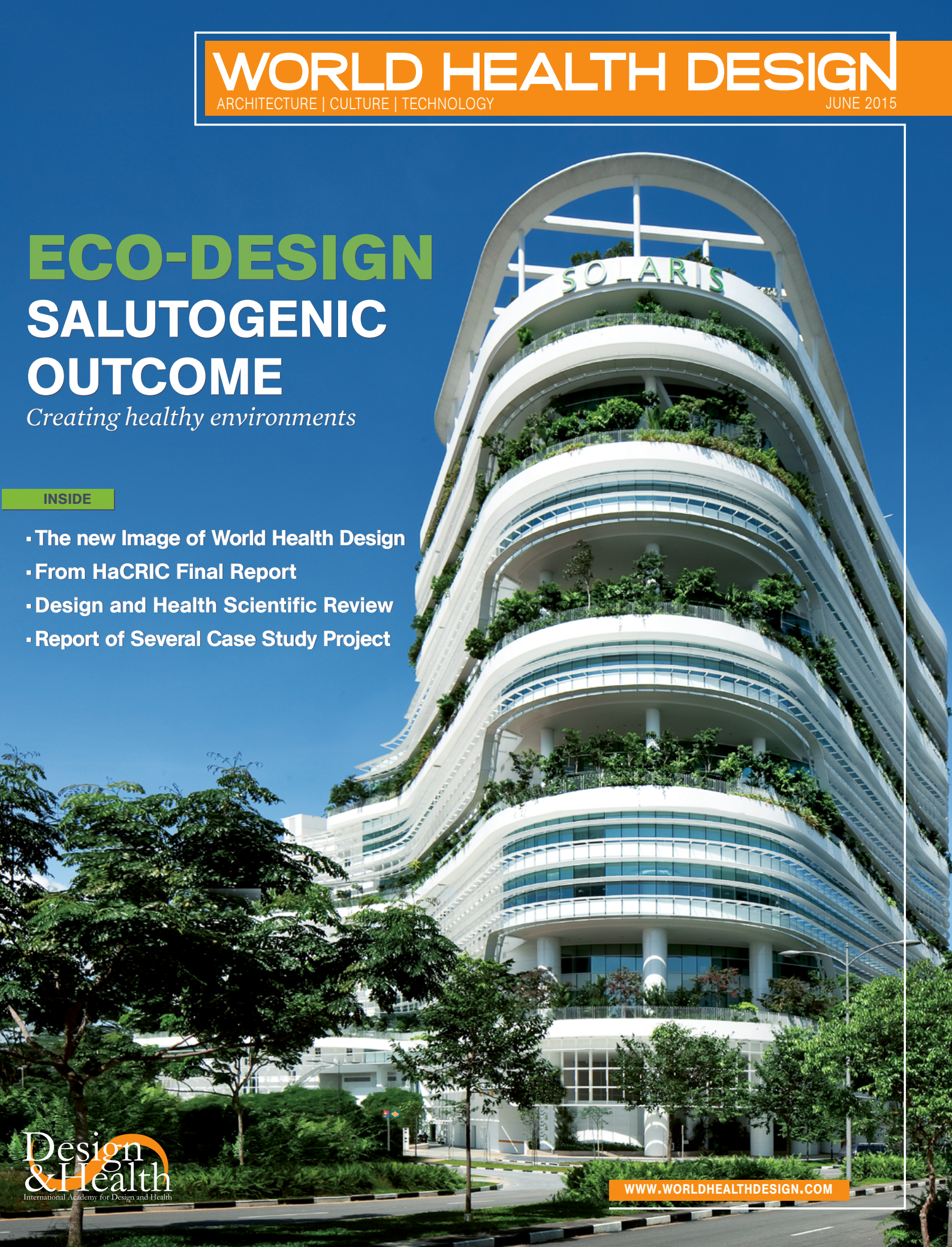


ECO-DESIGN SALUTOGENIC OUTCOME

Creating healthy environments

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- From HaCRIC Final Report
- Design and Health Scientific Review
- Report of Several Case Study Project





Design & Health

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WORLD HEALTH DESIGN

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By Editorial board

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We provide a short overview of the work of HaCIRIC and point to future research directions necessary to address the interface between healthcare built infrastructure, technology and services.

By James Barlow et al



WORLD HEALTH DESIGN

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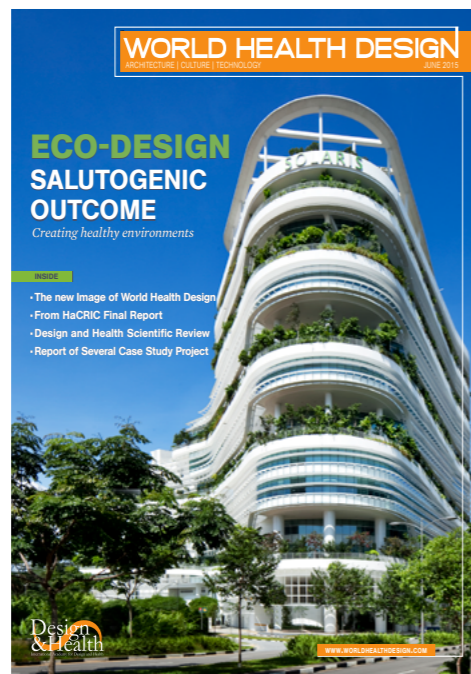
Restructuring World Health Design to strengthen our vision

In 1998 the International Academy for Design and Health launched the world's first journal focused on design and health, along with a website dedicated to the development of knowledge in this field. Since then the journal and the Academy have provided an arena for the exchange of knowledge between researchers and practitioners to stimulate debate across our community from industry, government and academia. For the past seven years the journal has highlighted the latest projects and research and critically reviewed the state of knowledge within the field of design and health.

WORLD HEALTH DESIGN HAS REFLECTED THE range of our activities, including research, education, advocacy, awards, media and conferences, including our annual world congress. The journal has delivered a mix of scientific articles and research papers, combined with business and professional content such as news, opinion, interviews with thought leaders, reviews of projects and books, and other material.

The journal is fully integrated into the Academy's business model as a non-profit organization, with a focus on bundling advertising into larger annual sponsorship agreements for the events.

The more successful this has been since its launch, the less reliant the journal has been on subscription revenue, which has begun to fall away in recent years due to a focus on higher value sponsorships. However, the journal's powerful mix of professional and market intelligence with scientific papers continues to provide a strong content proposition that retains significant subscription and advertising potential, particularly with the growing acceptance of online models on tablet and mobile platforms. The current hybrid model of both a controlled circulation of circa 6,000 copies and with free copies provided



at each event, and a subscription model is not economically reliable.

The Academy has now decided to restructure the content of the journal to provide a more wide-ranging presentation of successful case study project from industry combined with scientific review of interdisciplinary research projects. The future goal of the journal should be to increase its academic credibility and research content. We are also discussing broadening its scope to include more on innovation and change across the broad context for the built infrastructure, especially the evolving relationship between services, technology and infrastructure. The journal must subscribe to high production values to reflect the objectives of the Academy to promote the significance of good design.

Professor Mike Kagioglou, the Dean of Art, Design and Architecture at the University of Huddersfield, Professor Andrew Price, Loughborough University, Professor James Barlow Imperial College London and Professor Alan Dilani, founder of Academy and journal World Health Design, have taken the responsibility as editorial board for this issue of the journal as a pilot for the new direction of the journal.

This issue comprises two parts, one dealing with successful case study projects from industry and other dealing with papers reporting on applied research submitted to the World Congress on Design and Health.

We are asking for other colleagues from industry and academia to join us as part of editorial committee to develop World Health Design. We are looking to the Academy to provide guidance and support to ensure we remain the leading forum for the development and promotion of new knowledge within all the fields concerned with healthy and healthcare built environments.

We are excited by the new direction of the journal World Health Design that should raise awareness of this unique field among the health authorities and decision makers, and also provide a source of critical review and evidence in the field of design and health.

We would like to express our deep appreciation to our many colleagues and the editorial advisory board for their work over the past seven years, and especially to Dr John Zeisel as reviewer for Design and Health Scientific Review over this time. We invite all of you to contribute and support our journal in its goals of providing a dialogue to bridge the gap between researcher, practitioner and industry. We invite you to be part of the new direction and develop further the current mission by active supporting as part of the new editorial directory board.



Prof. Alan Dilani, Ph.D.
Founder
International Academy for Design and Health



Prof. James Barlow, Ph.D.
President
International Academy for Design and Health



Prof. Mike Kagioglou
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Getting the relationship between healthcare infrastructure, technology and services right

The work of the Health and Care Infrastructure Research and Innovation Centre (HaCIRIC).

James Barlow, Mike Kagioglou, Andrew Price, Chris Harty

We provide a short overview of the work of HaCIRIC and point to future research directions necessary to address the interface between healthcare built infrastructure, technology and services.

Health and Care Infrastructure Research and Innovation Centre (HaCIRIC)

HaCIRIC was a multi-disciplinary centre bringing together four UK universities (Loughborough, Reading, Salford and Imperial College London) and also working many other universities around the world.

The genesis for HaCIRIC was a concern in the early 2000s that the relationship between technology, services and infrastructure in healthcare was poorly addressed in research, policy and practice. While there was much research on individual components of the system – on design and architecture, new technologies and service design, for example – the messy and dynamic interface *between* them fell between different disciplinary, research and funding stools

HaCIRIC was therefore established in 2006 as part of a major initiative by the UK's Engineering and Physical Sciences Research Council (EPSRC) to create a number of strategic research and innovation centres. Each of the four partner universities already occupied a significant leadership position in built environment and innovation research. They were

therefore ideally placed to come together to tackle the main infrastructure challenges in delivering better health and care.

It became apparent very quickly that in addressing such a diverse area it was necessary to establish the strength and nature of the existing evidence base, as well as the elements of the relevant ecosystem and how these interact with each other. From this, over the next seven years, we were able to build an organization that could not only carry out high quality research to contribute to the evidence base, but also act as an agent of change, thus extending the traditional role of academia from the creation of new knowledge to the generation of impact in practice. Indeed, this additional role was fundamental to EPSRC's objectives in funding HaCIRIC. The initial proposal was formed through extensive consultation with providers, healthcare commissioners and providers, policy makers and the academic community at large. HaCIRIC had a clear and concise research domain as shown in figure 1.

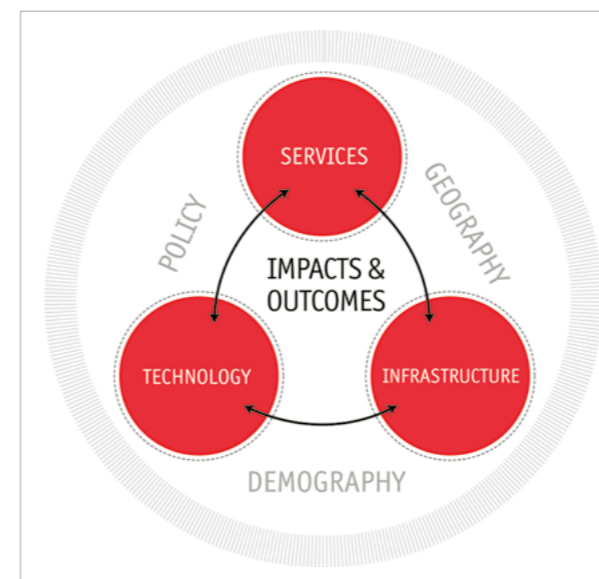


Fig. 1 HaCIRIC'S research domain

HaCIRIC's mission

The focus of HaCIRIC was rooted in:

- **Understanding the inter-relationship** between healthcare services, technology and infrastructure, focusing as such on systems rather than on stand-alone technologies.
- **Understanding the notion of systems and 'systems-of-systems'** when considering both 'hard' technologies (physical artefacts) and 'soft' organisational and policy structures within which they are embedded.
- **Understanding the importance of planning and coordinating** innovation and investment in a way that is performance improving.

We placed great attention on providing the analysis and evidence to support better decision-making. Particular areas of interest were

- **Patient-centred facilities** with a clean, safe environment and a good patient experience.
- **Changing the relationship** between home and hospital.
- **Modelling and simulating the complex** decisions about new service and infrastructure forms and their impacts.
- **Understanding the implications of funding** models of capital and infrastructure investment.

HaCIRIC outcomes

Over its seven year period HaCIRIC received £12m core funding from EPSRC and leveraged £5.5m in additional grants through a variety of sources. We also generated £3.6 of in-kind contributions.

Over 50 research projects were conducted by HaCIRIC'S team, which are summarised in eight impact studies in our final report to EPSRC (available from www.haciric.org):

1. New models for service delivery and infrastructure procurement.
2. New approaches to healthcare acquired infections.
3. An assurance based regulatory framework for NHS asset management.
4. Improving urgent and unscheduled care delivery systems.
5. Mainstreaming remote care.
6. Benefits realisation.
7. Modelling, simulation and visualisation to deliver enhanced performance and value of healthcare built environments.
8. Whole-system, service and asset evidence-based planning and design.

This work has generated over 200 refereed journal papers – with more in the pipeline – as well as 60 reports, 25 books and book chapters, and at least 320 conference papers and 140 keynote presentations.



