

The background image shows a person in a futuristic, metallic suit with a mechanical arm, jumping over a construction site. The person is in mid-air, with one leg bent and the other extended. The suit is dark and metallic, with various straps and buckles. The mechanical arm is visible on the left side. The background features a construction site with cranes and scaffolding under a cloudy sky.

Future Challenges in Evaluating and Managing Sustainable Development in the Built Environment

Edited by
Peter Brandon,
Patrizia Lombardi
and Geoffrey Shen

WILEY Blackwell

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Peter Brandon was appointed the UK's first Professor of Quantity and Building Surveying at the University of Salford, where many of the authors of this book have worked or studied. In the first five years of his time at Salford, he helped to raise the research performance of the School to the highest level attainable under the UK's Research Assessment Exercise, and in 2003 became Pro Vice Chancellor for research. In 2006 Professor Brandon led the University to the highest rise in the league tables of any university and, few years later has been awarded an OBE in the HM The Queen's Birthday Honours List.

In addition to his academic career at Salford, Professor Brandon has held many major posts related to surveying and construction in the UK, including Chair of the Construction and Built Environment Panel of the Science and Engineering Research Council, Inaugural Chair of the Research Committee of the Royal Institution of Chartered Surveyors, Chair of the Built Environment Panel of the UK's Research Assessment Exercise in 1996 and 2001 and Chair of the Ross Priory Group (incorporating all the major research organisations in the Built Environment in the UK) and many others. He has also been on a number of committees and delegations of the Higher Education Funding Councils and has toured the Institutional bodies of Vice Chancellors and Senior University staff in Europe addressing the subject of Research Quality Assessment.

Last but not least, our sincere thanks are due to Ms Hanneke Van-Dijk without whose dedicated support and professional services the workshop would not have been such a great success. We would also like to thank Ms Federica Borio for her help in the preparation of this book.

Chapter 1

Initiative and Obsolescence in Sustainable Development

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1.1 Introduction

There comes a time within every academic discipline or topic where we need to stop and take stock, consider the future and recognise that some of our cherished ideas must die. We can no longer persevere with the norms we have enjoyed in our research and we must think anew about discarding those which no longer have anything to offer, regenerating those which still have potential and exploring the horizon for new insights which will give us encouragement in the future. It is the history of scientific discovery and is often referred to as a paradigm shift (Kuhn, 1962).

Sustainable Development has been a latent factor in emerging research for a very long time although not always made explicit as such. Since the concept was formalised largely through the concerns about pollution, climate change and non-renewable resources. It has become almost a cliché. After more than 50 years of international focus it has become an umbrella term which encompasses many different things for many different people. The underlying concept of intergenerational justice (not penalising future generations by what we do today) permeates all discussion. However this important notion can give rise to everything from making people happy to conserving the planet to planning resilience to disaster and much more. This creates difficulties in establishing a vocabulary for communication of ideas and determining where to focus attention in research and application. Each focus has different ideas and different processes and often their own language. The temptation is to retreat into reductionism and, by so doing, ignore the dependencies between the complex variables which go to make up a sustainable environment. While we focus on climate change we may miss the importance of social cohesion. If we focus on energy production we may miss the side effects of other pollutants which are just as dangerous. If we concentrate on crime in a community we may miss the underlying problems of design of buildings which enable people to live together in harmony. If we focus on conservation we may play down the impact on the economy by which we maintain our style of living.

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These examples of inter-dependencies are reflected in the way we classify and structure the subject. They are also prevalent in what we measure and how we assess performance. Measurement and assessment enables us, or should enable us, to determine whether we are making progress in the field and also challenges us to make explicit what we mean by sustainable development. We cannot measure if we are not able to define the term explicitly.

This book attempts to shine light on some of these issues within the Built Environment. This admittedly is a subset of the whole subject of sustainability. It is however a significant sector dealing as it does with the quality of life (in accommodation for most human activity), the heavy use of scarce resources (including energy) and the transport and movement of people and goods across the globe. The subject, by its very nature, is concerned with the future and how we should design and shape it. What cities do we want to live in? What relationship do we want between ourselves? How do we want to travel? How do we protect ourselves against future possibilities of failure? What level of comfort do we want to achieve and how will we achieve it? How do we create harmony in all aspects of life? The list is endless but vital to our understanding of how and what we bequeath to future generations.

The book has been divided into three sections, each with experienced and knowledgeable authors who are leading thinkers in that field. The grouping is:

- Section 1 – World Views and Values
- Section 2 – Design and Evaluation Tools and Technology
- Section 3 – Engaging with Practice, Stakeholders and Management.

These groupings are important for a number of reasons. First, the world view helps us identify the lens by which we view the problem. Do we use the economy as the key feature by which we view and evaluate all others or is there something else? It would seem in most Western nations the economy would be the pre-eminent concern but is it right? Second, the growing use of information and other technologies in design is allowing us to communicate effortlessly between each other and promote ideas to much larger groups. Will this allow us to democratise decision making or will it lead to autocratic rule demanded by the controller of the machine? As artificial intelligence begins to make inroads into our decision making, upon whose values and whose world view will it be based? These are not trivial questions but must be addressed if we are to seek a sustainable future. Third, we need to devise methods by which the future thinkers can link with existing practice to create a seamless development so there is not a divide between theory and practice which has been the downfall of so many bright ideas. Here we have included, for example, a case study in Chapter 13 by Trevor Mole which illustrates how a small professional firm is engaging with the subject within its business plan. It is not an academic paper but it demonstrates that the subject can provide competitive advantage.

