be seen in Figure 1. There is a history of design interventions being made in order to revitalise the products and enable the ongoing existence of the mills from the 1920s onwards (Schoeser 1984, Sutton 1987). Those mills remaining are found in North and South West Wales.



Figure 1. Welsh Woollen Mill shop display

Alongside the traditional woollen industry has grown up another type of producer, some of whom produce fibre and products from specialised breeds of sheep and goats and some of whom work from small workshops producing

textiles in both rural and urban Wales. This 'new' Welsh woollen industry features weave or knit as manufacturing techniques alongside the use of fibres that may include fine wool, mohair (from angora goats), linen or silk. See figure 2 for illustration of hand knitted garments in mohair from this type of producer.

Both the traditional and the new producer of woollen or other natural fibre, in knit or weave, is the focus of the study. A selection of producers from one rural area are discussed in this paper while planned work will examine producers in contrasting, urban locations.



Figure 2. Hand knitted mohair garments in rural workshop

Methodology

The methodology being used in this research has evolved with the exploration of the problem, the major philosophical influence on the work being social constructionism, that is the belief that all knowledge is socially constructed, as described by Schwandt (2000, p 197):

We invent concepts, models, and schemes to make sense of experience, and we continually test and modify these constructions in the light of new experience.

The methods developed to explore the relationship between design and sustainable development are principally qualitative (Rossman & Rallis 1998). Of the many descriptions of qualitative research (Cresswell 2003, Denzin & Lincoln 2005, Rossman & Rallis 1998, Silverman 2000, Strauss & Corbin 1998) the characteristics of it as described by Rossman and Rallis are the most pertinent. They describe it as being in the 'natural world ... using multiple methods that are interactive and humanistic'. There is a 'focus on context ... the researcher systematically reflects on how she affects the ongoing flow of everyday life' showing 'an exquisite sensitivity to personal biography.' The 'emergent nature' of the research is acknowledged and uses 'sophisticated reasoning that is

multi-faceted and iterative'. The final characteristic, 'that qualitative research is fundamentally interpretive' underlies the research and it is this aspect that is now discussed (1998, pp. 7 - 11).

Interpretivism as described by Geertz was an influence on the study and the 'thick description' (1973) was a useful tool for the initial collection and ordering of data. Feminism has also been an influence on the style of the research, although no formal gender analysis has been undertaken (Gould & Hosey 2007, Roberts 1981, Stanley). A case study approach was selected as being an appropriate way to investigate the research question. A selected part of the Welsh textile industry formed the case study, i.e. the woollen industry both traditional and new, as discussed above. They were relatively easy for the researcher to access and would therefore fall into Langrish's category of 'the ones next door' (1993, p. 361). For the part of the study being reported, the producers were selected from one particular geographical area, being all those who met the criteria of producing knitted or woven textiles on site using wool or similar fibre. They included two of the remaining mills of the traditional Welsh Woollen Industry along with several newer producers. The type of producer therefore varied and included small scale factory production, individual designer makers, and those who have fibre to turn into products.

Data collection

Consistent with a case study approach, many ways of collecting data were used including formal and informal visits, semi structured interviews, collection of all types of material including publicity material, pictures of premises, signage and products. The interview schedule asked direct questions about the use of design in making decisions about what type of goods to make, methods of production, selection of colours, styles, source of raw materials and so on and how this was done if producers did not employ a designer. Questions were also asked about the 'three pillars' of sustainable development i.e. economic status, environmental impact and social impact.

Data analysis

Data analysis also took several forms starting with the construction of a 'thick description', all the information for each producer being collated in a uniform format.

The data collected were analysed using 'plain old hard thinking' as described by Rossman and Rallis:

We argue that all inquiry proceeds through a complex nonlinear process of induction, deduction, inspiration, and just plain old hard thinking (1998, pp. 7 - 11).