Doctor with VX cart and dermal camera

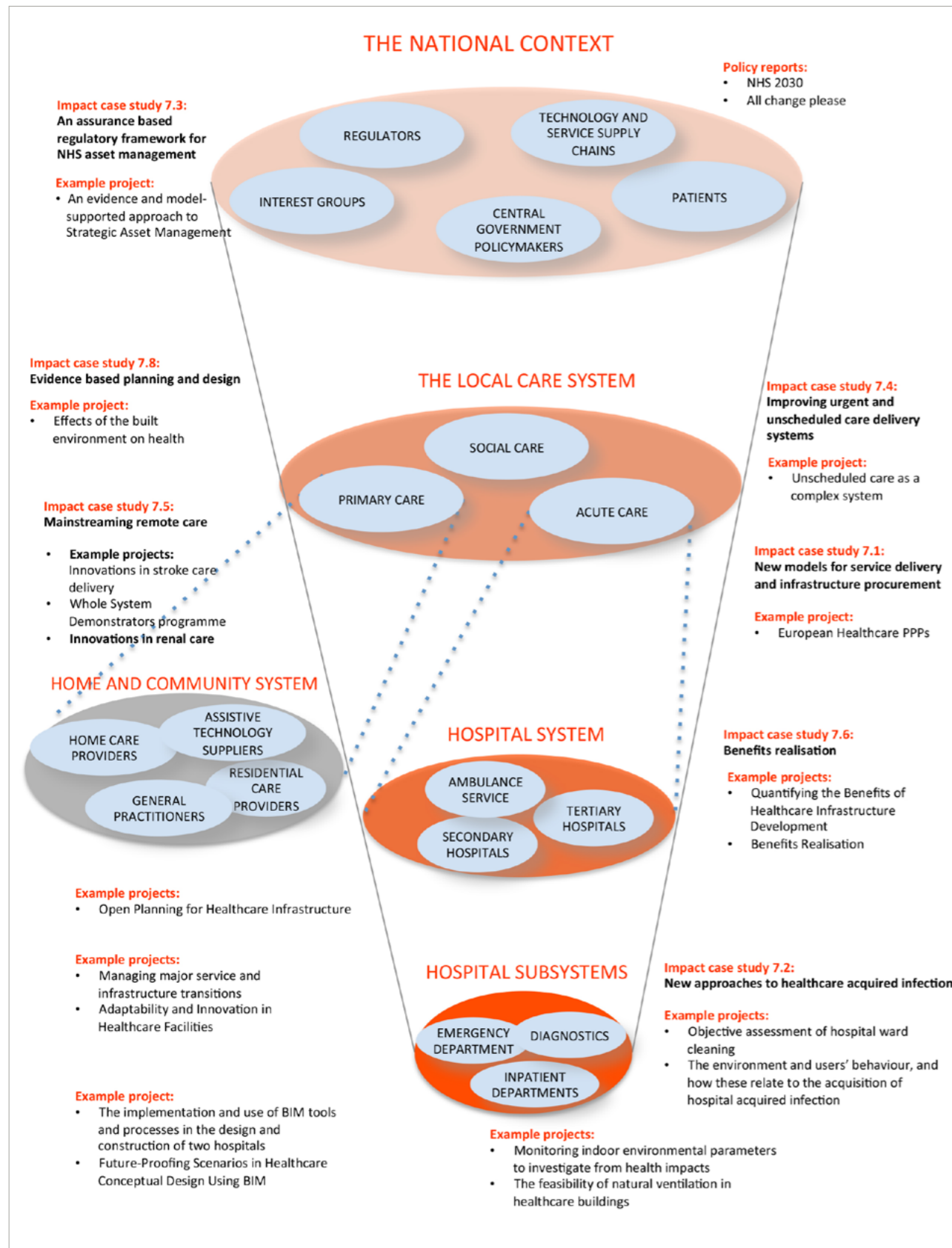


Fig. 2 The healthcare system and selected HaCIRIC projects

Capacity building

HaCIRIC's research funding was renewed in 2011 for a further two years. Since then we have been spreading and developing the legacy of our work.

One of the key aims of HaCIRIC was to build research capacity in this neglected field. Before the start of HaCIRIC individuals from both academia and industry positioned themselves around specific disciplinary areas of expertise which, broadly speaking, can be identified as 'hard' (facility managers, technologists, hard infrastructure specialists, etc.) and 'soft' (planners, medical specialisms, health impact analysts, etc.).

HaCIRIC aimed to bring together these disparate groups and instead of passing issues 'over the wall' to other disciplines, work collectively to understand and optimise whole systems. This was no small task. Early on we found that aligning disciplinary interests and understanding of the domain was challenging, especially for academics who were judged by publication in their own particular peer reviewed journals and were not used to straying outside these confines. As well as extensive knowledge sharing and community building activity, we funded eight other universities to the tune of £2.1m to undertake significant complementary research, bringing together specialists across disciplines to tackle particular projects such as infection control.

One of our most important legacies is the number of researchers and doctoral students who were members of the HaCIRIC team. Around 35 post-doctoral researchers have now moved into industry or academia, potentially acting as agents of change and helping to spread our approach to a multidisciplinary understanding of healthcare infrastructure issues. In addition 33 PhD students were funded directly through HaCIRIC or its participating institutions.

Much of the work of HaCIRIC has been embedded in continuing professional development, and MSc or PhD education in our various academic institutions.

All this was combined with a very extensive communications and dissemination programme, including attendance by more than 1800 delegates at HaCIRIC conferences, workshops and seminars.

We believe that HaCIRIC has therefore played a pivotal role in helping to develop a global healthcare infrastructure community.

The future

The work and mission of HaCIRIC is still as valid as when it started. New models of whole-system design and integrated healthcare and infrastructure supply chains across primary, acute and social care are emerging. Much evidence has to be collected in a robust and research-led way. The issue of healthcare delivery efficiency is more pressing than ever; optimising the many sub-systems of healthcare is needed if we are to bring about the necessary efficiency gains whilst improving performance and – ultimately – quality of life.

Many research questions still remain unformulated and unanswered. What are the new models, what are the appropriate governance structures, how can we maximise value and benefits for society, how should we be managing the implications of dementia and mental health issues in our modern society? How can policy be developed in a vacuum of evidence-based solutions? How can new and emerging technologies be incorporated and used appropriately in the future.

We hope that what HaCIRIC initiated through its existence can now become mainstream practice, building on our links with the International Academy for Design and Health and its global community. □



Vienna North Hospital designed by Albert Wimmer under construction, open by 2017



James Barlow has held a Chair in Technology and Innovation Management (Healthcare) at Imperial College Business School since 2003. From 2006–2013 he led HaCIRIC, a major programme of research on the adoption, implementation and sustainability of innovation in healthcare infrastructure systems. In September 2014 he was appointed President of the International Academic for Design and Health.

James was educated at the London School of Economics and has previously held appointments at the Science Policy Research Unit (University of Sussex), the Policy Studies Institute and the University of Westminster. He has published widely and has been a member of many expert panels on healthcare innovation, both in the UK and internationally. He has worked extensively with industries involved in the healthcare sector, including pharmaceuticals, medical devices, ICT and construction.



Professor **Mike Kagioglou** is the Dean of Art, Design and Architecture at the University of Huddersfield since November 2013. He was previously the Head of the School of Built Environment at Salford University. Mike was the Director of the £8M EPSRC (Engineering and Physical Sciences Research Council) Salford Centre for Research and Innovation (SCRI) in the built and human environment and the Academic Director for the £11M EPSRC funded interdisciplinary IMRC in Health and Care Infrastructures Research and Innovation Centre (HaCIRIC) for Salford University.

He has published more than 150 academic referred papers, many industrial reports and two books. Mike has taken part in international evaluations and consultancy activity. He is a Fellow of the Higher Education Academy (HEA), Fellow of the Royal Institute of Chartered Surveyors (RICS) Fellow of the Chartered Institute of Building (CIOB) and Senior Associate of the Royal Society of Medicine (RAM).



Andrew Price is Professor of Project Management with over 35 years design, construction and industry-focused research experience. His research focuses on: the innovative planning, design and construction of healthcare infrastructure and faculties; and improving project performance.

He has had considerable experience of managing major collaborative funded research projects and has: been principal or co-investigator on 34 completed research projects; supervised over 56 completed PhD students from 24 countries; and published 5 Books and over 400 papers in refereed journals and conferences. He was until recently a Member of the DH Dementia Friendly Environment Working Group and a Member of the Department of Health Estates and Facilities Division Advisory Group.



Dr **Chris Harty** is an Associate Professor of Design and Construction Innovation in the School of Construction Management and Engineering at the University of Reading, UK. He is also a Visiting Professor in the Department of Organisation, Copenhagen Business School Denmark, and an Editor of the journal Construction Management and Economics.

He has been the Director of two Engineering and Physical Sciences Research Council centres, including Academic Director of HACIRIC. A sociologist working in construction, his research interests include the impact of BIM on projects and organisations and health-care infrastructure provision.

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The Beneficial Health Outcomes of Salutogenic Design

Alan Dilani (© June 2015)

“We shape our
buildings;
thereafter,
they shape us.”

(Sir Winston Churchill)

There is an urgent and ever-growing awareness world wide of the need to invest in healthy and sustainable infrastructure. By applying salutogenic design principles that seek to promote greater health, this landmark shift can begin to occur. The resulting and striking healthful outcomes of such existing structures bring these concepts to the forefront of global building opportunities. This approach now comprises the leading edge of change in our society. By embracing these precepts to shape our built environments and infrastructure, we engage in shifting the quality of such environments. Salutogenic architecture is taking its rightful place in the vanguard of preventative care strategies that have the potential to change our lifestyle for the better.

Health has become a commodity that is not equally distributed within society. Certain groups of individuals are more successful than others in having access to proper health-related knowledge and information. This data gathering is very often supported by a healthier lifestyle, in combination with lower exposure to risk factors within the built environment.

The author discusses the principles and ideas for a salutogenic design approach in planning future built environments with one simple goal: to create a healthier society. For design professionals (architects, planners, designers et al), the focus upon and concern for designing a sustainable healthy future society is the most compelling task to be addressed and implemented in all societal sectors where human beings live work and play.

Introduction

In 1997, the World Health Organization identified that the health “arena” should include these frequently used priority spaces: the workplace, schools, hospitals, correctional institutions, commercial offices, public spaces within our towns and cities, and indeed

our own homes as the apex of health promotional activities in the 21st century.

During the 66th General Assembly Meeting of the United Nations in September 2011, the socio-economic challenge of non-communicable diseases was discussed for the first time. The author argues that built environments have a significant impact upon human health and states his commitment to bringing this understanding to the design and health professions to help reduce the prevalence of lifestyle diseases that are becoming the major health problem in our planet. Embracing a salutogenic approach when shaping our built environments creates a preventative care strategy that changes the current focus from risk factors and treatment of disease to a more holistic understanding and evolution towards a healthier society.

For this shift to occur, there must be an ever-increasing emphasis on promotion of a healthful society that is supported by investment in healthy and sustainable public, social, institutional and domestic infrastructure. Research on the salutogenic direction highlights the impact that design factors can have, inspiring both designer and planner to create a healthy society.

For the designer, the compelling question is: “How do we design for a sustainable healthy future?” First of all, we need to envision how such architecture might look if it is to be sustainable and salutogenic. This query necessitates an expanded understanding by addressing the health consequences of architectural design’s functions and processes. This shift includes finding new models for design, seeking new construction and production systems, materials and processes, along with the action we must take to realize this new vision with comprehensive salutogenic strategies.

On a global level, businesses and industries face similar concerns – seeking to understand the environmental consequences of their workplace, with

new business models, new production systems, materials and processes for better health performance.

The salutogenic design approach becomes an opportunity for the architectural profession to not only help the world with its problems, but also to stop creating new issues. Salutogenic design must become the core essence of all architecture, changing the way we design. But how should we shape our future environment so it responds to the pressing demands of our society?

We are living in a post-industrial age amidst the knowledge (Google) society; in this milieu, architecture should provide positive stimuli that promote creativity. Therefore a new way of looking at the role of the built environment is required within the context of health and well-being: this new perspective is Salutogenic design.

Salutogenic design highlights the impact of design factors that inspire both the designer and planner to create a healthy society: (1) by developing healthy urban design that stimulates healthy behavior and thereby (2) supporting the prevention of diseases and the promotion of health. Increased consideration of a salutogenic design approach leads to social innovation. Salutogenic design requires an interdisciplinary application of psychosocial factors with architecture that actually promote a healthy lifestyle. In order to reduce the global burden of disease in an efficient way, major investments need to be made in the promotion of healthy lifestyles and development of healthy spaces.

Theoretical Framework of Design and Health

Promoting healthy lifestyle and spaces depends upon ecological designs with infrastructure that creates clean air, clean water, clean food and clean land – through water management and retention, natural heating and cooling, and renewable energy – which in turn are necessary for human health. These

In order to reduce the global burden of disease in an efficient way, major investments need to be made in the promotion of healthy lifestyles and development of healthy spaces.

life-giving principles are intertwined with those of salutogenic design, which supports human health in daily behavior (Ken Yeang, Design and Health, WCDH2012). Improving population health as the foundation for social and economic development will only be achieved through salutogenic and ecological design principles. Salutogenic design can provide social organization, structure and function in society while ecological design works to continually restore the natural environment.

Ken Yeang, the father of eco architecture, linked the relationship between an ideal building and its environment to a human being with a prosthetic device. He considers that only if the device is in complete harmony with the body will it function optimally. In the same way, nature can be considered as the “host organism” to manmade infrastructure, with the same level of biointegration required if the whole system is to succeed.