Some will argue that science is a major factor in understanding sustainable development. One feature of science is that we use the existing paradigm to build our accepted knowledge for as long as it meets the need of the problem it seeks to understand or seeks to solve. There is a natural inclination to give up what we know to move forward into a new way of thinking. John Brockman (Brockman, 2015) edited a book which is entitled

'This idea must die'. It contains 165 short essays by a varied group of authors, spelling out what current ideas should be jettisoned within the natural sciences because they are blocking progress. Similarly there may be a requirement for us even at this stage of sustainable development to challenge our current thinking and decide which paths should continue and which should stop!

This book attempts to identify problems caused by existing methods and provide a challenge for the future. Paradoxically it uses active researchers to explain from their own research what these challenges might be and what ideas might be left on the junk heap of discarded imagination.

1.2 Section 1: World views and values

At the heart of any debate about the future is the lens through which we focus and view the whole problem. If we feel that little can be done without ensuring that economic development continues unabated then our prism is the economy. If we think that conservation of all non-renewable resources is key then we will look at preservation as being the key factor, that is, we do not want to leave future generations with an absence of key resources. On the other hand, if we consider that religion is central then we seek out the precepts of a religion and its beliefs and adhere to these at all costs. If we think that science and technology will eventually resolve our problems then that is where we put our effort.

It may be hard to harmonise these broadly and firmly held views (and others) but if we are to seek a global consensus then we shall have to try and seek common ground.

The root of the world view can be seen in its definition of sustainable development. Perhaps the most well known and well used definition is the WCED Brundtland Commission (WCED, 1987) which states the following:

'Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.'

This definition does not attempt to define the needs of the present or the needs of the future, both of which are difficult to assess. If we cannot define our present needs without compromise then what chance have we of understanding future needs? This definition is often quoted but the real world view it represents is seen in the next paragraph of the report which says:

'In essence sustainable development is a process of change in which exploitation of resources, the direction of investments, the orientation of technical developments and institutional change are all in harmony and enhance current and future potential to meet human needs and aspirations.'

Now we see a shift towards what many people would say would be the predominately Western view of development although it does leave scope for others. It does not talk about sharing or making sacrifices for future generations. It appears to be the sort of

statement large global companies would want to make to secure their future. The statement may be right but who has the power to implement and what will be their priorities? It may be that we all have to make sacrifices even for selfish reasons to avoid social conflict but will the people with power really choose this world view? It is an enormous agenda just to find the harmonious common ground.

So what is a world view? At the heart of a discussion on sustainable development must be the very essence of the attitudes and beliefs which influences our thinking. One definition of a world view is as follows:

‘A comprehensive view or personal philosophy of human life and the universe’ (Collins, 2000)

Others have enlarged upon this definition and Wikipedia has suggested:

‘A World View is the fundamental cognitive orientation of an individual or society encompassing the entirety of the individual or society’s knowledge and point of view. A World View can include natural philosophy, formative, existential and normative postulates; or themes values and ethics ... additionally it refers to the framework of ideas and beliefs forming a global description through which an individual, group or culture watches and interprets the world and interacts with it.’

Probably it is the latter part of the last statement which is most pertinent to this book. In particular it is the way in which we interpret the world and how this interpretation allows us to interact with it which is important. In fact professional knowledge and skill within the design and construction professions is largely based on the way we interpret and act upon our understanding of the built environment.

Leo Apostel (1925–1995) was a Belgium philosopher who was interested in bridging the gap between exact science and the humanities (Anon, 2015). He suggested that a ‘world view’ is an ontology or a descriptive model of the world and should comprise six elements, namely:

1. An explanation of the world
2. A futurology answering the question ‘Where are we heading?’
3. Values, answers to ethical questions such as ‘What shall we do?’
4. A praxeology or methodology or theory of action
5. An epistemology or theory of knowledge ‘What is true or false?’
6. An aetiology (the study of causation) as it should contain an account of its own building blocks, its origins and construction on which it is based.

These six facets give us an indication of what we should be addressing when we explore and challenge the issues related to Sustainable Development. This book is mainly concerned with item two, futurology examining where we are heading. Since Sustainable Development covers such a wide range of subject matter this is not a trivial matter. It is not surprising, that in general debate, one or more of these characteristics is missing. Andrew Basden in Chapter 19 uses the work of the Dutch philosopher Herman Dooyeweerd to provide a framework for discussion which is outlined by Brandon and

Lombardi (2011). The Dooyeweerd approach to the cosmos (Dooyeweerd, 1955) is gaining momentum and may assist in dealing with the inter-dependencies between various aspects of what make development sustainable.

In this book, John Ratcliffe (Chapter 2) calls on his vast knowledge and experience in considering sustainability futures to examine the changes that are likely to happen to cities. Chrisna du Plessis (Chapter 3) uses her renowned knowledge of examining sustainable development in developing countries to challenge the prevailing views of sustainable development, while Patrizia Lombardi (Chapter 4), through her extensive work on evaluating sustainable development, focuses on the post carbon city and whether resilience has a part to play in future assessments. Finally, Ian Cooper (Chapter 5) reflects on the outcomes of the successful European BEQUEST network – one of the pioneer projects in the field – where he had a key role in analysing the methods by which sustainability in the built environment was evaluated. All these chapters reflect on the persistence of current world views and those which should replace them.

It is unlikely that we will ever get a full and complete World View defined but our explanation and recognition of what World View we are using may help us to understand our limitations and may help us appreciate others. Even within a single world view we find a large number of unintended consequences caused by not taking a holistic view of the problem. For example the Aswan Dam in Egypt, built to stop flooding of the river Nile and to generate hydroelectric power, has also stopped the natural deposition of silt during the annual flood. The farmers now require artificial fertiliser, which leads to pollution of the river as the fertiliser seeps out from the land. One solution provides another problem! If it is a problem within one world view then it is likely to be a greater problem when more than one view is seeking to be harmonised with others.