Two diagrammatic techniques of analysing and re-ordering data were used, situational analysis and systems diagrams. Situational analysis as described by Clarke (2005), working in the grounded theory tradition, gives mapping techniques for the analysis of qualitative data and these were used (2005, pp 83 - 144). The systems tools used were diagrammatic; the systems map, the influence diagram, the multiple influence diagram and the rich picture (Open

University 1992, 2005). These enabled further ordering and reflection on the material collected.

Findings/results

The two mills are discussed first then the five smaller producers who are discussed together. Use of design is discussed followed by a discussion of it in relation to the 'three pillars' of sustainable development i.e. economic, environmental and social aspects.

The mills

The two mills are identified as M1 and M2. Both produce woollen textiles on mechanised looms capable of producing plain, striped, checked or textured cloth. Both are tourist attractions, having 15 – 20,000 visitors each annually.

Their approach to design is very different, M2 being very design driven. M2 is using design in a 'text book' way to drive sales and to place goods at the top end of the market (Design Council 2006, Lorenz 1986, Thackara 1997). Colours are chosen with care and with consideration of the colour forecasts including those produced by Design Wales, the Welsh Assembly funded design advice service (Design Wales 2006). A full time designer is employed and design students have worked there on placement. The owner is a trained architect and brings a design sensibility to the publicity, signage and web site, all of which he designs. M2 also works in conjunction with Design Wales on a student design competition. It has been selected by Design Wales to be a case study to showcase the use of design in manufacturing (Design Wales 2008). The design aspect is linked to customer service meaning that customers can have exclusive fabrics and colours in relatively small quantities and this is also a key part of their strategy. Prices are high and an overall message of tradition with a modern twist is given through the products and through all communications from road signs to paper and web based material.

At M1, the design of products is done mostly by the owner and his wife, neither of whom are designers. The owner knows that a design input could benefit his sales but for various reasons, including expense and the expense of having special yarn colours dyed it is not used in a formal or professional way. Most of the production is made from redundant yarn from the UK carpet industry and therefore the choice of colours is limited. The mill produces striped and geometric floor coverings that are sold in the shop at the mill. There is no overall design theme to publicity material, signage and so on; these are being updated constantly but there is no consistency in the graphics used. These have become more attractive during the course of the study however.

Taking the component parts of sustainable development in turn, in economic terms both make a contribution in the local area, being in business since 1907 and 1912 respectively. M2, the one with the clear design agenda, is a major employer locally, employing about 20 people. M1 is also an employer but not at such a size, having a workforce of about four, mostly family members. Another aspect of the producers' economic impact is that of the visitors they attract to the area. This is difficult to assess as it is unlikely that many visitors come exclusively to either of the woollen mills. A visit to the mills is likely to form part of a day out during a holiday in the area and both mills are part of the

range of attractions, having brown tourist signs, tourism being important locally.

Turning to the environmental impact of the mills themselves, they are both relatively small factories and care is taken at both to re-cycle machine oil, packaging and waste. Both have water wheels, one recently re-placed, and these could be used for driving machinery. The placement of the 'system boundary' is important in assessing environmental impact as the manufacture and dyeing of the yarns used has an environmental impact, but not locally. Assessing the environmental impact of the thousands of visitors arriving by car is another difficulty and again, dependent on where boundaries are drawn around the mills. Design can have contribution to make in ensuring that goods have little environmental impact but in these cases the use of wool as a raw material, a renewable source and one that is easily recycled (Blackburn 2008) and the small scale manufacturing mean that environmental impact is low.

Continuing with the 'three pillars' model of sustainable development, the mills' social impact and the effect that design could have on it is apparent in the case of M2 which has been involved with design competitions for Welsh students. Social effects are not easily separated from economic ones and the potential link between design and increased economic activity has been drawn. The social effects of the mills employing people locally and the effect of the continued production of traditional Welsh textiles on intangible concepts such as society or community are hard to quantify but socially and culturally significant. The role that design could play in ensuring the continued existence of these forms of manufacture with their heritage and cultural significance is again most likely linked to its role in economic sustainability and a contribution to the tourist economy in the area. Both mills emphasise their long history, one having a leaflet on its history in the mill shop and both having their history on their web sites.