The world requires a new paradigm, and the creation of a healthy global society is a vision we should all embrace. Ecological design deals with infrastructure that creates clean air, clean water, clean food and clean land – and these ideals are focused on achieving an ideal interaction between the built and the natural environment.

Research has shown that well-designed and people-friendly spaces stimulate walking, cycling and the use of public transportation. High levels of greenery also encourage physical activity, which lowers blood pressure, decreases the risk of heart disease, stroke and diabetes, and prevents falls in the elderly. Evidence also shows that attractive and open public spaces reduce mental fatigue and stress.

All these elements contribute to a reduction in the burden of disease, which may eventually reduce the costs of healthcare. “Global health means making major investments in the promotion of healthy lifestyles throughout the world and the development of healthy spaces to reduce the burden of disease.” Julio Frenk, Dean of Public Health at Harvard University told Alan Dilani in an interview for World Health Design, October 2010.

Largely informed by global recognition of the urgent need to reshape our built environment and tackle the 21st century challenges of chronic- and non-communicable diseases, The International Academy for Design and Health has undertaken nearly two decades of dialogue and interdisciplinary, research-based design. While significant progress has been achieved to understand the value of salutogenic and eco design, there are still inadequacies when it comes to implementation.

hend the built environment (comprehensibility), to be effective in his behavior (manageability) and to find meaning from the stimuli and exposure from their built environment (meaningfulness).

Ken Yeang (2015) describes the key salutogenic components as the following:

(1) 'environmental comprehensibility' that requires environmental orderliness, predictability and legibility. This includes, for instance, the importance of creating visual order in the built environment with legible, intuitive way-finding, the elimination of visual chaos, etc. (2) 'Environmental manageability' requires effective family and social support, and (3) 'Environmental meaningfulness' requires the provision of visual and aesthetic meaning, interest, satisfaction and attendant spaces for contemplation in the urban environment.

Impact of Built Environment on Health and Well Being

There is an interaction between the health of human beings and their built environment. According to Dilani (2006), the physical environment is not only vital for good health, but can also be a critical stressor for the individual. Physical elements in an organization can contribute to stress, and therefore are essential design factors that are increasing comfort (Dilani, 2001).

Despite this reality, the majority of humans in the western world spend most of their time in indoor environments. There is a lack of knowledge about how these environments affect a person's health and wellbeing. There is a general belief that humans are always adapting to the environment (ibid.). Often called the theory of adaptation, this belief indicates that people become less conscious of the environment the longer they reside or work in that given environment (Carnvale, 1992). A general belief is that if one lets oneself be affected by the physical surroundings, it is a sign of weakness.

In order to create supportive physical environments, it is crucial to understand an individual's fundamental needs (Heerwagen et al., 1995). It is also necessary for different professional disciplines to willingly cooperate in creating the best conditions for humans (Heerwagen et al. 1995; Lawrence, 2002). Before a zoo is built, it is common practice for architects, designers, biologists, landscape architects, animal psychologists and building specialists to collaborate in creating an environment that optimizes living conditions for the animals (Heerwagen et al., 1995). Factors such as materials, vegetation and lighting are

taken into consideration; animals need enough space to eat, sleep and decide when to be social or seek solitude, and even their need for control and choice have been noticed. The aim is to create an environment that will completely support the animal's physical, psychological and social wellbeing. Ironically, humans do not seem to make the same demands when a workplace for people is going to be designed.

Heerwagen et al. (1995), created a framework and guidelines for a salutogenic design which highlighted the following factors: (1) Social cohesion, both formal and informal meeting points; (2) Personal control for regulating lighting, daylight, sound, temperature, and access to private rooms; (3) Restoration and relaxation with quiet rooms, soft lighting, access to nature and a good view.

Stokols (1992) also contributed with design suggestions for health-promoting environments that stem from three different dimensions of health: physical, mental and social. Physical health can be promoted by an ergonomic design with non-toxic environments. Mental health can be promoted by personal control and predictability as well as aesthetic, symbolic and spiritual elements. Social health can be promoted by access to a social support network, and participation in the design process.

However, within health research, it is not a new idea to view the physical environment as a health-promoting factor. During the nineteenth century, Florence Nightingale developed a theory of health care which emphasizes that physical elements are vital for an individual's health (SHSTF, 1989). For example, noise, lighting and daylight were considered vital factors in affecting a person's mood (ibid.).

During the 20th century, different researchers developed stress models that illustrate how the physical environment may affect human health and wellbeing (Levi, 1972; Kagan & Levi, 1975; Dilani, 2001; Dilani 2006b). Levi (1972) founded the stress theory, which was later developed by Kagan and Levi (1975). The model describes how the physical environment is the foundation upon which societal organization, structure and function is built and in the long run, is critical to the promotion of health or disease (Dilani, 2001). The model is based on a system that points to a deeper understanding between the physical environment and different human components (Kalimo, 2005). The model describes that the physical environment is the basis for creating social organization, structure and function in society.

According to Kalimo (2005) the theory has developed a deeper understanding for the physical environment's effect on humans. Emdad (2005) has developed a model called *Instability of Pyramids of*

Stress, where architecture and art are measurable variables. Emdad presents a new framework, which in relation to health in the workplace, has taken neuro-ergonomics into consideration. For example, there is a risk that the employee will develop stress related symptoms and disease if he or she experiences high demands from the surrounding environment, but does not receive any reward. Furthermore, the employee will experience stress if the reward is too low or inadequate. The employee will also experience stress if they do not have any suitable effort strategies in relation to psychosocial factors, home and family factors or neuro-ergonomics. The model integrates all these factors and focuses on health, burnout, cardiovascular disease and short-term memory (ibid.).

Salutogenic Design Principles Create Healthy Built Environments

Salutogenic design principles serve to create healthily built environments that support users and the local community through the application of a holistic, knowledge-based approach in the delivery of healthy built environment. This approach is a systematic application of research-based knowledge with a focus on the wellness design factor including exposure of positive stimuli experienced by users as enjoyable when activity promotes health, wellbeing and quality of life.

Salutogenic design environments stimulate and engage people, both mentally and socially, and support an individual's sense of coherence. The basic function of salutogenic design is to start a mental process by attracting human attention, which may reduce anxiety and promote positive psychological emotions. The principles of Salutogenic design describes the following:

Space for Social Support

Social support is an important factor when the aim is to promote an individual's health and wellbeing (Costa, Clarke, Dobkin, Senecal, Fortin, Danoff and Esdaile, 1999; Saito, Sagawa, Kanagawa, 2005; Jacoby and Kozie-Peak, 1997; Oginska-Bulik, 2005). The knowledge and consciousness of social support and its relation to health increased in the 1950's (Fleming, Baum and Singer, 1985).

At the same time, researchers established that the ways the physical environment influences people's emotions, behaviors and motivation are important to take into consideration when the aim is to promote health and wellbeing (ibid.). It is therefore essential



Space for Social Support

to identify design factors in the built environment and through a salutogenic approach, create meeting points that can promote spontaneous social interaction and social support (Fleming et al. 1985, Connors, 1983). Crowding is closely linked to social support and is often defined as the number of persons in a certain area or how much space every individual has received in a certain area (Geas, 1994). Altman (1975) describes crowding as a condition where a person's private sphere is trespassed; for example, when a person or group is exposed to more social interaction than desirable. If there is too much undesirable contact, an individual may experience a sense of crowding. On the other hand, if an individual experiences too little contact, there is a risk that he or she may feel lonely and isolated (ibid.). This balance between social interaction and desired loneliness can be regulated and achieved if one can control his or her own levels of social interaction (Maxwell, 2006).

Crowding Space

Crowding can be reduced by creating buildings and space, where the individual can control and decide if they would like to be in privacy or participate in social

interactions (Altman, 1975). For example, research has shown that a certain length and layout of student dormitories can increase the number of social activities and promote social interaction, creating a higher sense of control and reducing a sense of crowding (Baum & Davis, 1980). Even a high ceiling can contribute to a reduced sense of crowding. Even though the area of the room is the same, people perceive a room with a high ceiling as lighter and more spacious.

Therefore, if architecture and design can create space that minimizes crowding, it can reduce the experience of stress and promote social interaction (Baum & Valins, 1977). Crowding can also constrain social interaction and social support (Geas, 1994), which are closely linked to health and wellbeing (Costa, Clarke, Dobkin, Senecal, Fortin, Danoff & Esdaile, 1999; Saito, Sagawa & Kanagawa, 2005; Jacoby & Kozie-Peak, 1997; Oginska-Bulik, 2005). This illustrates the importance of identifying factors in the physical environment that promote spontaneous social interaction and social support (Fleming et al., 1985).



Place for Restoration, walking and cycling

Nature and Its Meaning for Health

Most people have some kind of relationship to nature and there are many people who greatly value diverse natural environments. There are also many people who want to get away from everyday life, during weekends and holidays, and regain their strength in relaxing amidst natural recreational areas. What is

it that makes people feel at ease in nature? Does the natural environment affect people in different ways? Is it possible to draw any general conclusions about nature's influence on human beings?

Direct and Indirect Attention

Kaplan and Kaplan (1989) have developed the *Attentional Restorative Theory* (ART), which identifies two attention systems and how they are related. The researchers have chosen to call them direct and indirect attention. Indirect attention does not demand any energy or effort from the person and it is activated when something exciting suddenly happens or when one does not have to focus on anything in particular.

Direct attention is activated as soon as a person needs to concentrate and focus on a task and simultaneously block other disturbing stimuli. After an intense period of direct attention, a person is in need of restoration; otherwise they will easily become mentally exhausted. People who have been using their direct attention without resting often become impatient and irritated; and it has been shown that a mentally exhausted person often commits so called 'human errors' (ibid.). A person who does not have the capacity to concentrate often becomes careless, less cooperative and less competent (Kaplan & Kaplan 1989; Kaplan 1995; Herzog, Maguire, & Nebel, 2003). Therefore, in order to work efficiently, it is vital to have a well-functioning attention system and find time for restoration.

The Restorative Environment

In their studies, Kaplan and Kaplan (1989; 1995) have been able to distinguish the following four needs when individuals are in need of restoration and recreation.

- The need for being away from everyday life and its surrounding routines, sounds and crowding, etc.
- The need for fascinating stimuli which effortlessly stimulate the individual and diminish the risk of boredom.
- The need for extent (breathing space) which at the same time can create a feeling of being in a completely different world.
- The need for compatibility while performing one's tasks (ibid.).

The restorative environment should be inviting and well balanced with an aesthetic beauty that allows people to reflect (Herzog, et al. 2003). Nature offers various colors, forms and scents, which can encourage humans to forget about their everyday life (Kaplan & Kaplan, 1989; Kaplan 1995; Herzog et al. 2003).

Natural environments often offer an atmosphere in which the individual's needs for harmony and compatibility are met. It is therefore very important that natural environments are accessible at the workplace (ibid.). The ART has been tested and confirmed by different researchers (Herzog et al., 2003; Tennessen and Cimprich, 1995). One of the studies (Herzog et al., 2003) showed that three of the four components: being away, extent, and compatibility, are seen as measurable indicators of how to create a restorative environment.

Natural environments often offer an atmosphere in which the individual's needs for harmony and compatibility are met.

Several studies have also confirmed that human beings perceive natural environments as more restorative than urban environments (Van den Berg, Hartig and Staats, 2007). Therefore, when human beings are tired and mentally exhausted, nature is the appropriate place for restoration. Other studies have shown that viewing nature through a window has positive health outcomes (Moore, 1981-1982; Ulrich, 1984; Leather, Beale and Lawrence, 1998; Frumkin, 2001).

Daylight, Sunlight, Windows and Lighting's Effect on Health

There is a great deal of research on daylight's positive effects on a human being's psychological wellbeing (Evans, 2003). A lack of daylight can lead to both physiological and psychological difficulties (Janssen & Laike, 2006). Another researcher studied a correctional institution in Michigan and the results proved that inmates who had their windows facing the prison yard were visiting the health care facility more often than inmates who had windows facing the forest and farming fields (Moore, 1981-1982). Ulrich & Lundén (1984) showed that hospital patients who were staying in rooms with windows viewing nature were rehabilitated faster than patients who viewed a brick wall. Research has also shown that daylight in a classroom is necessary for the pupils to maintain a balanced hormone level (Küller & Lindsten, 1992).

Windows can also have positive health outcomes on patients (Verderber, 1986; Lawson, 2001). For example, the window can contribute to improved

health by allowing fresh air and daylight to enter, or by providing a view and a link to the outer world, thus satisfying a patient's or prisoner's need for viewing the seasonal variations (Verderber, 1986; Lawson, 2001). Another study showed that exposure to direct sunlight via windows in a workplace increased the workers' well being and had a positive impact on their attitudes and job satisfaction (Leather et al., 1998).

Rooms without a window can affect human health and well being negatively (Janssen & Laike, 2006; Küller & Lindsten, 1992; Verderber, 1986). One of the studies showed that blue collar workers who worked in rooms without windows experienced more tension and were more negative towards their physical working conditions than workers who had offices with windows (Heerwagen & Orians, 1986). Patients who are staying in rooms without windows can develop sensory deprivation and depressive reactions and exacerbate perception, cognition and attention (Verderber, 1986).