1.3 Section 2: Design and evaluation tools and technology

The recognition of a world view influences our view of how we should act to realise development of that view in practice. To achieve this we need a series of tools which enable us to act in a sensible and structured way. These tools allow us to communicate and build knowledge as a community. They can vary from paper-based calculations derived from measurements and evaluations, to technical support, all in the form of solutions to various aspects of the physical built environment. These might include innovation in heat storage, passive design for energy reduction, extraction of materials, dealing with pollution and in fact the list could go on forever! Alternatively they might be more abstract issues which deal with qualitative judgements, feelings and emotions which are difficult to assess. Our way of handling this complexity is to build models with different levels of granularity to address different levels of knowledge and hopefully at some time we can bring them together to deal with the interdependence they have upon each other. Gaining harmony among the myriad of models is probably one of the most difficult and challenging things we seek to achieve, as it is in real life. A decision in one area can have repercussions in any number of different areas and in ways which are not always predictable. Nevertheless the way forward must be to strive for models which give us a better picture of the world as we observe it and which can be inter-related.

The introduction of information and communication technologies (ICT) has provided a springboard from which real advances in integration and computation can take place. The limitations of the human mind are gradually being overtaken by the computing power of the machine. We are not yet at a stage where we can realistically claim artificial intelligence is available but the signs are there for massive improvement in the next 50 years. This development raises all sorts of ethical and moral questions regarding the delegation of authority. At what point do we delegate authority to the machine on issues which affect human lives? The truth is that we are already delegating much of human decision making to machines and to some extent we are happy to do so. It is expedient for us because human beings do not have the capability to deal with very large scale problems involving masses of data. At the moment the machine models our thinking once we have given the parameters and inputs it requires. However the modelling process within the machine is largely a model of our own form of reasoning. As time goes on then the machine may well develop its own form of reasoning following the evolution which we have given it in the form of its architecture and software. It will have its own equivalent of DNA and it may be difficult for mere humans to understand what has developed. Booth, the Chief Scientist of IBM, saw the development of software intelligence developing in three stages (Booth, 2007): first, transparency in the development of the model, second, dependence on the machine to write software and then, third, what he called 'the rise of the machine'. His prediction for these stages was three 10-year developments running sequentially.

Already developments are taking place where the machine is required to solve common problems in engineering and design. We cannot design and build the designs created by, say Frank Gehry and others, without the use of the computer. In medicine we are jacking microprocessors into the human brain to compensate for hearing and sight loss. It is not too big a step before we use the machine for enhancement of the brain rather than repair. It may be difficult to know whether it is the human aspect of the brain or the model in the microprocessor which is influencing our decisions. There are serious ethical and moral problems associated with such advancements.

The danger is that it becomes expedient for us to allow the machine to take decisions. If we do not have the means by which we can challenge its decisions or we choose not to worry about such issues then we can find ourselves in a situation where we are reliant on the intelligence of the machine alone. It may be difficult for us to design intelligent machines which are challengeable and they may become 'black boxes' to most people. We are then in the hands of the machine or an elite human population which has power to control both us and the machine. This sounds like science fiction but we are slowly moving to this threshold by default. In the context of sustainable development where we might not be able to understand our current human needs nor those of future generations we are placing human beings in a precarious position. When we create these models we build in the programmers view of what 'values' the machine should hold and we find that other programmers adopt the same routines until one person's values get embedded so deep that we cannot clearly identify the source, let alone challenge the content. In addition values and knowledge need to evolve and change over time and this becomes more difficult as the models are adopted and extended. One postulated solution to this problem is to allow the machine to learn of itself using the routines

embedded by humans which by themselves may have built in bias and prejudice. Unfortunately if the machine can change these learning processes on its own then there is likely to be a loss of transparency in the process. How will we be able to democratically change what the machine has determined? Will there still be scope for dialogue?

These are not trivial issues and they are magnified by attempting to use these tools for a subject with so many interdependent variables such as in Sustainable Development. It may be easy to write a program that calculates heat loss. However when we try and look at the reasons why we are concerned about this issue, namely the cost and nature of fossil fuel, then it becomes an extremely complex situation for which most of our current models are ill prepared. The political ramifications, the competitors in the market, the prevailing economic models, the geopolitical alliances, the pollutants in the fuel, the comfort level expected by users, the transport requirements, consideration of the needs of future generations and so on; we can see that we are dealing with a much larger universe of issues, many of which are changing with time and possibly values. Inevitably many of the variables will be qualitative and almost by definition will require human judgement. We then have the problem of which human, or humans, do we model to make these judgements? This is a gross simplification of the problem but it illustrates a few of the difficulties we would face.

This book cannot deal with a problem of this magnitude and the issues raised in Section 2 are more immediate and the models created are heavily constrained. Nevertheless they outline the direction of flow within the research community towards new tools to enable us to be for effective and efficient in our decision making.

Section 2 has a wide variety of chapters by significant authors engaged in the development of tools. Tuba Kocaturk (Chapter 10) addresses the role of design in shaping a sustainable future using ICT through 'digital ecosystems'. Sidney Newton (Chapter 6), Sara Biscaya and Ghassan Aouad (Chapter 7) and Marjan Sarsha et al. (Chapter 11) look at tools that might provide new approaches. Srinith Perera and Michele Victoria (Chapter 8) look at evaluating carbon in sustainable development and Terence Fernando and Marta Alzhami (Chapter 9) examine the tools used in disaster management, an extreme form of instability.