The smaller producers

The second stage of the work being reported involved five rural producers of textiles in the same county. Two were designer maker weavers who have been in business over 20 and 30 years each, P1 and P4, two were small holders or small farmers with flocks of goats and sheep, P2 and P3, and one P5 is no longer trading at present, although the premises were still intact at the time of the visit. This producer is included in the commentary. All fall into the 'new Welsh Woollen industry' classification, as already discussed; making products in Wales, in knit or weave with wool or similar natural fibre; they were not selected because they had a designer or a specified design input.

The place that design played, as an identified process, varied. The designer – maker – weavers were both strongly design driven as they make individual pieces, sometimes to commission, often as pictures or wall hangings, so there is a strong design input adding value to their work. One of them has a textile design degree and the other holds that 30 years as a designer maker gives him design expertise, as he does not have a formal design qualification. The small holders, P2 and 3, saw design as a minor part of their business although they both produced ranges of garments, see figure 2, and domestic textiles, rugs and throws etc. They also selected goods for sale in their shops or workshops. Design is not considered an important aspect of what they do

although there was some acknowledgement by one of them that being able to employ a qualified designer would be advantageous. They defended this position by saying that their customers were not interested in fashion, they just want good quality garments that will cover their 'lumps and bumps'. For both of them, making decisions about the design of their goods was a minor part of their activity as they also produce fibre, and run farms. They dye the yarn themselves, in one case offering 50 colours so that there will always be something that will appeal, while the other is guided by what sells. One is a main dealer for textile equipment and teaches spinning, and the other has a bed and breakfast business. The fibre and garment production is therefore only part of how they make a living. There is no consistency or obvious design element in any of their visuals, publicity material or signage.

The fifth in this group, no longer in business, P5, produced organic fibre and garments and sold other ranges from a former milking parlour on her farm. Although with no design background, the owner had a good understanding of the use of design in enhancing sales, and employed a knitwear designer to produce a range that 'would give the yarn more appeal'. These designs were available as yarn and patterns or as completed garments. She also understood the value of design in marketing the yarn and other products and had had discussions with Design Wales about the design of publicity material and packaging. Cost prevented her from taking up the ideas for designs that were put forward, apart from at a very small scale. She also understood the importance of good quality images for a web site and the lack of these held up its development. It is important to note that the business ceased trading because of external, rather than business, circumstances.

The discussion of the role of design in sustainable development with respect to these five producers, is broken down again into economic, environmental and social aspects. However, it must be emphasised that these are inextricably linked in the concept of sustainable development and should be seen as interdependent. The interview schedule listed the Welsh Assembly Government's indicators of sustainable development 2006 (WAG 2006a) for discussion and while some were irrelevant or difficult to relate to for individuals, for example, infant mortality, others elicited responses, for example, Welsh speaking.

Economic sustainability

Four of the producers have been in business as textile producers in their current location from 17 (P3) to 32 (P4) years. The fifth producer is currently working away from the business, see above, but plans to return to it on retirement from waged work, currently necessary. The producers are therefore economically sustainable, apart from one, but they do not aim to earn large amount of money. The fact that craft producers make an economic sacrifice to follow their craft has been documented (Crafts Council 2004) and is reiterated by one producer who says 'It's never going to make me rich, you know' (P4). Their economic durability is strengthened because they are diverse in what they do, including making, teaching, accommodation and farming.

Economic contribution to the local area

This is seen to be important by all the interviewees and a source of pride that they are self supporting from their textile businesses. Three of them also provide employment for outworkers who hand make garments for them. (P2, P3, P5). Those that run courses and attract visitors point out that these visitors make a contribution to the local economy too.

Environmental impact

The producers live in a national park and operate on a micro scale. They all minimise their environmental impact and re-cycle and compost waste. In one case the farm is certified organic by the Soil Association meaning that all inputs have to be closely monitored and controlled (P5). Others have areas of land that are designated as of special interest for wildlife (P2,4), including a site of special scientific interest (P3).