Since daylight positively influences human physiology, it should be prioritized more than artificial daylight, which claims to have the same affect. According to some research, artificial daylight can positively affect a pupil's cortisol levels and perhaps contribute to fewer sick days (Küller and Lindsten, 1992). Lack and Wright (1993) showed that exposure to lighting at certain times during a 24-hour period can prolong sleep and improve the quality of sleep.

Energy consumption and costs can decrease if the individual has the ability to control the lighting levels (ibid.), which also has positive effects on environmental resources (Moore, Carter and Slater, 2004). Furthermore, an individual's general satisfaction was higher when they had the ability to control the lighting levels themselves (ibid.). Küller's (2002) conclusion suggests that lighting will become more important in the future, especially since it is becoming more common to have buildings without windows that have no access to daylight.

The Impact of Color on Health

Colors can possibly affect the brain's activity and create a sense of well-being and originality within architecture (Janssen, 2001). Colors can also have symbolic value and, in that way, contribute to the building's identity and/or cultural meaning. Colors should be of high interest to city planners, mainly because of the aesthetic values, but also because of their symbolic values, which can reflect the organization's philosophy (ibid.). The so-called warm colors (red, yellow and orange) are considered to have an activating effect, while the so-called cold colors

(blue, purple and green) are considered to have a calming effect (Küller, 1995).

Küller (1995) refers to a well-known color study from 1958 in which researchers conducted different physiological tests to investigate the brain's activity during exposure to different colors. When the participants were exposed to the color red, their brain activity increased more than when they were exposed to the color blue. The results showed differences in blood pressure, breathing, and blinking frequencies (ibid.). Another study showed that restoration was more complete when the participants were exposed to blue light, which confirms that colors do affect brain activity (Ali, 1972).

Goldstein (1942) calls attention to an important viewpoint which asserts that an individual's former experiences can affect their emotions, actions and behavior, depending on what color they are exposed to. There are geographical, cultural and historical factors that may affect a person's color choice and some colors have a religious meaning (ibid.). Berlyne (1971) and Janssen (2001) highlight that colors should suit the contextual environment and it is important that color activation should be well balanced to match the environment.



Landmark within the building, designed by Farrow

The Impact of Design as Landmark on Health and Well Being

Space is both what separates people from one another and bonds them together (Lawson, 2001). It is the architecture, with its buildings, rooms, surfaces, dormitories and facilities, that create the prerequisites for individuals to cooperate, work in privacy, create relationships and fulfill their general social, psychological and physiological needs (ibid.).

According to Vischer (2005), the organization's image and identity are viewed and expressed through the architectural facilities. Vischer (2005) also maintains that the employee's working identity and role are associated with the working environment and therefore, the architectural design partly forms the employee's identity. Furthermore, the physical work environment's design has a pronounced effect on worker performance, and in the long run affect the organization's productivity. Physical, psychological and functional comfort can have positive outcomes on employee performance and morale (ibid.).

Other design factors for well-being are landmarks in buildings (Dilani, 2004; 2006b). Landmarks are closely related to the perception of space and building related to the level of stress (Dilani, 2004), serving as reference points in the buildings for easy orientation and helping to create cognitive maps of the environment (Dilani, 2006b). These landmarks could be objects such as sculptures, paintings, aquariums or different colors in different area of the built environment that work as a GPS to navigate us and make way-finding much easier.

The Impact of Noise Level on Health and Well Being

Noise is one of the most evident problems within public institutions. High noise levels can disturb sleep, increase stress and complicate communication (Janssen & Laike, 2006). Studies have shown that noise can contribute to irritation, which can lead to stress and cause stress-related diseases (Dijk, Souman, De Vires, 1987). Research has also shown that noise can lead to increased levels of cortisol (Brandenberger, Follenius, Wittersheim & Salame, 1980; Evans, Bullinger & Hygge, 1998). Other researchers proved that noise can increase an individual's blood pressure (Lang, Fouriaud & Jacquinet-Salord, 1992; and Evans et al., 1998). Noise can also negatively influence the healing process (Fife & Rappaport, 1976) and contribute to mental exhaustion, which in turn may affect the amount of medication that a patient takes (Persinger, Tiller & Koren, 1999; Yoshida, Osada, Kawaguchi, Hosuhyama, Yoshida & Yamamoto, 1997).

Investigations have also established the connections between noise, irritation and lack of concentration (Dijk et al., 1987). Finally, other studies indicate that the perception of life quality decreases in a noisy environment (Evans et al., 1998) and high noise levels can also inhibit social interaction (Mathewes & Canon, 1975).

Leather, Beale and Sullivan (2003) have shown that noise can have a significant relationship to working demands, where the workers' perception of work stress decreases with lower noise levels. The researchers explain that workers in a less noisy environment need fewer coping strategies for adapting to the physical environment and can therefore focus their energy and coping strategies on other stressful events. In that way, the physical auditory environment can be a vital factor in helping individuals cope with other stressors (ibid.). It is also important to realize that the experience of sound is highly individual (Staples, 1996). Kryter (1994) describes three variables that affect an individual's sound experience: volume, predictability, and possibilities for control.

The Impact of Music on Health

There are sounds that can promote health and Lai, Chen, Chang, Hseih, Huang, Chang and Peng (2006) maintain that music is one of these factors, since it may contribute to a decreased activation in the sympathetic nervous system. Music has psychological affects and can unite people, open their senses and help them cope with difficulties and trauma. Music may also lead to lower heart and breathing frequencies



Music, Health and restoration

and increased body temperature (ibid.). Lee, Chung, Chan and Chan (2005) conclude that music can be an effective method for decreasing negative physiological effects, when people are suffering from anxiety and stress.

Music, either by itself or in combination with therapeutic treatment, can improve a patient's healing process (Nilsson, 2003). For example, McCaffrey and Good (2000) showed that patients who listened to music after surgery experienced less pain, anxiety and fear than those who did not. The patients claimed that, instead of being frustrated over pain and fear, music helped them to focus on healing (ibid.). In her research, Spychiger (2000) showed that more music lessons in school had positive emotional, social and cognitive affects and that the pupils with more music education cooperated better and had greater motivation for learning than pupils who had fewer lessons.

Paul Robertson (2001) suggests that music is human richest language that expresses complex, emotional insight and for long time, it has been linked to human well-being. Robertson also suggests how different music therapy programs are used instead of medicine at the different treatments, where the music rhythm and melody distract a patient's perceptions of pain and also reduces a patient's stress hormones. The challenge of salutogenic design is to integrate space for music experiences in the built environment.

The Impact of Culture on Health

Participation in cultural activities has positive effects on human health (Koonlaan, 2001). His study showed that individuals who did not participate in cultural activities had a 57 percent higher mortality risk compared to those who participated in cultural activities. The research showed that those who had not been participating in cultural activities, but who changed their behavior to become active cultural consumers, had almost as good health at the end of the study as those who had been participating in cultural activities from the beginning.

In his study, Koonlan (2001) proved the close connection between being an active cultural consumer and being able to increase one's health status rating. Koonlan also found sup-

port for his hypothesis that if a person is changing her behavior to participate in cultural activities, her health perception becomes more positive.

Another study showed that people who participate in cultural activities have the potential to live a longer life (Bygren, Benson & Johannson, 1996). Theorell (2000) concludes that cultural consumption is very important from a public health perspective.

Music can be a health-promoting activity in a built environment. Silber (2005) studied a choir project for women, where the results indicated that participation in a choir had positive effects on health. For example, the choir became a new social platform where the participants created social bonds with one other. The participants learned to listen to each other, receive criticism and express themselves in a different way. Silber's (2005) research emphasizes the value of choirs and explains that the choir can help people to improve their perceptions and relationships to others, including authoritative persons (ibid.).

In a choir, the members have to follow and trust the conductor, which can be a good training for the person who has difficulty with authoritative figures. In an institution, conflicts can arise regarding power and control between director and employees. With the conductor, the participant has to cooperate and together strive for a common goal, which does not imply power or control (ibid.). Furthermore, the choir generates a dynamic interrelation between its members. Every member has to

control his or her own voice and at the same time listen and cooperate.

To achieve this, the members train their self-control, patience, intuition and trust, which can strengthen the participants' self-esteem and give them a more positive self-image. Pratt (1990) considers that music can create a new reality, which can make it possible for participants to find herself/himself in another context. Music can create a sense of freedom, which can give the participants new inspiration and strength to change their behavior. It can help the individual to survive, grow and create both a personal and collective identity. Pratt also explains that the space created by music reminds people about their fundamental and psychological need for freedom. Music can make the person forget about worrisome thoughts and emotions, allowing them to temporarily live in the present moment (ibid.). The research on the choir's positive, social and therapeutic affects in institutional and workplace environments is limited (Silber, 2005).

However, there are several reasons why it is worth investigating how a choir can be a good method for helping people to change their behavior, such as increasing the people's self-esteem, empathy, self-control, and decreasing aggression and the need for immediate acknowledgment (ibid.).

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Art, Healing Process and Well Being

According to art historians, humans today live in a more aesthetic world, where art, fashion and design offer countless aesthetic experiences (Leder, Belke, Oeberst and Augustin, 20004). When a person observes and appreciates different visual scenes, such as a piece of art, complex cognitive and emotional processes arise (Keith, 2001). In order to understand the meaning of a painting it is important to understand its different parts before it is possible to understand the whole. During the observation of a painting and in the process of understanding it, a person can for example experience joy, participation, discomfort or inter-

est. These emotional and cognitive responses are called *aesthetic experiences* (ibid.) and often lead to positive stimuli, satisfying and rewarding experiences for the viewer (Leder et al., 2004).

According to Kreitler and Kreitler (1972), art psychology is an empirical, scientific discipline that focuses on a person's internal and external behavior and how they are related to art. There are several psychological theories that try to explain and describe an individual's experience of art. In summary, Kreitler and Kreitler believe that psychological models regarding art perception should be based on the homeostatic behavior model, which suggests that there is an optimal physical condition in which humans strive to reach the balance between tension and relaxation. This condition of homeostasis can explain some parts of the individual's relationship to art, and that the art experience can help an individual restore the homeostatic balance (ibid.).

Art therapy (music, dance, painting and drama therapy) has a unique potential to reach patients with psychosomatic diseases, who are otherwise difficult to reach with traditional therapeutic methods (Theorell & Konarski, 1998). For example, Argyle (2003) showed how a group of people, identified as being in the risk zone for mental disease, participated in different art projects and improved their social and mental wellbeing. The participants testified that the project had strengthened their self-esteem and given them a sense of belonging to a social group. This health promoting art project is considered to be cost effective (ibid.). Gardner (1994) also maintains that participation in different art processes can give the individual the tools to express feelings and experiences in a way that is nonverbal.

Salutogenic Design and Productivity

When an organization's management wants to increase productivity, they often focus on employee competence and personal motivation rather than the physical environment and design (Heerwagen et al., 1995). In his study, Herzberg (1966) observed employee motivation and the relationship between worker behavior and the physical environment.

When the physical environment is perceived as disturbing it can negatively affect employee motivation and thereby decrease productivity. Herzberg emphasized that it is necessary to have access to a physically supportive environment, which can contribute to employee motivation (ibid.). Maslow's (1987) theory of motivation is one of the most well-

known theories related to human need and motivation. Maslow's theory was developed to analyze and explain the social environment, but it can also be applicable to the physical environment (Heerwagen et al. 1995). For instance, the need for safety can be achieved through designed environments that allow people to have a good visual overview (ibid.). If humans are not stimulated by their surroundings, they can easily lose interest and this can result in reduced performance (Lawson, 2001). On the other hand, too much stimulation can lead to stress, since a person may not have the capability to deal with the stimulation (ibid.).

Increased knowledge and consciousness about the relationship between improved health and increased profitability would affect how designers, architects and managers design, build and maintain buildings (Fisk, 2000). For instance, improved indoor climate can improve employee health, decrease the amount of sick days, reduce healthcare needs and increase productivity, which in turn strengthens the human capital and leads to higher company profitability. Ergonomic improvement for employees has also been proven to increase a company's profitability (ibid.). For example, IBM invested \$186,000 in ergonomic education and implemented extended ergonomic changes, whereby they changed the design of the workplace and various working tools (Helander & Burris, 1995).

The improvements contributed to better working positions, improved lighting, lower noise levels and better support with heavy work routines. The project decreased sick days by 19 percent, which generated



Art and Culture Royal Children's hospital, designed by BLP, Bates Smart and HKS



Healthy workplace designed by BVN

an annual profit of \$68,000. In addition, the changes contributed to higher productivity and improved quality, which led to an annual profit of \$7,400,000. In other words, investments and changes within the physical environment led to profits through an increase in health conditions and productivity (ibid.).

Discussion and Conclusion

As a consequence of our knowledge and idea-driven society, fueled by the internet, it can be argued that diseases are becoming more psychosocial and psychosomatic in nature. Credible research is also finding that people who frequently experience positive emotions are also more likely to be healthier – they have fewer heart attacks, for example, and fewer colds.

With the link between a positive outlook and good physical health moving from hypothesis to fact, it is time to recognize that the way we live, where we work, the way we interact with the built environment all have a tremendous impact on our emotions and experiences. These emotions and experiences are central parts of the health process that could be strengthened and supported by the stimuli from salutogenic design and psychosocial design factors, among them nature with most positive stimuli within the built environment.

The growing prevalence of non-communicable diseases (NCDs), or “lifestyle” diseases, is highly related to the quality of eco design and built infrastructure and the design of the built environment.