Although computer technology will dominate this area of modelling for many years to come it is not just the architecture, capacity and speed which will have impact. It is also the type of measurement, the source data and the assumptions in such models which will influence our behaviour. This is true even without the computational power of machines. Bentivegna (1997) in his chapter on the *Limitations of Environmental Evaluations* suggests that:

'Environmental evaluation is still a controversial question because its theoretical and empirical outcomes do not yet allow generally valid results. Therefore they need to be put into practice cautiously. Moreover, when environmental evaluation is used in decision making within public decision processes, its intrinsic limitations are magnified by its multi-functional task'.

There is evidence that there have been major errors in prediction caused by incorrect assumptions in relatively simple measures. If this is true for simple evaluation it is even more true when the whole of the factors contributing to Sustainable Development are

taken into account. The number of variables and the number of permutations coupled with the uncertainty and fuzziness of the data leads to vast potential for error. At the present time there is considerable interest in integrating large data sets and trying to solve big data problems. One specific area is the integration of computer systems throughout a city in order to take a more holistic view of any problem relating to the sustainability of the city and/or the community. The Salford University Thinklab¹ has been using such major data sets for many years in matters such as crime detection and flooding and in social aspects such as employment, health and planning.

The fact that we can put information into a machine and we can model aspects of city structure and life does not mean that we will get a sensible result. The assumptions in the models and structure of the data lead to a combination which can only increase the uncertainty of the results. Nevertheless the process should be evolutionary. Providing appropriate feedback is available, the systems can be modified to improve performance and over a long period of time this process may be enhanced by computer self learning. It may be that we can create an intelligent digital ecosystem as suggested by Tuba Kocaturk in Chapter 10 of this book. In such a system the dependencies between variables must be made explicit and quantified and the modelling of the process of change over time must be modelled too.

At the moment we have a long way to go before we can rely on these systems. We do not have robust models, we do not have a significant understanding of inter-dependence and we do not have the robust feedback mechanisms needed to modify the system as the physical and community systems change. It is a massive multi-disciplinary research agenda. To approach such a task we do need a robust world view structure which will allow all disciplines to contribute, from the humanities and the arts to the engineering and science communities and from the social sciences to the designers of the physical attributes of the built environment. Whichever structure and approach is adopted it must also include a method of challenging the results and understanding its argument otherwise the computer and its models can become an oppressive tool operated by an elite. Some of the early work on knowledge-based systems provided ideas for such a democratic approach (Brandon *et al.*, 1996) but the problems tended to be formulaic and the arguments rudimentary whereas the real world is difficult to define in these terms. The result was useful but too simple for further development.

Section 2 of this book gives some insights into current thinking within members of the research community engaging with these problems. It will be interesting to observe how far these ideas can be taken in the foreseeable future.

1.4 Section 3: Engaging with practice, stakeholders and management

Once our current and future world views have been established and once we have considered how technology can provide the tools by which we can support sustainability it is important that we consider the manner in which we can expedite any change through

¹ The Thinklab is a laboratory at Salford University developing the use of ICT in a hitech environment to address the needs of cities and particularly their future sustainability.

practice. If we need to go from one paradigm to another we must be prepared to take our fellow practitioners on the journey. It is often the implementation which slows down the whole process. This implementation inevitably requires communication, education and sometimes regulation and a legal framework for it to be successful. Bright ideas remain hidden because these factors are not addressed within the practice of professional and other interest groups. There is inertia to change which can delay acceptance and implementation for decades and even longer. Even now in the climate change agenda there are still those, expert and non-expert, who refuse to believe that human intervention is the cause of changes in greenhouse gases and must be remedied. Gore (2006) in his book '*An Inconvenient Truth*' addresses a readership of perceived sceptics in an attempt to convince them that we need a shift in our thinking. It is part of the communication and education that needs to prevail to exercise change. Albert Einstein was aware of this in his own domain of physics and drew attention to the fact that we often look for solutions to a problem within those ideas which caused the problem in the first place! Hence the solutions fail. James Lovelock (2000) in his book '*Homage to Gaia*' outlined his struggle to develop a theory that would redefine how we see the Earth and come to terms with what it means to be a responsible 'child' of Earth. It was this struggle which played a major part in establishing the Green Movement which is a significant aspect of sustainable development. These leaders were or are in the vanguard of change and though they would not claim perfection in their thinking they adjust the social attitudes and willingness of peoples to change that which is necessary for a revolution in human thought.

The practitioners then follow with their response to the challenge of the thinkers once the thinkers message is beginning to influence the world. The problem for many small firms is 'how to begin to immerse themselves in the new paradigm'. For many it is a question of timing. Engaging too quickly may mean that the markets (within a Western view of economic activity) may not be receptive to a new idea. On the other hand move too late and your competitors are leaving you behind. To them in it can be a matter of life or death within a commercial environment. In this book Trevor Mole (Chapter 13) explains how his medium sized building surveying firm is tackling the issue in a very pragmatic and practical way. His clientele are open and willing to change and his commercial antenna is such that he knows he has to provide new products and new processes to suit their requirements. This response provides him with a competitive edge.

These practitioners also work within a professional environment, often facilitated by a professional Institution which seeks to set standards and encourage education on sustainability matters. In the Built Environment most of the professional institutions are encouraging various approaches to Sustainable Development. They have limited powers to enforce a view but they have a great opportunity to promulgate new ideas through their education and research activities. They have a major impact on attitudes within their membership to any new paradigm. They have power through the organisations and bodies they support. For example in this book Peter Hibberd (Chapter 16) outlines how the UK Joint Contracts Tribunal have attempted to bring aspects of sustainable development into their Standard Forms of Contract for the Industry. (As Chair of the JCT he has a unique insight into the current thinking on the issue.) It is unlikely that his would have happened if it were not for the groundwork done by the Thinkers and the Educators related to Property and Construction.