All five of the textile producers dye yarn, either for use in their own work (P1), for sale (P2, 3 and P5) or as part of running courses (P4). All are conscious of the potential harmful impact of dyestuff waste and all cope with it by using a technique in which the dye is all taken onto the yarn leaving clear water. As one says; 'You couldn't put anything toxic on the land and therefore we are careful' (P2).

However, in attempting to assess environmental impacts, note that all of the rural producers are tourist destinations so the comments made with respect to car transport of visitors to the mills also applies.

In terms of the environment and design, one of the producers specifically sees the local landscape as a design inspiration. Some use undyed fleece and yarn in their work and this reduces the environmental impact of it (P2,P3, P4, P5) although this does not seem to be a conscious decision.

Social impact

The social impact of the producers on the communities where they live is significant and includes learning the Welsh language, taking an active part in agricultural shows and societies and volunteering and running activities for local schools. However, the link with design and these aspects of the producers' lives is tenuous. Overall though, the fact they have all moved into a rural area and run businesses with a minimal environmental impact, and contribute to social aspects of local life would indicate that they are contributing to a vital part of the sustainable development of Wales.

Discussion of findings and further work

Other conceptual tools for enabling understanding of the relationship between design and sustainable development are needed to examine this further. These conceptual tools could include structure and agency taken from social theory (Barnes 2001) and the use of social arena maps taken from Clarke's situational analysis (2005, pp 110 - 125). When studying design as a decision making process done by individuals, a micro 'thing' and sustainable development, as a government policy, a macro 'thing', a problem common to many research situations is found:

... the question arises as to how the properties and propensities of 'macro' things are related to those of 'micro' things, and how the enquiries of fields studying the one should be related to enquiries in fields that study the other (Barnes 2001 p339).

When studying the macro i.e. sustainable development, against the micro, design, the sociological concepts of structure and agency are useful tools. The structure and agency debate in social theory examines the role that structures play in determining how people behave, that is elements of their lives such as social class and political and economic institutions, as against their individual ability to make their own decisions about their actions and life choices within these structures, i.e. their agency.

The debate revolves round the problem of how structures determine what individuals do, how structures are created, and what are the limits, if any, on individuals' capacities to act independently of structural constraints; what are the limits, in other words, on human agency (Abercrombie et al 1988, p6).

Sustainable development is one part of the policy framework within which the case study and its constituent producers exist and is therefore a structural element in the problem situation. Other parts of this include the legal framework, the markets within which the producers operate and so on. Government policies such as the specific remit for sustainable development may not be understood or appreciated by individuals, and this was in fact found to be the case. In the initial interviews, when direct questions were asked about the Welsh Government remit for sustainable development there was an understanding of environmental issues but not one that embraced the wider sustainable development remit embracing economic and social elements. This direct question about sustainable development was subsequently taken out of the interview schedule and substituted with prompts taken from the Welsh indicators of sustainable development. The agency that individuals have in the situation being studied could include the conscious use of design in their work but that then would depend on their expertise and opinion of the value of it to them and the enterprise, which as was shown above, is variable.

There is a gap therefore between structures and agency of individuals and while theorists such as Giddens bridge this gap (Barnes 2001 p345 – 346), the most useful tool here seems likely to be one part of the situational analysis toolkit offered by Clarke (2005) that is a social worlds/arenas map. These she says 'allow the fluidities and actions among structures and agencies to become visible and, thus, theorized and memoed' (2005, p110). She describes the use of social worlds/arenas maps thus:

We can (also) see individuals acting both as individuals and as members of social worlds; we can see social worlds, arenas, regimes of practice, social formations, and discourses produced and circulation in them (2005, p110).

This tool will be used in future data analysis.

Conclusion

The findings from the first stage of data collection with producers were contradictory. There is a spectrum of design activity and importance from high to almost irrelevant. Decisions about the appearance and manufacture of goods are made by people with no design training and with no reference to designers. Design is not undertaken as a formal activity in some manufacturing situations, professional design input or advice being seen as expensive and unnecessary. In other instances a design input may not contribute to economic sustainability as expected. The difficulty of measuring sustainable development at a micro level makes it difficult to judge whether it is happening and to what extent.