Suggestions about how we can reduce NCDs such as obesity are one of the primary challenges facing the designer and planner. Ageing populations and urban growth are a further two huge challenges to which salutogenic design could be applied to increase life quality and exposure for positive stimuli and active lifestyle behavior for the elderly. We must focus on the innovative design and planning of ecological, sustainable and salutogenic healthy urban planning around the world. It is the task of the designer and planner to reconsider the value of eco design and health promoting with a knowledge-driven approach to salutogenic design. The aesthetic value of our surroundings communicates the value of our society; beautiful places are not only stimulating, but they have also been proven to be sources of enjoyment that make us feel less anxious and less stressed.

A well-designed built environment can positively shape the social, psychological and behavioral patterns of our society: if we were to bring nature to the built environment through eco design and fill our workplaces with art and culture, then we could optimize brain performance and restore our energies.



Singapore Gardens by the Bay – space for healthy lifestyle, designed by CPG

The approach of eco design and salutogenic architecture promotes a healthy lifestyle by creating a built environment that focuses on wellness factors that promote health, thereby contributing to the realization of a healthy society.

An increase in the consideration of the principals of eco design and salutogenic architecture leads to social innovation and economic growth, not least of which is through its interdisciplinary approach, integrating sciences such as architecture, medicine, public health, psychology and engineering with culture, art and music.

Our challenge is to commit to the innovation and innovative ideas that will inspire architects and planners to tackle a demanding economic outlook. The “Eco and salutogenic design” perspective should be considered as a tool for designers to be more competitive: by designing highly salutogenic environments, we can reduce the rising burden of healthcare costs, and save and improve lives in our planet. As more scientific research comes to light on the link between eco and salutogenic design and our health and well-being, it becomes even more apparent that we need to develop and apply more research.

The aesthetic value of our surroundings communicates the value of our society; beautiful places are not only stimulating, but they have also been proven to be sources of enjoyment that make us feel less anxious and less stressed.

There is still much more theoretical work, technical research and invention, environmental study and design interpretation that needs to be done and tested before we can have a built environment with an entirely salutogenic design.

The aim of this study was to illustrate how salutogenic design principals are compatible in creating built environments for a healthy global society. The research has shown that the salutogenic perspective forms a theoretical framework for designing our built environment that could stimulate, engage and improve an individual’s sense of coherence and thereby strengthen their coping strategies and promote health.

To implement above mentioned design principals, it is necessary that the whole organization, government and/or policy makers understand the meaning of eco design with a salutogenic perspective. Knowledge of which environment factors contribute to health and well-being can thereafter be guidelines in making political decisions. In the process of making decisions it is important to have an interdisciplinary perspective where different individuals with different backgrounds and knowledge work together in this field – people such as psychologists, architects, landscape architects, doctors, behavioral scientists, engineers and health promoters.

Fortunately, it is becoming more common to use an interdisciplinary perspective as a central strategy (Barry, 2007). For example, the Internet technology sector recruits sociologists, anthropologists and psychologists who can study and explain how a product will be used in different cultural contexts. The application of an interdisciplinary approach to work may challenge existing ways of thinking may make research and innovation more democratic and receptive to public input (ibid.).

Decision makers should consider the following factors during the process of building: good lighting; positive interior distractions; and access to daylight and/or nature, art, symbolic and spiritual objects. Other important factors to take into consideration are the individual’s need for control over lighting, noise, indoor temperature and the possibility of choosing when to seek social interaction or solitude. It is also important to create attractive and inviting spaces that promote social interaction and social support as well as creating spaces

for restoration and private conversations. In order to motivate people to change their lifestyle, it is necessary to offer them activities that strengthen their self-esteem and self-efficacy. This can partly be achieved by participating in different cultural activities.

In summary, this study has shed light on salutogenic design principles that can create our cities and our built environment with infrastructure that could promote health, well-being and increase productivity and profitability. Secondly, we have shown that there is a need for more empirical studies that verify, investigate and identify more benefits of eco design and salutogenic built environment. Thirdly, we encourage decision makers to implement eco and salutogenic design that in turn promotes health and well-being.

Finally stated, salutogenic design is still very much in its infancy. The totally Salutogenic city does not yet exist – and neither has the complete application of salutogenic design principal been implemented. We can find some of those principles in the built environment, but not complete application in any kind of design that authors experienced yet. There is still much more theoretical work, technical research and invention, environmental study and design interpretation that needs to be done and tested before we can have a built environment with an entirely salutogenic design.

We all need to continue this great search of our time. It is the most important scientific question of modern civilization, of the “Google society”. How do we maintain our health and quality of life far into old age? How do we reduce the burden of lifestyle diseases through shaping our city and built environment and infrastructure that actively promote health in our global society? This study is the basic ideas and question to be explored further as a future research agenda that highlights the most important interdisciplinary research program to be developed and serve humanity in its future. The search for the application of Salutogenic Design to create sustainable global Healthy Society will continue!

“Be the change you want to see in the world.”

(Mahatma Gandhi)



St Olavs Hospital Norway, commissioned and managed by Helsebygg Midt-Norge, designed by Nordic Office of Architecture / Ratio Arkitekter / Studio4 Arkitekter / KHR / Pre Knudsen Arkitekter / Asplan Viak / Niels Torp Arkitekter / Pol G Kavli

A clear example of salutogenic design

St Olavs Hospital, Trondheim, Norway

The hospital Considered by the judges of International Academy Awards to be at the leading edge of innovation in terms of both its adoption of digital technology, its approach to health promotion and the way the hospital design had been integrated with the city, St Olavs was judged to be the overall winner of three categories, including International Health Project (over 40,000 sqm); International Salutogenic Design; and Product Design for Healthcare Application for an interactive digital installation that assist patients and families to educate themselves about their health.

The hospital has also received awards for the category Use of Art in the Patient Environment; whilst its specialist Knowledge Centre building received a

special award for Sustainable Design; Interior Design and International Health Project (under 40,000 sqm).

In 2014 World Congress on Design and Health held in Toronto, Canada the hospital has been awarded for an outstanding acute or non-acute healthcare building where patient-centered considerations are as evident as clinical and managerial priorities. The project has demonstrated an understanding of the therapeutic effect of a supportive environment for healing process, and shows how innovative design permits ongoing flexibility of use, addresses issues of sustainability, which recognizes the broader civic context.

With seven Academy Awards winner the hospital should be considered the most advanced in the world and for the first time in the history of International Academy for Design and Health receiving 7 Academy Awards creating a benchmark and new standard for healthcare design in Europe and rest of the world. □



From left: Alan Dilani, Founder of International Academy for Design & Health; Ragnhild Aslaksen, Helsebygg Midt-Norge; Per Anders Borgen, Ratio Arkitekter; Liv Haugen, Helsebygg Midt-Norge; Alf Haukeland, Asplan Viak; Kjell Olav Lyngsmo, Helsebygg Midt-Norge; John Arne Bjerknes, Nordic Office of Architecture; Trond Heggem, Asplan Viak.

Foto: Siri M Bakken



Professor **Alan Dilani**, Ph.D. is a founder of the International Academy for Design and Health (IADH) and the journal, *WORLD HEALTH DESIGN*. Dr Dilani has been engaged worldwide in several universities in the field of Design and Health developing a "Salutogenic Design", in both medical and design institutions. He holds a Masters of Architecture in Environmental Design from the Polytechnic of Turin, Italy and a Ph.D. in Health Facility Design from the Royal Institute of Technology, Stockholm.

His research at the Karolinska Institute, Medical University, which developed a multi-disciplinary research approach, led to a new definition called "Salutogenic Design". He has designed all types of healthcare facilities and has been consulted as an advisor for several Ministries of Health around the world.

He lectures worldwide and author of numerous articles and books in the field of Design and Health. Dr. Dilani was awarded in 2010 from the American Institute of Architect, Academy of Architecture for Health for his promotion of high quality design research.

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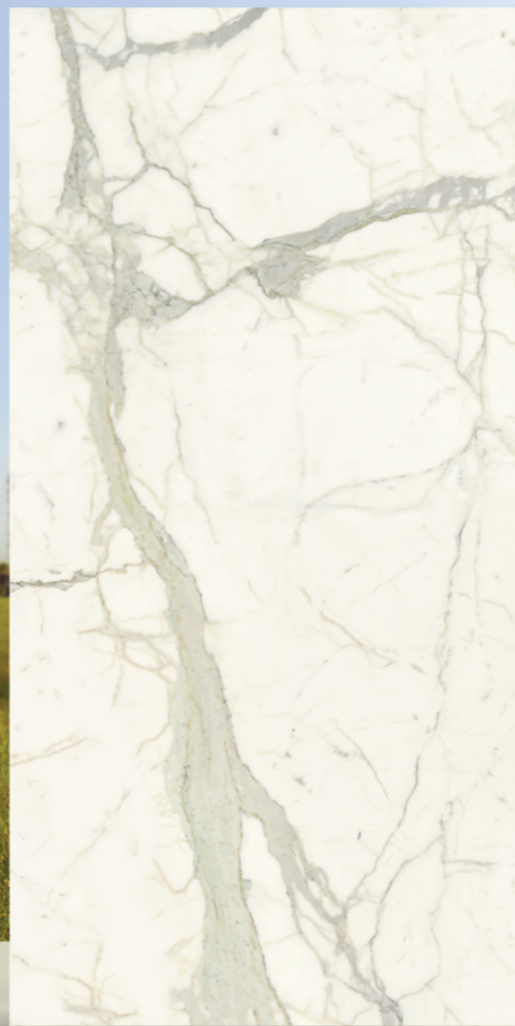
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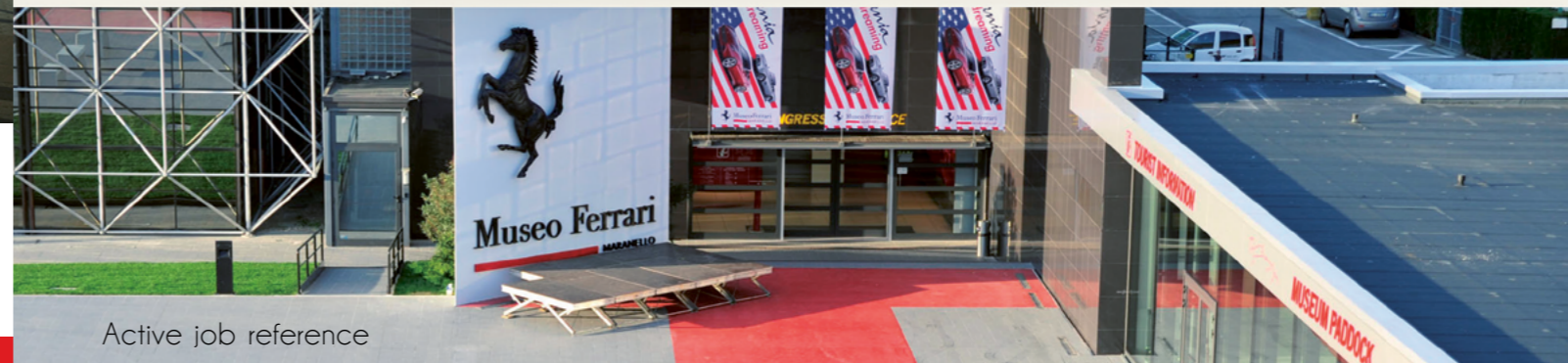
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Introduction of Ecological Architecture and Green Design

Ken Yeang (© June 2015)

The challenge of ecological architecture is to provide a green context of healthy society dealing with built environment and urban infrastructure that creates clean air, clean water, clean food and clean land – through water management and retention, natural heating and cooling, and renewable energy, for example – which in turn are eventually necessary for healthy society. The author Ken Yeang the founder of Ecological design principals discuss the principals and benefits of this progressive approach that are far-reaching providing governments, public- and private sector leaders with the opportunity of developing healthy built environment through the application of ecological design principles. These principals and application are important scientific finding to improve the context of healthy society in our planet.

Background and Problem

The key factors in ecological design interconnected with human being. We need to question our own demands on the environment and our behaviour upon it. We need to start with this as the first crucial factor in design - simply stated, the less we need from the environment and the lesser will be our impacts upon it. We can refer to our human society and communities here as the human eco-infrastructure being one of the factors to bio-integrate.

Humans although being one of the multitude of species in nature, is the most powerful having the immense ability such as the ability to literally move hills and landforms and significantly change landscapes. We need to modify and redirect waterways, to make huge discharges of gaseous, solid and liquid matter into the environment that affect global climate and its ecology, all of which generally made possible by the extensive use of non-renewable energy resources (such as fossil fuels, etc.). It is the culmi-



Eco - Cell - Solaris, Singapore.

nation of all these callous acts on the natural environment, which resulted in today's global climate change, besides other attendant large-scale acts of impairment such as destruction of natural habitats with extensive loss of biodiversity and loss of top soil leading to surface runoffs and siltation and eutrophication of waterways.

We need to consider and quantify the extent of our needs and demands on the natural environment (on the land, waterways and on the atmospheric cycles, and on the environment's natural resources, in particular on the extraction and use of non-renewable



Solaris, Singapore – The eco-cell as a device to bring vegetation to the lowest levels of the building.

energy resources. The less human society needs means the less taken from the natural environment and the less needed to make and the less to build, which in turn lessens the overall burden on the natural environment and its systems. This applies not just to society but must extend to all our commercial world being our businesses, manufacturing, agro-food production systems, urban services, transportation systems, etc., essentially extending to all that we make and do that impinges on the natural environment.