Important issues arise when addressing the engagement of practice and these link back to the 'world view' of practice and the tools that are available to them. The delay in implementation of ideas very often arises because the technology that is needed for implementation has not developed or been made available at an economic cost for general acceptance.

Implementation research is a key investment for any idea. Lester Thorow (1971) in his book *'The Zero Sum Society'* suggested that there are three major forms of research and he used the analogy of road building to illustrate the purpose of each. The first he described as 'Scientific Research' where the researcher scours the horizon and explores the terrain to find new ways across the landscape. The second he called 'Engineering Research' where the researcher addresses the problem of 'How to get from where we are to where we want to be; and the third was 'Implementation Research' (although he did not call it by this name) where the researcher finds out whether it is possible to adopt the engineers solution at a reasonable cost and in reasonable time to get a return on the investment. Very often the cost of the implementation research far exceeds the cost of the other two. These three types of research address the why, how and when of progress.

The chapters in the third section of this book embrace the views of those who are attempting to bring sustainable development to the forefront of practice. These include the Institutions such as the Joint Contracts Tribunal (Chapter 16, by Hibberd) and firms such as Property Tectonics (Chapter 13, by Mole) as well as researchers working in combined teams with practitioners. The recognition of identifying our values (Chapter 12, by Shen and Mok; Chapter 14, by Formosa and Miron) is important in this field as we shift from our present view of practice to that of the future. Within practice there is the question of how we integrate sustainable development in urban environments (Chapter 15, by Curwell) and with reference to urban transport systems and infrastructure (Chapter 17, by Yang *et al.*). Permeating all the chapters is the important issue of time and our understanding of the multiple horizons within which we work (Chapter 18, by De Iuliis). Time is critical to our conceptual thinking engaging our world view but is often ignored. We need to address what we mean and over what period when we evaluate sustainable development (Schwartz, 1991; Brand, 1999).

If Sustainable Development is to continue to be an important theme then the relevance to practice is essential and we need to take all stakeholders on the journey!

1.5 Initiative and obsolescence

Having considered the world view that is appropriate to progress, the tools that can enable the view to be realised and the means by which we can make it a reality we then need to address how we identify ideas that are most likely to achieve positive results and those which are no longer pertinent to achieving progress. Neither are easy to achieve. We know there is massive investment in our current models, not only in monetary terms but in education, research and belief systems. If we are to change then the investment must change too and there will almost certainly be inertia to anything that requires these aspects to be challenged. Ideas which have been held for considerable lengths of time will need to be ditched to allow new models to emerge. Some will be embedded in history,

in markets, in belief systems and attitudes which may be centuries old. They do not fall easily! It is probably easier to postulate something new than to let go of the old. What ideas are we prepared to let die?

In this book the death of ideas is not made explicit but rather implicit in the discussions which follow in the text. The problem is that most authors will have sought a reductionist approach which allows them to handle a complex problem through a focus on part of sustainability and it is usually a simplification. This is understandable. Virtually all researchers take this approach in order to be able to achieve an output which is accessible to their clientele and acceptable to the research community within the time that is available before their money runs out! However there must come a point when the inter-dependence between models and ideas needs to be addressed as a whole in order to gain the harmony that sustainability demands.

In the author's view and in the context of evaluating sustainable development certain principles should be adopted for examining the models and systems which we might develop to achieve sustainable development. These should be (Brandon and Lombardi, 2011):

- *Holistic*: They should encompass all the key aspects needed to establish Sustainable Development.
- *Harmonious*: They should endeavour to balance or be used to balance the criteria upon which sustainability will be judged and particularly the inter-dependence between all the contributing factors.
- *Habit forming*: They should be a natural tool to all concerned and encourage good habits.
- *Helpful*: They should assist in the process of evaluation and not confuse matters by further complexity or conflict.
- *Hassle-free*: They should be able to be used by a wide range of people, both expert and non-expert (although at different levels) and the results and limitations should be easy to communicate and explain.
- *Hopeful*: They should point towards a possible solution and not leave the user in a state where there appears to be no answer.
- *Human*: They should seek solutions which by their nature assist the development of human beings without pain, suffering and undue anxiety.

Of course it is much easier to say these things and rather more difficult to achieve them. They represent aspirations but nevertheless they provide a check list for any future approach. The first two items in the list are key to addressing sustainable development and the remainder outline the importance of recognising the human and social requirements if such a system is to be adopted and used.

If we relate this to the main sections of the book we can probably say that:

- *World View*: This represents the biggest challenge facing us today. We have made progress in recent years in recognising at an international level the importance of sustainable development in terms of climate change. The Leaders of the world have committed themselves to the reduction of greenhouse gas emissions to avoid global

warming. However this is only part of the change in world view that needs to be addressed and there is far less unanimity about all the other issues such as pollution, population control, mutual sacrifice for mutual benefit and a re-prioritisation of values to assist the whole human race. This is not a trivial issue and it will take much political, scientific and sharing of belief before a world view can be established. Present value and belief systems have taken centuries to develop and it would be difficult and optimistic to expect change in much shorter time periods. However the growth in exchange of knowledge and the way in which social media now permeates large parts of the world can give us a realistic expectation of faster change. This informal method of education coupled with formal approaches may well be the best way of changing viewpoints and may be preferable to imposition.