Next, the focus of the research will move to organisations and institutions operating at policy level including the county council, the national park and the Welsh Assembly Government. Producers in another, urban, locality will also be interviewed, in this way allowing comparisons with the data already collected and more insight into the research question.

References

- Abercrombie, N, Hill, S and Turner, B. (1988). *The Penguin Dictionary of Sociology* London: Penguin Books.
- Archer, B. (1974). *Design Awareness and Planned Creativity in Industry* London, Office of Design, Dept of Industry, Trade and Commerce, Ottawa, and the Design Council of Great Britain, London.
- Baker, S. (2006). *Sustainable Development* London: Routledge.
- Barnes, B (2001). The Macro/Micro Problem and the Problem of Structure and Agency, in *Handbook of Social Theory* eds Ritzer, G and Smart, B. PP 339 -352
- Bell, S and Morse, S. (1999.) *Sustainability Indicators. Measuring the Immeasurable?* London: Earthscan
- Bell, S and Morse, S. (2003). *Measuring Sustainability Learning by Doing* London, Sterling VA: Earthscan
- Birkeland, J. (2002). *Design for Sustainability: A Sourcebook of Integrated Ecological Solutions*. London: Earthscan Publications Ltd
- Bhamra, T and Lofthouse V. (2007) *Design for Sustainability. A Practical Approach*. Aldershot: Gower.
- Blackburn, R. (2008). *A Sustainable Future for Textiles*, Lecture to the Huddersfield Textile Society, 14 January 2008. Huddersfield Textile Centre of Excellence.
- Brower, C, Mallory, R, Ohlman, Z. (2005) *Experimental Eco→ Design. Architecture / Fashion / Product*. Mies, Switzerland. Rotovison
- Burrall, P, (1991) *Green Design*. London, Design Council

- Clarke, A. E. (2005) *Situational Analysis: Grounded Theory After the Postmodern Turn*. Thousand Oaks, London, New Delhi: Sage Publications
- Chapman, J. and Gant, N. (2006) *Designers, Visionaries and Other Stories. A Collection of Sustainable Design Essays*. London, Sterling VA, Earthscan
- Cooke, C. (1992). *T264: Design Principles and Practice. Block 1 An introduction to Design*. Milton Keynes: Open University
- Crafts Council. (2004) *Making it in the 21st Century. A socio-economic survey of crafts activity in England and Wales, 2002-03*, London: Crafts Council
- Cresswell, JW. (2003) *Research Design. Qualitative, Quantitative, and Mixed Methods Approaches* Second edition. Thousand Oaks, London, New Delhi. Sage Publications
- Datchefski, E (2001). *The Total Beauty of Sustainable Products*. Hove: Rotovison
- Department for Environment, Food and Rural Affairs, (DEFRA) (2006) *Sustainable Development Indicators in Your Pocket 2006* London: National Statistics
- Design Council Link Design and Business Success: the facts accessed (n.d.). retrieved 4 July 2006, from <http://www.design-council.org.uk>
- Design Wales (2006). Retrieved 28 February, 2006 from <http://www.designwales.org.uk>
- Design Wales (2008). Retrieved 14 February 2008 from http://www.designwales.org.uk/version2.1/design_futures.html
- Dresner, S (2002) *The Principles of Sustainability*. London, Sterling VA: Earthscan.
- Ekins (1999) in Baker, S (2006) *Sustainable Development* London: Routledge
- Elliott, J.A. (2006) *An Introduction to Sustainable Development*. (3rd Ed). Abingdon: Routledge.
- European Union Sustainable Development, Europa. (n.d.) Retrieved 13 April 2008 from http://ec.europa.eu/sustainable/welcome/index_en.htm
- Fuad-Luke, A (2004) *The eco-design handbook : a complete sourcebook for the home and office* New edition, London: Thames & Hudson
- Geertz, C. (1973/1993). *The Interpretation of Cultures*. London. Fontana Books
- Gould, K & Hosey, L (2007). *Women in Green. Voices of Sustainable Design*. Bainbridge Island, WA, USA: Ecotone Publishing Company
- Jenkins J. G. (1969). *The Welsh Woollen Industry*. Cardiff: National Museum of Wales, Welsh Folk Museum
- Jenkins, J. G. (1987) *From fleece to fabric : the technological history of the Welsh Woollen Industry*. 2nd impression. Llandysul: Gomer
- Jenkins, J. G. (1992) *Getting Yesterday Right. Interpreting the Heritage of Wales*. Cardiff: University of Wales Press
- Jenkins, J.G. (2005a), *The Flannel Makers. A Brief History of the Welsh Woollen Industry*. Llanrwst: Gwasg Carreg Gwalch