The built structures that we construct (buildings, bridges, roads, etc.) and all the artefacts that we make and fabricate (refrigerators, clothes, cars, etc.) all require materials and resources taken or extracted from the natural environment, which at the end of their useful life need to be green. It must be either reused or recycled or be reintegrated benignly back into the environment as against being dumped into landfills or into the air or water.

Our human eco-infrastructure must also include the intangible aspects of our human society being our regulatory systems (laws, legislations, penalties, incentives, ethics, etc.) that society formulates to control and guide our activities (eg. social interaction, business, construction, recreational, mobility, etc.). All these must be change to be environmentally responsive.

This infrastructure consists of all our human communities globally and consideration of their impacts is commonly missing in the design endeavours of most designers where the focus remains essentially on just the built structures. Consideration must be given to the impacts of all aspects of human life including how we use the built facilities - not just in what they do within the built structures but how we move about, how and what we are fed, what are our habits, how we service the built structures, our related recreational and leisure activities, etc.

We also need to change our human mind-set to depart from present day's culture of 'consumerism' that mass retailing encourages. This leads to the acquisition of material goods beyond that, which is essential and adequate for living. We need to lower the 'haves' excessive standards of living to reduce the impacts of manufacturing and disposal of commercial wastes and emissions into the environment. This is similarly applicable to our built environment in eliminating polluting and high-energy consuming industries into net zero energy built structures, net water and net waste systems. In summary, we as humans need to radically rethink and change all our unsustainable activities on the natural environment.

In ensuring human health by ecological architecture, we can adopt salutogenesis as the factors that support human health and well-being. The salutogenic model requires the creation, enhancement and improvement of our human society's physical, mental and social well-being through designing basic 'quality of life' features in our built environment.

The key salutogenic components are firstly 'environmental comprehensivity' requiring environmental orderliness, predictability and legibility such as for instance creating visual order in the built environment with legible intuitive way-finding, the elimination of visual chaos, etc. It follows by 'environmental manageability' requiring effective family and social support, and thirdly, 'environmental meaningfulness' requiring the provision of visual and aesthetic meanings, interest, satisfaction and attendant spaces for contemplation in the urban environment.

Designing 'Constructed Ecosystems' and its Subsystems

Our human infrastructure needs to adhere to an ecological ethic. While this effort of changing society's worldview lies beyond the sphere of the designer's influence and capabilities, we need to recognise that this is a vital aspect for concerted societal changes at the global level.



BIDV Tower, Ho Chi Minh City - A diagrammatic design spearheads architectural development to encompass the ecological architecture theory.

In aggregate, our designing the human eco-infrastructure means our departure from present day's 'one-way' demands on the natural environment but to a two-way reciprocal relationship, that society gives back to environment where beside reducing and eliminating our negative acts upon it, we design to have positive impacts on the natural environment and to enhancing its ecology. Achieving this bio-integration requires our built environment to be an integrated part of the natural environment as against existing in a separate alienated environment to nature.

Our work on eco-architecture is best described as 'RD&D' (research and development by design) that carried out as investigative and experimental work while concurrently delivering built projects in a professional design organisation. This RD&D work contacts at four general levels of investigations - on premises, on theory, on interpretations and on aesthetic explorations of green design and eco-architecture. The premises are the axioms that are the starting basis for the reasoning underlying our work. These are the springboards enabling our deducing and inferring the other aspects that provide the fun-

damental empirical bases for the theoretical aspects of eco-design.

Whereas theory are the general explanatory frameworks for green design that, evolve from the premises and ideas. Following this are the technical interpretations by design being the physical manifestations into physical environment of the theoretical work as applied research that demonstrate the formal possibilities in built configurations, devices and sub-systems in the physical application and testing of the theoretical propositions. Our preoccupation further involves aesthetic development being endeavours to ascertain the visual imaging of what constitutes the aesthetics of eco-architecture and eco-master plans, seeking to discover what these could look like, perhaps as a style.

In totality, our investigative work on these approximate a programme for research, discovery and invention. The developmental work on each are not sequential but generally done in conjunction with designing and delivering built projects.

In practice, such RD&D work hampered by the vicissitudes of being a project-based activity, impacted by extraneous factors outside the research work, such as pressing external demands in a fast-tracked programme of delivery not enabling prototypes. This could be the reiteration of simulations, or by the physical constraints of the project site, by local constructional limitations, by budgetary limitations, or constraints arising from the need to comply with local governmental requirements, and a multitude of other constraints. As such, what might be a promising idea with potential could have its subsequent adoption, development and realization curtailed due to commercial circumstances or simply rejected by the project's sponsor. The emergent idea then has to be kept on hold, with the hope of being resurfaced and adopted on another occasion when a suitable opportunity appears that will offer amenable conditions for its inclusion and implementation.

The relevance and rationale underlying an ad hoc investigative programme of RD&D work is simply that an ongoing professional practice provides extensive and unique location specific opportunities for experimentation and invention. This is not always found in the formality of a research laboratory. The demands in a project-based programme is by necessity the generation by the designer of rapid responses as insights and ideas. The pressure of this condition encourages serendipity in the creative design process and in unpredicted opportune 'eureka' moments.

In our journey of experimentation and the continued maturing of work at these levels of investigation, we became aware of the gaps in the field of eco-design at each of the levels. These provide impetus and

opportune areas for us to seek solutions. Discussed here are some of our work as applied research in the design interpretation of the axioms and the theoretical frameworks as technical solutions and 'subsystems' endeavours to bridge the gaps between knowledge and practice in eco-design.

The fundamental premise underling our work on eco-architecture is the design objective to achieve a seamless and benign bio-integration of our built environment and our activities with the natural environment. This includes everything that we make and produce, and everything that we do on the land, on the waterways and in the air.

The design approach is to bring together four factors holistically as a system - these are our human society and its acts and activities, the ecology of the environment, the water cycle and its management, and the ecoengineering systems. These together becomes the broad theoretical framework for our eco-design work, for which the challenge then is to find effective formal solutions that interpret the issues in each by design into physical environment and into working technical subsystems.

The first factor to be consider is we as human. In seeking to achieve a sustainable future, there must be radical changes in ourselves, in our society globally and a myriad of socio-economic-political and physical systems.

This involves radical changes to our current profligate ways of life and to our commerce, economic and social systems which have been prevalent over time, such as in our production of the artefacts and food products for contemporary life. We need to change our industrial and mass production systems, to our mobility and transportation systems, to our other activities such as recreational and others, all of which must become green and environmentally responsive.

Just designing and delivering green buildings and artefacts is just not sufficient - we need to extend the knowledge of eco-design to the public at large to educate and make them change their ways in all the above respects. This ambition requires an effort beyond the usual professional realm of the designer, but we need to recognise that effecting the changes in society will need the involvement of others if we are to have a greater impact than just designing green buildings.

The second factor to be bio-integrated is the ecology of the environment. Ecology is the branch of science dealing with the interrelation between the environment and organisms, but more fundamentally between humans and the natural environment. The



Masterplan at Omark Enclave, Bangalore, India – Landscape concept for an ecological nexus across the site.

natural environment is the biosphere, being the thin film at the surface of the planet, where organisms live and which provides the context for all our human activities including all that we make, build, use and throw away.

The issue here is that as the planet is a closed system, there is no 'away'. Our discarded stuff and emissions have to go somewhere and it is the impact of these unaccounted discharges whether gaseous, liquid or solid that are the causes of much of the global environmental issues today, compounded by our other acts of impairment to the natural environment.

Then comes consideration to water, a factor that is fundamentally vital for all organic life and its existence. We need to close the water cycle inasmuch as possible rather than have a throughput system of use and discharge. We need to manage it within its locality of use as a precious resource.

The other factor is engineering being crucial here because it provides the technological systems and subsystems that support our human life and its expectations for comfort, mobility and commercial activity.

We can refer to all the above factors as armatures of sets of 'infrastructures', where green design is



Calvary Convention center; Malaysia – The operable roof for mixed mode cooling.

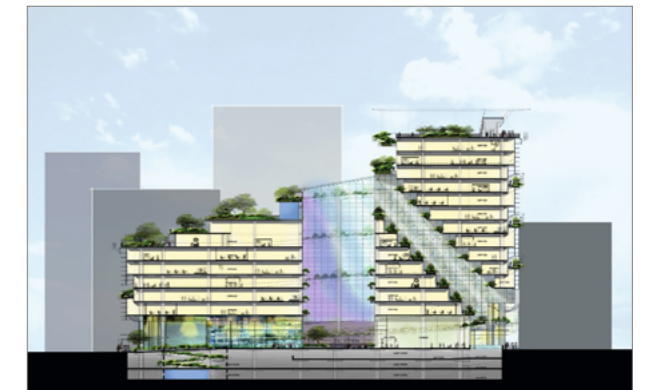
the bio-integration of all four into a holistic functioning system.

The contents of our present built environment is mostly synthetic, artificial and de-natured, besides also existing separately alienated from nature. Nature prior to human intervention existed in a general state of stasis even as its ecosystems go through their stages of succession. Our built environment needs to mimic this stasis in a similar symbiotic state of stability within itself as a 'constructed ecosystem' and at the same time, our built environment needs to become an integral part of nature rather than separate from it.

We can refer to this endeavour as 'biomimicry', being designing to imitate the ecosystem's attributes, properties and processes. This includes for instance, mimicking the way materials are recycled within ecosystems. Here the waste of one organism becomes the food of another. Other aspects to mimic is the biological structure of the ecosystem where there is a balance of biotic constituents with the abiotic constituents acting together as a whole, or imitating its energy source being renewable and entirely from the sun.

This framework of the four sets of eco-infrastructures and their bio-integration as a system becomes for us, a flexible 'platform' for green design. It provides the basis for designing beyond for instance, the simplistic compliance to an accreditation system, being essentially a tick-list set of prescriptive items, or the just designing carbon neutral clean tech engineering systems.

The eco-infrastructures platform for eco-design is analogous to the DNA model (of Crick, Francis and Watson, James) where the approach is to reduce the complexity of DNA to four simple sets of instructions. Here our four sets of 'eco-infrastructures' provide a flexible structure and framework for a comprehensive approach for green design. Of course, to reach success-



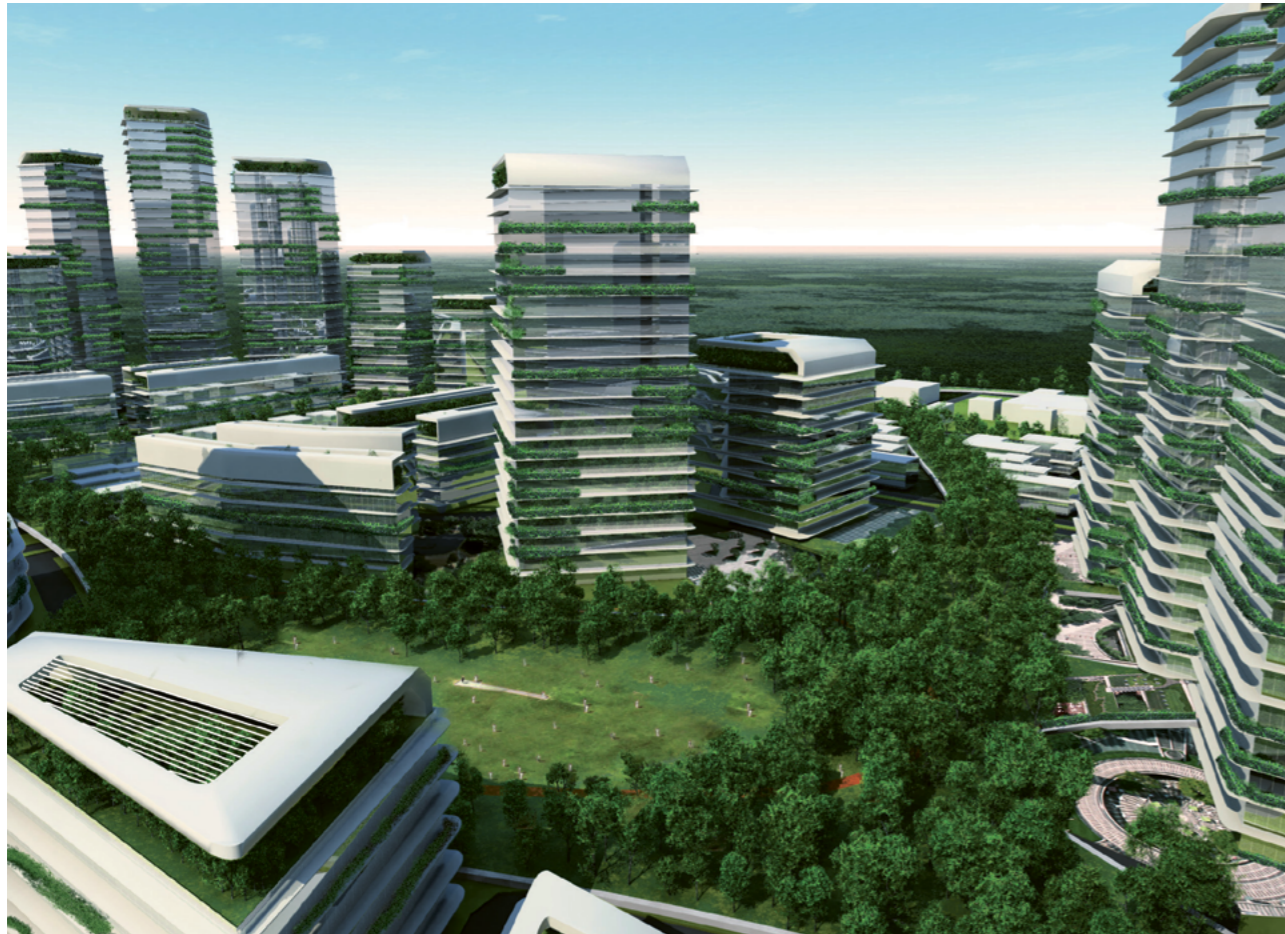
Solaris, Singapore – The diagonal light shaft.

fully is easier said than done, but herein lies the challenge in finding design solutions and appropriate subsystems to interpret these into physical environment.