- *ICT Design and Evaluation:* These tools contain within them the power to reveal new discoveries, new ideas and new methodologies. The development in artificial intelligence, providing it is controlled for the benefit of human kind (and we understand what does benefit humans both now and in the future), has the possibility of enhancing our own capability to solve problems. Perhaps the biggest issue we face, at least in seeking harmony, is dealing with the interdependence between events and decision-making. The past has seen us limited by a sharp focus resulting in a myopic view of each sub-problem and a reductionist view resulting in sub-optimisation. If the ICT tools now dealing with Big Data can be harnessed then it may be possible to unite the different perspectives to the same problem from different viewpoints. However it will not deal with the resolution unless a true world view can be developed.
- *Engaging with Practice:* In the shorter term practice and professional judgement must be engaged to assist in the journey to a sustainable future. Those who earn their keep by making judgements now need to act wise to the needs of sustainable development and recognise the implications of their judgements for the longer term. A realistic approach has to be communicated simply and positively. A good example in the past has been the Three Ls concept (Long life, Loose fit, Low energy) put forward by Sir Alex Gordon in a lecture to the RIBA in 1974 which was a useful mantra for architects and building professionals to adopt as they went through the process of designing and creating a new building. However the process of building is a complex social organisation engaging many hundreds of specialists, as well as clients, and they work together in a position of trust. Socially there needs to be good faith and the avoidance of an inequality of knowledge and power to ensure that all move forward together in harmony.

Ceric (2015) quotes Ostrom in her recent book on '*Trust in Construction Projects*' as follows:

'A central question has overshadowed the thinking of social scientists at least since the work of Thomas Hobbes(1588–1679): how do communities of individuals sustain agreements that counteract individual temptations to select short term, hedonistic actions when all parties would be better off if each party selected actions leading to higher group and individual returns? In other words how do groups of individuals gain trust?'

This question could be easily placed at the door of all those concerned with sustainable development. What sacrifices are we prepared to make now in order to ensure that future generations are not disadvantaged leading to social breakdown, poverty and potentially the end of a species (see Rees, 2003). It lies at the root of our understanding of sustainable development. We can develop technology and persuade governments to adopt limited gains but if we are not prepared to look beyond the present and sacrifice where this is required then sustainability is an illusion. To do this then we must develop trust between all participants.

1.6 Final statement

This book is intended to encourage new thinking and new developments as we test the underlying concepts of sustainable development in the built environment. It can only do this if we, as a research and practice community, are prepared to challenge the status quo and engage together in developing new ideas which will encourage us all to work together for mutual benefit. May this book provide a stimulus!

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Section 1

World Views and Values

Chapter 2

Cities of Tomorrow: Five Crucibles of Change

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‘The ideas which are here expressed laboriously are extremely simple and should be obvious. The difficulty lies not in the new ideas, but in escaping from the old ones, which ramify, for those brought up as most of us have been, into every corner of our minds.’ (John Maynard Keynes)

2.1 *Exordium*

2.1.1 The global context

We live at a time of monumental change that includes troubled and turbulent globalisation, mounting quantities of information and regulation, the growing hegemony of science and technology and the discordant clash of civilizations. These changes call for new ways of thinking and learning – at school, by government, in business, within communities and among the professions. There must also be changes in the rules of the game as they affect the economy in general and the built environment in particular.

The spirit of this work is based on the premise that a new mindset, reinforced by fresh ways of thinking about the future, is needed by all those involved in conceiving, designing, funding, constructing, occupying and managing the world’s cities of tomorrow so as to face the challenges, and grasp the opportunities, that lie ahead over the new few decades.

At the global scale, there is growing recognition that humankind is on a non-sustainable course which could lead to ‘grand-scale catastrophes’ (e.g. Lovelock, 2006; Rees, 2003). At the same time, however, we are unlocking formidable new capabilities. This could be humanity’s last century, or a century that sets the world on a new course towards a spectacular future. Echoing the warnings of Paul Hawken and Amory and Hunter Lovins (2000) and their promotion of ‘natural capitalism’ as a fundamental change in the way of doing business, the global economy seems to be outgrowing the capacity of the earth to

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support it. We are consuming renewable resources faster than they can regenerate: forests are shrinking, grasslands are deteriorating, water tables are falling, fisheries are collapsing and soils are eroding. On top of this, there is climate change, rising and moving populations, an increasingly polarised world, perverse subsidies by governments, impending energy and water wars, failed nations, shanty cities and false accounting for the GDP measure that ignores natural capital. Throughout, there is also the uncertainty of new technologies more powerful than the sum of their parts. Indeed, it is possible to think that we have become like the sorcerer's apprentice, having started something we can barely control!

2.1.2 The city dilemma

City building has become the ultimate expression of mankind's ingenuity. The twenty-first century, moreover, is set to be the century of cities, for cities are moving centre stage, with both the commercial and cultural world increasingly being characterised by cities rather than by countries. Though the world's cities differ significantly, they should all espouse one particular key ambition – to pursue a path of sustainable urban development – enhancing their quality of life and economic competitiveness while reducing both social exclusion and environmental degradation. Cities of all sizes, locations and conditions face this dilemma – and share the need to develop new processes of policy formulation and decision-making to reconcile their quandary.

Further, as one of humanity's primary predicaments, the accelerating process of urbanization presents multiple pressing problems that are intensely complex, deeply uncertain and latently lasting a generation or more. Failing to understand and address these intricate, ambivalent and enduring dilemmas could result in systemic breakdowns with major consequences for the civic societies concerned. Political policy makers and professional urban planners alike need the structured capability to sense, explore, envision and prepare for how the future may emerge and to use those insights in formulating strategy, plans and operations for the communities they serve. This, of course, is Strategic Urban Foresight.

2.1.3 City planning and futures thinking

City planning and futures studies are both chiefly concerned with the needs and expectations of tomorrow. Each activity deals with ambiguous, multifaceted and contentious issues, for which the outcomes are complex and uncertain. Their common purpose is to provide a 'better future', while avoiding undesirable risks. City planning and futures studies both share ethical dilemmas of representation and manipulation from the way they operate, and the methodological difficulties of balancing a wide range of information, techniques, participants and attitudes. Despite these similarities, the way of thinking about and addressing the future by the city planning profession differs greatly from the one practised by futurists. A 'futures' approach constitutes a much more effective platform for collaborative planning, helping to develop agreed solutions and ensuring

that the ownership of those solutions is embedded in the community so that they have a greater chance of successful implementation.