Jenkins, J. G. (2005b) *Dre-fach Felindre and the woollen industry*, Revised edition. Llanrwst: Gwasg Carreg Gwalch

Jones, JC. (1970) *Design Methods: Seeds of Human Futures*. London: Wiley Interscience

Heskett, J (2002). *Toothpicks and Logos: Design in Everyday Life*. Oxford: Oxford University Press

Kelday, F (2006) *Identifying Ecodesign Opportunities in the Welsh Fashion and Textiles Sector*. Unpublished MSc Thesis. Cranfield University, UK.

Kenway P. & Palmer G. (2007) *Monitoring poverty and social exclusion in Wales 2007 London and York, Joseph Rowntree Foundation*. Retrieved 14 April 2008 from: <http://www.poverty.org.uk/summary/reports.shtml#wales>

Langrish, J (1993) Case studies as biological research process. *Design Studies*, Volume 14, number 4, pp 357 – 364

Lawson, B (1980). *How Designers Think*, Oxford: Butterworth Architecture

Lewis, H. & Gertsakis, J. (2001) *Design + environment. A global guide to designing greener goods*. Sheffield. Greenleaf Publishing

Lorenz, C (1986) *The Design Dimension: the new competitive weapon for business*. Oxford: Basil Blackwell

Luke, TW, (2005) Neither Sustainable nor Development: Reconsidering Sustainability in Development in *Sustainable Development* Vol 13, Issue 4, 228–238

Mackenzie, D (1991) *Green Design: Design for the Environment*, London: Laurence King

McDonough, W & Braungart, M (2002) *Cradle to Cradle: Remaking the Way We Make Things* New York, North Point Press, Rodale Books, USA

Millennium Development Goals. (n.d.). Retrieved 3 July 2007 from <http://www.un.org/millenniumgoals/>

Open University (1992) *Student Handbook, Systems Summer School TS 264*. Milton Keynes, The Open University

Open University. (2005). *Global Programme in Development Management. Mapping Toolkit. CDR0939*. Milton Keynes, The Open University

Purvis, M & Grainger, A, eds (2004) *Exploring Sustainable Development. Geographical Perspectives*. London and Sterling VA. Earthscan

Redcliff, M (1987). *Sustainable development: exploring the contradictions*. London: Methuen

Roberts, H, ed, (1981) *Doing Feminist Research*. London, Routledge

Robinson, J (2004) Squaring the circle? Some thoughts on the idea of sustainable development in *Ecological Economics* 48, pp369 – 384. Retrieved 8 June 2006 from <http://www.ub.unimaas.nl/ucm/e-readers/LS212/robinson.pdf>

Rossman, GB and Rallis, SF (1998) *Learning in the Field. An Introduction to Qualitative Research*. Thousand Oaks, London, New Delhi, Sage