The next crucial factor to be considered in eco-design is the natural environment itself, which we term here as the 'green eco-infrastructure'. The green eco-infrastructure are 'nature's utilities'. These natural utilities provide the 'common natural services' from the ecosystems which are crucial and beneficial for human life and to wildlife alike.

Consideration of the ecology of the environment is an aspect of green design and vital to all green design and planning work. Many designers often neglected this factor. This green eco-infrastructure is equivalent and is more crucially important for our sustainable future and more important than the human-made urban infrastructure engineering utilities. Being organic, its whole is greater than the sum of its parts, whereas human engineering systems being mechanistic can be separate to fix any faulty components without affecting the whole. This green infrastructure needs to be the form of an interconnected network of ecological corridors and fingers across our landscape and urban scape. It is the prime system in eco-design as a device that links and reconnects the land into an ecological nexus where the original greenfield areas had earlier been fragmented by human acts upon it and by other human built interventions (such as roads, drains, dividing walls and barriers, impervious surfaces, constructed changes in levels, etc.).

This approach to re-connect all the existent disparate green areas and habitats in cities and in urban areas into a network across the landscape and urban scape with its green hinterland should be the first step towards the greening of our cities as eco-cities, concurrent with making all their utilities sustainable. This re-connectivity enables the green areas



SOMA Masterplan – Green roofs, green walls, and constructed wetlands as habitat

to flourish again as natural habitats whereby being inked, it enables a greater pool of natural resources to be shared by all the species within the ecosystems. This ecological nexus conserves the existent ecosystems' natural values, enhances their biodiversity, besides providing natural processes that deliver a wide array of beneficial ecological functions that includes the provision of cleaner water, enhancing of existent water supplies, enabling cleaner air, reduction of the heat island. This effect in urban areas detrimental to all species, the moderation of the impact of climate change, engendering increased energy efficiency in the built environment, the protection of source water, and a multitude of other ecological benefits.

An unbroken linkage in the eco-infrastructure enables species free migration across the landscape whether for breeding, seeking of food and water or for refuge, enabling greater interaction between species and generally engendering a more diverse range of wildlife and their survivability and stability,

Reconnecting the green areas in the landscapes

further enables larger habitats to exist in their own right especially in newly linked existent woodland belts or wetlands, or newly linked existent natural features in the landscape such as overgrown vegetation alongside railway lines, existent hedges, etc. We must also take care to ensure that these new green infrastructures complement and enhance the natural functions of what already exists in the landscape.

Where there are other existent human-made infrastructures (such as roads, drains, impervious areas, barriers, etc.) that bisect or inhibit ecological nexus, the green connectivity can be achieved by using vegetated 'eco-bridges' and 'eco-under crofts' including other devices such as vegetated mounds and green ramps.

While the prime systems of nexus are the ecological corridors and fingers as the 'networks', the eco-bridges and eco-under crofts are the subsystems as the 'connectors'. These subsystems then enable the continuance of connectivity across the landscape over and under the conflicting routes of the other constructed eco-infrastructure.



DiGi HQ, Malaysia - The green interconnectivity can continue from ground to the top floors where the green environment can coexist with the built form.

We also need to make use of the locality's existent natural waterways and use their edge greenery to link alongside them. These waterways themselves as aquatic ecosystems also provide ecological services, such as providing natural drainage to attenuate flooding.

The green eco-infrastructure as networks of eco-corridors and fingers becomes an ecologically vital network and connecting device. Without it, no matter how advanced a design's ecoengineering systems may be it remains biologically inert and isolated as an artificial built environment separated and alienated from nature.

We must give precedence to this 'green' infrastructure as nature's utilities over and above the human-made 'grey' ecoengineering infrastructure. While being a new human intervention, the green eco-infrastructure reverses previous human fragmentation and interventions on the land and changes with positive consequences and environmental benefits. Its values are as a green armature and framework for natural systems with natural functions fundamental to the viability of the locality's flora and faunal life and their habitats, including ensuring viable soil, water and air. This re-connectivity reverses the impairment to the landscape by previous fragmentation and simplification of habitats and making it completely again, to provide a new green fabric for human society's living while safeguarding and enhancing the existent landscape's natural features.

The present built environment with its current intensity of construction further needs to be re-natured such that our new connectivity across the

landscape by the green eco-infrastructure can extend into the urban design. This greening balances the synthetic inorganic content of present built forms with biotic constituents - both as eco-infrastructures horizontally across the urban scape and vertically and internally within its built forms. This 'vertical landscaping' is a crucial aspect of green design. The green eco-infrastructure becomes a vital constituent of our built environment where our eco-design extends the eco-infrastructure vertically upwards and inwards in the urban physical environment, extending from the ground plane to create habitats-in-the-sky. A combination of other subsystems such as green walls, stepped and ramped vertical landscaping systems, green roofs, and other areas within the building become new habitats within the building de-alienating it with the natural environment.

A crucial aspect of eco-master planning is to ensure that before our making any physical act upon it (such as clearing or remodelling of a greenfield site, land, construction, whether for roads, drains, buildings, etc.), we need to carry out an ecological analysis beforehand to ascertain the locality's ecosystem's characteristics and carrying capacity for human intervention. This analysis includes a deep understanding of the ecosystem's biological structure, its inherent energy flows, its species diversity, its materials and nutrient flows, its soils and edaphic factors, and other internal ecological processes.

This ecological analysis of the ecology of the site enables us to identify more precisely which parts of the terrain can permit beneficial irreversible acts upon it. Which types of built structures and human activities may be imposed? Which parts of the land are ecologically sensitive and susceptible to human intervention and construction? What are the natural drainage patterns to avoid future flooding of our built systems and to guide the designing of sustainable drainage systems (such as identifying appropriate locations for the bio-swales, rain gardens, detention ponds, etc.) and for the location of the constructed wetlands for the natural treatment of black water. This approach is an anticipatory one, in advance of the likely ecological impacts of the intended construction of our built forms or interventions. However, we need also to be aware of the consequences after construction of the consequences of subsequent use and operations over time and at the end-of-useful-life.

This ecological analysis needs to be implemented diurnally and in some instances where applicable over

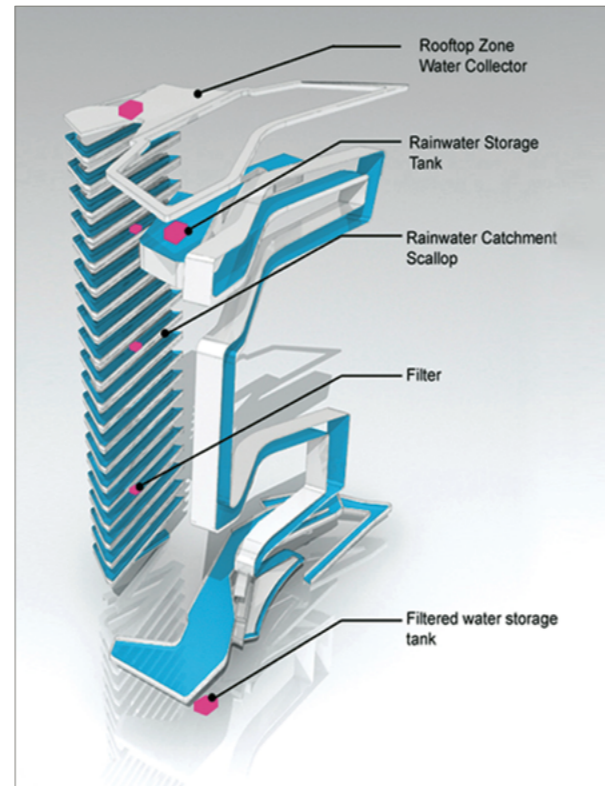
several years. In seeking ways to reduce this lengthy effort, an abbreviated approach is through the 'sieve-mapping' technique currently used as the basis for 'ecological land use planning'.

We must caution that this method is a simplified approach to understanding the ecology of the terrain, and tends to regard the site's ecology statically and in a simplified way. We need to ensure that we do not ignore the dynamic forces taking place within the ecosystem, between each of our mapped layers where there are complex interactions. The mapping needs to be verified by periodic assessment of its reliability monitored by study using conventional methods. Nevertheless, the ecological sieve-mapping technique provides a good starting basis for eco-master planning.

The third factor in eco-design and planning is to be integrated with the other factors in our framework are the engineering aspects. These eco-engineering systems (whether within buildings or externally as urban infrastructural nullities such as roads and other transportation networks) are essential for contemporary human life, comfort, health and safety. The internal environmental engineering systems for our built forms include designing passive mode, mixed mode, full mode and productive mode systems for creating conducive internal comfort conditions for the human inhabitants.

The usual external engineering eco-infrastructure of utilities in urban development includes items such as roads, drains, sewerage system, water reticulation system, telecommunications, IT, and energy and electric power distribution systems. To avoid obsolescence, we need not prescribe specific engineering systems here but to design these to be clean technologies as net zero energy systems, as carbon neutral with zero emissions inasmuch as possible, as having low-embodied energy, as net waste materials systems. It must at the same time be integral with the other eco-infrastructures, giving precedence to the green eco-infrastructure over others rather than vice-versa. These provide design opportunities for creating new subsystems.

The fourth factor in eco-design and planning that needs to be integrated in our design framework is the water infrastructure. This parallels in significance to our green ecological infrastructure and needs to be managed to enable the water cycle of the locality to 'close its loop' inasmuch as possible although this is not always possible in all localities (e.g. due to dry climatic conditions, to evaporation, low rainfall, or to leakages in existing systems, etc.).



Spire Edge, India Water management "closes the loop".

The locality's rainfall needs to be harvested and the built environment's grey water must be treated for reuse and recycling. The locality's rainfall and excessive surface water must be retained within the site and the surplus be returned to the groundwater to recharge the aquifers by means of subsystems such as bio swales, filtration beds (as 'rain gardens'), pervious roadways and pervious built surfaces, retention ponds and bio swales. We must consider the locality's ground water-table and its location the natural drainage patterns must provide appropriate surface-water management so that the rainfall remains within the locality and not lost drained away into rivers and other water bodies.

The storm water management must enable the surface water to be harvested or infiltrated using natural processes or by evaporate on or near the site where it falls while potentially generating other environmental benefits.

We must treat black water by using natural processes as opposed to mechanical means that require energy inputs.

Waterways should not be culvert as engineered waterways, and existent culvert waterways should be replaced with 'constructed wetlands', rain gardens and buffer strips to become ecologically functional meadows and woodland habitats.

Design needs to avoid the impervious sealing of ground surfaces, as these tend to reduce soil moisture and leave low-lying areas susceptible to flooding from their run-offs.

Design can provide green buffers and used together with the green eco-infrastructure to maximise its habitat potential.

The site's wetland greenways need to be designed as part of the sustainable drainage systems to provide vital natural ecological services. These sustainable urban drainage systems can function as constructed wetland habitats. Designing for surface-water management should maximise their habitat potential. These not only alleviate flooding, but also create buffer strips for habitat creation. While the widths of the green buffer may be constrained by existing land uses, their integration through the new green corridors as linear green eco-infrastructures can allow for wider widths.

Intermittent waterway tributaries can be linked and using bio swales.

In aggregate, we need to integrate all the above four eco-infrastructures – the human societal factors, the 'water cycle and its management system, the ecology of the land as a network of ecological corridors and fingers and the eco-engineering clean tech systems. It should be such integration into a seamless system as a complete whether we are designing a single built form or multiple built forms or an area or region. Green design requires getting all the above together to achieve a seamless and benign bio-integration of our built environment with the natural environment.

This framework provides a flexible platform for a comprehensive approach to green design and planning and for designing our built environment as 'constructed ecosystems' in eco-mimicry of the stasis in ecosystems in nature. □



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Nature Based Designs for Health

Connecting Built Environments, Housing Conditions and Urban Health

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This paper argues and illustrates why the multiple factors that influence both natural and built environments, living conditions and health status can be reconsidered using interdisciplinary concepts and methods. In contrast to conventional approaches that are sector based, interdisciplinary contributions offer a broader approach that helps to overcome a conceptually limited vision. For example, the principles of ecological public health highlight the difference between a biomedical model of health that often adopts a symptom-treatment interpretation of housing and urban health, and an integrated interdisciplinary one that combines biological, cultural, economic, political, psychological and social factors. Nature based designs at the multiple scales of housing units, large buildings, urban neighbourhoods, cities and their immediate surroundings are increasingly created using interdisciplinary and intersector collaboration to promote health and quality of life.