For some time, it has been recognised that the prevailing planning approach towards the future is inadequate and a slow shift towards new ways of thinking and acting about the future of cities has been observed. Various criticisms have been levelled at prevailing planning practice, which include the following:

- Ineffective mechanisms to deal with the complexity and uncertainty of urban environments.
- Widespread short-term orientation of planning.
- Inadequacy of the 'predict and provide' model, which reinforces the present conditions and makes it more difficult to consider alternative future options.
- Lack of a comprehensive integration of physical planning with economic and social development.
- Limited collaboration of stakeholders from different sectors.
- Paucity of real community participation.
- Failure to provide visionary and innovative solutions.
- Being reactive rather than proactive towards the future.

The recognition of these failures of current planning practice has led to a search for and adoption of new and more imaginative future-oriented approaches. Over recent years, The Futures Academy has developed a futures methodology – Prospective Through Scenarios – which aims to integrate futures thinking into city planning. This 'prospective' method employing 'scenario' techniques enables the forward view. That is, it provides interpretative or propositional knowledge about the future, up-dates this regularly, assesses the quality of emerging understandings and uses them for a range of socially useful purposes. Also, it provides a 'map of the future' and supplies policy-makers and others with views, images and alternatives about city futures in order to inform and future-proof decisions in the present. There are a number of reasons why it is important to adopt futures methods into city planning:

- Extending thinking beyond the conventional and fostering more forward thinking as a result.
- Forcing thoughts and stimulating conversations about the future.
- Helping to identify assumptions about the future that might require examination, testing and subsequent modification.
- Encouraging people to have regard to the positive possibilities and opportunities that tomorrow might hold, as well as the potential threats and disasters.
- Making more intelligent decisions today concerning the future by focusing the mind on the most important questions that must be resolved in order to formulate better policy.
- Inspiring people to 'think outside the box'.
- Widening perspectives and increasing the number of options available for exercising more deliberate decision-making towards positive change.
- Preparing for and managing change better by enhancing the capacity to learn.

- Making response times to actual future events much shorter and reactions more relevant.
- Fostering active participation in strategic thinking leading to decision-making.

The adoption of futures methods into city planning offers a rigorous, comprehensive and integrated approach towards urban stewardship, relying more on intuition, participation and adaptability. It also enables the development of preferred visions of urban futures through mobilisation – bringing together and facilitating the networking of key stakeholders and sources of knowledge. What follows is distilled from that approach.

2.1.4 A sense of foresight

Over the past few decades, futures thinking and foresight studies have progressively been employed to inform and influence urban policy. The performance, however, has been extremely patchy and partial. Proselytizers of a ‘prospective’ process within the public realm of urban affairs are constantly faced in practice by barriers to effective strategic long-term thinking. These include: the dominant focus on electoral, legislative and budgetary cycles; the paucity of political support and poor stakeholder engagement; institutional inertia and compartmentalisation of function and responsibility; and incompatibility of timescales and inadequacy of experience and expertise.

Moreover, whilst the academic ‘cognoscenti’ of the futures and foresight field produce an extensive theoretical literature on the pros and cons of different methodologies and devise ever more sophisticated refinements to techniques, a sensible and systematic appraisal of workaday approaches, with guidelines as to their application, impacts and effectiveness, remains largely lacking, or at best superficial. But even the most relevant, reliable and robust foresight frameworks, constructed and conducted by experienced consultants, are of little use or significance if the organisational culture and capacity to absorb and apply them is enfeebled. The overriding goal, therefore, is not just an awareness of the potential of futures studies and strategic urban foresight, but the embedding of it in the societal mindset and civic capabilities of the communities engaged.

By far the greatest challenge of all, therefore, is the embedding of futures thinking into the urban agencies, authorities, organisations and communities concerned.

2.2 Disquisition

Contemplating our cities of tomorrow is, of course, a complex affair. It requires drawing on a wide range of information sources, anticipating emerging issues, identifying unintended consequences, involving all concerned and getting a sense of the big picture. Strategic foresight, thus, becomes the pre-eminent methodology for thinking about and planning for the future. Strategic foresight is having a view of what can be done by communities and organisations today to positively influence tomorrow. It is the ability to create and maintain a high-quality, coherent and functional forward view and to use the insights arising in organisationally useful ways. Above all, it is about thinking, debating and shaping the future.

Central to foresight, however, is the concept that trends matter and weak signals count. Setting up a rigorous, systematic and sensitive process for spotting and acting on emerging trends and detecting seemingly unimportant things that could ultimately have profound impacts is a prerequisite for the successful modern municipal organisation. The five 'crucibles of change' that follow have surfaced during the course of the past few years in a succession of strategic urban foresight studies and describe the major forces where stresses and tensions will be greatest. But they also identify where opportunities for innovation and change will arise. Organisations that understand them will be best equipped to anticipate and respond to their own advantage. Others ignore them at their peril.

1. Quality of Life: people, places and profiles.
2. Competitiveness: creativity, knowledge and enterprise.
3. Sustainability: resilience, responsibility and readiness.
4. Connectivity: communications, infrastructure and facilities.
5. Governance: values, vision and leadership.