- Schoeser, M (1984) *Marianne Straub* London: The Design Council
- Silverman, D. (2000) *Doing Qualitative Research. A Practical Handbook*. London. Thousand Oaks. New Delhi. Sage Publications
- Skillfast-UK, (2005) *A skills needs assessment for the apparel, footwear and textiles sector in Wales*. Retrieved 14 April 2008 from <http://www.skillfast-uk.org/publications.cfm>
- Spangenberg, J, (2001) Sustainable Development: From catchwords to benchmarks and operational concepts. Chapter 1 in Charter, M and Tischner, (2001) *Sustainable Solutions; Developing Products and Services for the Future*, Sheffield, Greenleaf, p 24 – 47
- Stanley, L, and Wise, S, (1993) *Breaking Out Again: Feminist Ontology and Epistemology*, New edition, London, Routledge
- Strauss, A and Corbin, J. (1998) *Basics of Qualitative Research. Techniques and procedures for Developing Grounded Theory*. (2nd Ed.). Thousand Oaks, London, New Delhi. Sage
- Sustainable Communities (n.d.). Retrieved 14 April 2008 from <http://www.communities.gov.uk/communities/sustainablecommunities/>
- Sutton, A (1987) *The Textiles of Wales*, London, Bellew Publishing
- Schwandt, T, A. (2000) Three Epistemological Stances For Qualitative Inquiry. Interpretivism, Hermeneutics, and Social Constructionism in Denzin, Norman K, & Lincoln, Y. S. *Handbook of Qualitative Research*. Second edition. Pp189 – 213. Thousand Oaks, London, New Delhi. Sage Publications Inc.
- Thackara, J (1997) *How Today's Successful Companies Innovate by Design. European Design Prize Winners!* Aldershot, Gower
- Thorpe, A (2007). *The Designer's Atlas of Sustainability*. Washington, Covelo, London. Island Press
- UK Government Sustainable Development (n.d.). Retrieved 14 April 2008 <http://www.sustainable-development.gov.uk/index.asp>
- United Nations Conference on Environment and Development 1992 : *Rio de Janeiro, Brazil. Agenda 21 : programme of action for sustainable development. Rio declaration on environment and development. Statement of forest principles : the final text of agreements negotiated by governments at the United Nations Conference on Environment and Development (UNCED), 3-14 June, 1992, Rio de Janeiro, Brazil*. New York : United Nations, 1993.
- United Nations Department of Social and Economic Affairs. Division for Sustainable Development. (n.d.) retrieved 13 April 2008 from <http://www.un.org/esa/sustdev/index.html>
- Walker, Stuart. (2006). *Sustainable by Design. Explorations in Theory and Practice*. London, Sterling, VA. Earthscan
- Welsh Assembly Government, WAG (2003) *Wales: A Better Country. The Strategic Agenda of the Welsh Assembly Government*. Cardiff. Welsh Assembly Government

Undisciplined! Proceedings of the Design Research Society Conference 2008.
Sheffield, UK. July 2008

Welsh Assembly Government, WAG, (2004a) *The Sustainable Development Action Plan 2004 – 2007*, Cardiff, Welsh Assembly Government

Welsh Assembly Government, WAG, (2004b) *Sustainable Development Annual Report 2004*, Cardiff, Welsh Assembly Government

Welsh Assembly Government, WAG, 2004c *Starting to Live Differently. The Sustainable Development Scheme of the National Assembly of Wales*. Cardiff, Welsh Assembly Government

Welsh Assembly Government, WAG, (2005) *Sustainable Development Annual Report 2005*, Cardiff: Welsh Assembly Government

Welsh Assembly Government, WAG, (2006a) *Sustainable Development Annual Report 2006*, Cardiff: Welsh Assembly Government

Welsh Assembly Government, WAG, (2006b) *Indicators for Sustainable Development for Wales. Recommendations of the Sustainable Development Indicators Working Group, April 2006*. Cardiff: Welsh Assembly Government

WCED, World Commission on Environment and Development, 1987, (Brundtland Report) *Our Common Future*. Oxford. Oxford University Press

Yin, RK (2003) *Case Study Research: Design and Methods*, (3rd ed.). Thousand Oaks, USA: Sage

Angharad Thomas

Angharad Thomas is currently senior lecturer in the School of Art and Design, University of Salford (0.6) and PhD researcher. She is a Geographer (undergraduate degree) and textile designer (Masters degree). She has a long standing interest in the role that design plays in development, having studied this in Zimbabwe. She has research interests in the interpretation of sustainability issues within the heritage sector.