2.2.1 Quality of life: People, places and profiles

When it comes to 'quality of life' as an 'ideal' for building tomorrows cities, it was Leonard Hobhouse, an Edwardian liberal and radical thinker, who insisted that: 'An ideal is as necessary to the reformer as the established fact is to the conservative'. The ideal, perhaps, is to view the city as a kind of 'liberal republic', in which independent, capable individuals have the power to determine and create their own version of 'a good life' and a 'good society'.

Social cohesion

Successive scenario exercises conducted by The Futures Academy over the past 20 years around built environment futures have identified a recurring 'pivotal uncertainty' that describes the onset of civil strife and the breakdown of law and order in the inner-city as a result of worsening social exclusion and increasing marginalisation among large parts of the local populace. An inventive scare story, perhaps, but so too was the threat of urban terrorism a decade or so ago and, in 'scenario-speak', terrorism has moved from being a 'wildcard', through the 'pivotal uncertainty' stage, then to being a 'significant trend', and finally now forms a 'context shaper' in most scenario exercises. The collapse of established order is most evident in some of the mega-cities of the developing world. Frustrations with poverty and unemployment can, however, breed hopelessness, unfulfilled expectations and boredom in almost any city context, and whole areas can be changed into virtual ghettos with self-reinforcing cycles of deprivation and disorder practically anywhere. Tackling terrorism will seem relatively straightforward compared with controlling the tumult of a city's own citizens.

Social disruption threatens cities economic prosperity and social stability, as well as constituting a personal tragedy for those affected. Exclusion takes many forms: children

without real prospects for their future; low educational attainment; isolation; homelessness or inadequate housing; high levels of debt; limited access to transport and essential services, including information and communication services; limited access to police and justice; poor health; and lack of citizens' rights. It also has many secondary symptoms, such as social fragmentation, civil disorder, a growth in racial tension, youth alienation and delinquency, crime and policing problems, drug abuse and mental health problems. All these factors have encouraged the development of segregated cities where certain distressed neighbourhoods have become locked out of wider social and economic development. Such social disorder is a mounting cost to society as a whole and a serious drain on the local as well as national economy.

Exclusion and culture

Detailed studies of social exclusion in localities throughout Europe, reinforced by findings from The Futures Academy, have indicated that the broad processes of such exclusion are roughly similar:

- Stigmatisation of the areas based both on the presence of specific groups within them (minority ethnic groups, migrants and the unemployed) and on the physical signs of neglect;
- Spatial concentration of stigmatised groups, whether through public or private sector housing processes;
- Subtle local social processes, which contained the aspirations and affective focus of everyday life within the neighbourhoods, whether the neighbourhood was in an isolated peripheral position or an enclave within the central urban area;
- The presence of specific groups and conflicts in the neighbourhood which disrupted social relationships within it (mental illness and substance abuse, in particular, generated high levels of fear and anxiety).

To these must surely be added the lawlessness engendered by the drug culture dominating more and more areas of cities. In all the neighbourhoods examined, however, the social bases of conflict were similar: young versus old, minority ethnic versus ethnic nationals, newcomers versus long established residents. Clearly, a new set of pro-active strategies to overcome these divisions is necessary.

Portentously, and perhaps a little pompously, it can be claimed that rediscovering the importance of open and direct dialogue between cultures will be one of mankind's major challenges in the years to come.

Authenticity and distinctiveness

Cities should acknowledge the unique identity they possess, play to their strengths, be authentic, avoid direct copying from others and seek to be best in class at something.

Though distinctiveness is something of an elusive concept, every village, town or city has distinctive assets. There has, however, been widespread debate over the past couple

of decades about the apparent process of homogenisation that has happened to towns and cities. The expression ‘cloneliness’ has been coined to describe how cities have become more and more alike – identical chain shops, similar restaurants and common commercial designs. This reduction in locally owned business can also result in economic weakness as money flows out of an area to distant corporate headquarters and local needs no longer determine decision-making.

While these trends towards homogenisation are troubling, there are growing signs that cities are seeking to be distinctive. They recognise that, by striving for distinctiveness and developing their own unique assets, specialisms and character, they can enhance their profile.

Distinctiveness in itself, however, is not a solution. It must also be authentic, for when an ill-conceived marketing campaign falters, or a ‘flash’ landmark building fails, the results can actually be counter-productive.

Decent affordable housing

Common to all The Futures Academy city visioning exercises over the years, and familiar to anyone concerned with community planning and development, is the continuing call for decent and affordable housing. It is fundamental to the health and well-being of citizens, and to the smooth functioning of economies; nevertheless, around the world, in developing and advanced economies alike, cities are struggling to meet that basic quality of life requirement. It has been estimated that, if current trends in urbanisation and income growth persist, by 2025 the global affordable housing gap could affect one in three urban dwellers, or about 1.6 billion people (McKinsey Global Institute, 2014). Four actions used in concert could, however, reduce the cost of affordable housing by 20–50% and narrow the gap: unlocking land supply; reducing construction costs; improving operations and maintenance; and lowering financing costs for buyers and developers (McKinsey Global Institute, 2014). Policy makers, working with the private sector and local communities, need to set clear aspirations for housing throughout their cities.

Asset-based community development

A defining influence upon the work of The Futures Academy was a masterclass given in Dublin by John McKnight of Chicago for The Futures Academy on the use of asset-based community development (ABCD) as an approach that seeks to identify and deploy the innate strengths within communities as a means of enhancing the quality of life therein (Kretzman and McKnight, 1993). The process of ABCD starts by assessing the resources of a community through a ‘capacity inventory’ or, more generally, by exploring with citizens the types of skills and experience that are locally available. Then the communities are supported to discover what they care enough about to act upon. And, finally, individuals, agencies, associations and institutions all come together to determine how everyone can collaborate to achieve the goals set. At the core of ABCD is its focus on social relationships as assets. In this way, not only is it a practical application of