Introduction

During the majority of the 20th century urban planning and development programs applied functional, monetary and technical criteria to accommodate the requirements of rapidly increasing populations, a growing economy, and a wide range of technical, electronic and industrial innovations in the construction sector. Much of this development did not use land or other natural resources efficiently. Consequently, the biological, geological, and environmental consequences of housing, building and planning for urban development have had negative impacts on natural ecosystems as well as negative health impacts (Rodwin and Sanyal, 2000).

The health status of populations in precise urban areas is not only the result of many material and

non-physical constituents but also the interrelations between them. Hence, several conceptual and methodological questions need to be considered if the constituents and the interrelations between them are to be understood comprehensively. It is inappropriate to isolate a constituent from the contextual conditions in which it occurs. Instead, ecological approaches ought to be applied. This paper argues that in-depth studies of people-environment relations in specific localities can offer useful empirical contributions that will broaden our current understanding of this complex subject.

People-Environment Studies (PES) is a term that refers to a multidisciplinary field of theoretical and applied research stemming from a concern about the relations between people and their surroundings (Lawrence, 2001). These surroundings include the internal and external conditions of everyday life such as public parks, botanical gardens and urban forests. This paper argues that interdisciplinary concepts and methods are pertinent for analysis of the interrelations between health and natural environments because they permit the integration of concepts and principles of environmental epidemiology into a broader conceptual and methodological framework of people-environment relations.

The following sections of this paper discuss and illustrate some principles of ecological public health that can be used to study and understand *how* nature based designs can impact on health and quality of life. The next section presents definitions of health and health promotion, before the foundations of ecological public health are summarized. Then some ways in which urban planning can promote health and quality of life by nature based designs are presented. From this perspective the co-benefits of integrating the components of natural and built environments in cities are illustrated.

Interdisciplinary Health: Beyond the Bio-Medical Model

Health is defined in this paper as a condition or state of human beings resulting from the interrelations between them and their biological, chemical, economic, physical and social environments which are inscribed in a precise cultural and geo-political context. All these components of the immediate surroundings of people should be compatible with their basic human needs and full functional activity including biological reproduction over a long period (Lawrence, 2001). Health is the result of both the direct pathological effects of chemicals, some biological agents and radiation, and the influence of physical, psychological and social dimensions of daily life including housing, transport, communal services and other infrastructure of residential environments and metropolitan areas (see Figure 1). For example, improved access to medical services is a common characteristic of urban neighbourhoods that is rare in many rural areas.

In the field of health promotion, health is not considered as an abstract condition, but as the ability of an individual to achieve her/his potential and to respond positively to the challenges of daily life. Hence, health is an asset or a resource for everyday life, rather than a standard or goal that ought to be achieved (Sallis *et al.*, 2006). This interpretation is pertinent for studies of the interrelations between health, human behaviour and natural environments because the environmental

and social conditions in specific localities do impact on human relations, they may induce stress, and they can have positive or negative impacts on the health status of groups and individuals (Lawrence, 2002). This implies that the capacity of the health sector to deal with health promotion and prevention is limited and that close collaboration with other sectors would not only be beneficial but is necessary in order to improve health status. Therefore it is crucial to pose the question how nature based designs can positively influence health. In essence, there is a fundamental shift from the question whether buildings and public spaces and urban neighbourhoods can make people ill, to a new question about how housing, building and planning can promote health and quality of life.

During the last four decades a growing number of contributions around the world have focused on those positive factors that promote human health and well-being. For example, some architects and designers have been working on the design of health care buildings following a salutogenic interpretation using the introduction of indoor vegetation and/or views to natural landscapes (Golembiewski, 2012).

Linking Planning and Ecological Public Health

From the 1960s, some authors inspired by Ian McHarg in North America shared a concern about the interrelations between natural landscapes in and adjacent to urban areas and the planning and use of urban areas, buildings, communal services and infrastructure (McHarg, 1969). This concern has been enlarged by theoretical and empirical research that studies how these kinds of interrelations between the natural and built components of urban ecosystems influence the health and quality of life of citizens. This approach has been named 'healthy urban planning' (Barton and Tsourou, 2000), 'biopolis' by Welter (2002) and 'biophilic design' (Beatley, 2010). Specific examples include the restoration of the Cheonggyecheon stream in downtown Seoul and the converted High Line in Manhattan, New York City.

Ecological Public Health posits that human health is dependent on how people live in a complex ecological system. As Hippocrates noted, health is the outcome of the mutual interaction between humans and their immediate environment (see Figure 2). Rayner and Lang (2012, p.93) wrote that a key theme "...is interrelatedness, how people fit into the biosphere, how they use and care for the natural world, how all species interact, and how their interactions have

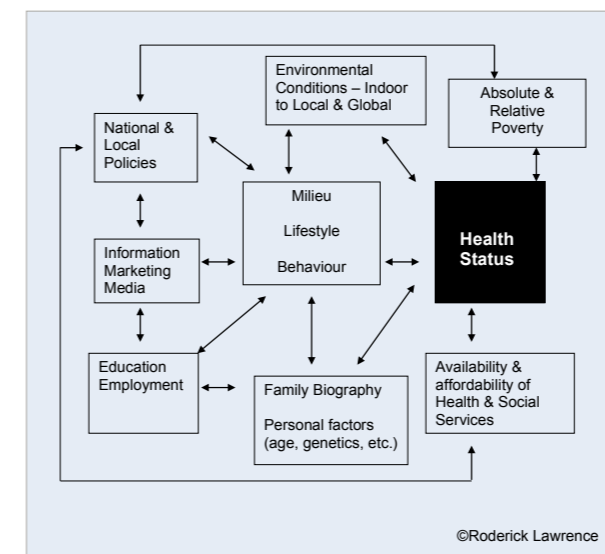


Figure 1. 8 classes of factors ("determinants") of health

These classes of factors are multidimensional and the interrelations between them can be direct or indirect. Interdisciplinary and inter-sector collaboration are necessary in order to understand health status in precise localities.

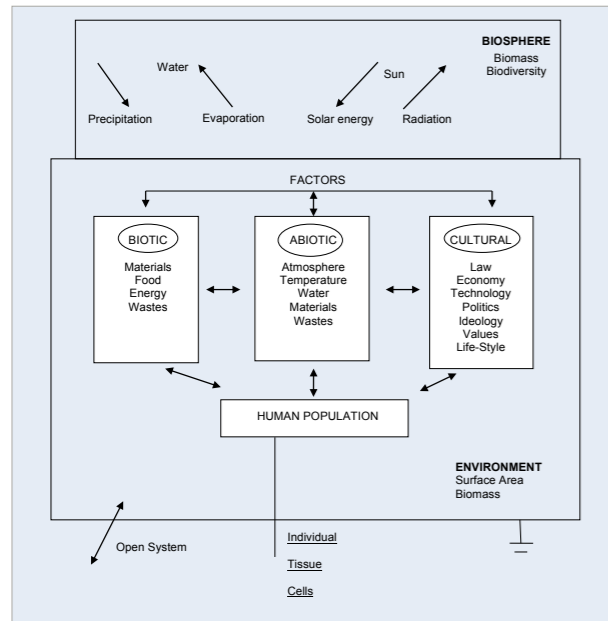


Figure 2. Holistic Framework of a Human Perspective (Source: R. Lawrence, 2001)

consequences almost always with feedback loops.” One example of this approach is the growing concern about the relatedness of climate change and public health in cities.

Ecological Interpretations of Public Health

Ecological thinking applied to public health does not search for specific cause-effect relationships isolated from the contextual conditions in which people live. This kind of thinking recognizes complexity and change stemming from either internal development or external influences, which can challenge both nat-



Cheonggyecheon. Urban Park in Seoul

ural and built environments. Extreme weather events are one common example of this kind of challenge. Socio-ecological theories and concepts have been used increasingly since the 1980s to study environmental health in specific localities and especially in situations of change (Sallis *et al.*, 2006; Stokols *et al.*, 2009).

Ecological interpretations of public health were proposed in the behavioural and social sciences that addressed people-environment relations as early as the 1950s (Lawrence, 2001). For example, a branch of psychology known as ecological psychology has applied the concepts of affordance, behaviour setting and supportive environment to analyze specific kinds of human activities in precise types of settings including schools and public parks (Sallis *et al.*, 2006; Stokols, 1992). The World Health Organization (2004) Strategy for Diet, Physical Activity and Obesity is one example of the application of ecological interpretations in recent public health campaigns.

Ecological interpretations can provide a more comprehensive conceptual framework for understanding the multiple and mutual influence of variables on human health across a wide range of geographical spectrums from specific buildings and public spaces to neighbourhoods and cities. In contrast to other kinds of interpretation of environmental health, ecological ones consider simultaneously the environmental and policy contexts of human life, as well as the cultural and social influences and specific psychological characteristics of humans. Ecological interpretations explicitly account for multiple levels of influence, thus enabling the development of more comprehensive public health policies for coordinated interventions

They have been used to develop comprehensive interventions that target change in environmental conditions (such as access to healthy food, or public green spaces); specific human behaviour at the personal, interpersonal and community levels (such as the promotion of active living to counteractive sedentary lifestyles).

Ecological interpretations can be distinguished from behavioural ones that focus only on individual characteristics and nearby social influences while not accounting for the larger environmental conditions, community organization, economic development and public policies that influence human behaviour and health. These interpretations posit that a combination of individual level, environment level, societal level and policy level influences should be considered using an integrative approach. For example the common request to provide green public spaces in urban areas is no assurance that people will use them to promote their health.



The aerial greenway crosses 20th Street in New York



The center section, which opened June 2011

Sallis *et al.* (2006) have proposed an ecological interpretation using an onion structure to represent the multiple levels of influence of physical activity. The four domains of active living represented in this model are recreation, transportation, occupation, and household activities. The multiple levels of influence that should be included to analyze active living include intrapersonal influences such as the perception of environments, human behaviour, the characteristics of behaviour settings, and the policy environment. This model confirms the need to identify variables that are specific to human activities in public green spaces. For example, physical activity, social interaction, or stress reduction by restorative processes will require different interventions for each kind of behaviour. Public awareness about the need to enact healthy lifestyles (e.g. replace sedentary by active living, or replace isolation by social interaction) is also crucial (Sallis *et al.*, 2006).

The main advantage of ecological interpretations is their focus on multiple levels of influence and the combined effect of different influences across a range of geographical scales. In particular, public policies that are intended to promote nature based designs of buildings and public spaces in cities can impact entire populations, whereas those interventions that target individuals may only achieve desired outcomes for those who choose to participate.

Intersectoral and Transdisciplinary Contributions

There is a need to reconsider the knowledge base that made possible the 20th century revolution in public health in order to deal with the complex interrelations between diverse kinds of human behaviour in natural environments and their positive health effects. Our capacity to deal with these complex sub-

jects is insufficient for several reasons discussed in this paper, including the diversity and complexity of these problems; the difficulty of identifying and measuring the interrelations between them and their components; and the need to understand the relative importance of these components in precise localities, at different geographical scales and over time. Therefore, it is suggested that it is necessary to shift from multidisciplinary to interdisciplinary and transdisciplinary contributions.

In this paper, disciplinarity refers to the specialisation and fragmentation of academic disciplines especially since the 19th century. Each discipline has its own concepts, definitions and methodological protocols for the study of its precisely defined domain of competence (Lawrence, 2010). For example, in the domain of environmental sciences, different definitions, concepts and methods exist in biology, geology, physics and chemistry. This means that collaboration across disciplinary boundaries is not easy until a common understanding can be achieved.

Multi-disciplinary refers to an additive research agenda in which each researcher remains within his/her discipline and applies its concepts and methods without necessarily sharing a common goal with other researchers. This approach is still common in the environmental sciences today and it is frequently applied in environmental impact assessment (EIA).

Interdisciplinary contributions are those in which concerted action and integration are accepted by researchers in different disciplines as a means of achieving a shared goal that usually is a common subject of study. In contrast, transdisciplinary contributions incorporate a combination of concepts and knowledge not only used by academics and researchers but also other actors in civic society, including representatives of the



New standard for sustainable housing, the concept of "Bosco Verticale" or Vertical Forest, as a way to combine high-density residential development with tree planting in city centers.

private sector, public administrators and citizens. These contributions enable the cross-fertilisation of knowledge and experiences from diverse groups of people that can promote an enlarged vision of a subject, as well as new explanatory theories (Lawrence 2010). Rather than being an end in itself, this kind of research is a way of achieving innovative goals, enriched understanding and a synergy of new methods.

Multidisciplinarity, interdisciplinarity and transdisciplinarity are complementary rather than being mutually exclusive (Lawrence, 2010). Both interdisciplinary and transdisciplinary research and practice require a common conceptual framework and analytical methods based on shared terminology, mental images and common goals. These need to be applied to promote more real world cases of nature based designs in cities around the world. □



Roderick Lawrence graduated from the Faculty of Architecture and Town Planning at the University of Adelaide (Australia) with First Class Honours. He has a Master Degree from the University of Cambridge (England) and a Doctorate of Science from the Ecole Polytechnique Fédérale, Lausanne, Switzerland. In 1999 he was nominated Professor in the Faculty of Social and Economic Sciences at the University of Geneva.

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Proposed Mexico Square Urban District, Ethiopia
[Design Development]



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Design for people living with dementia

Efthimia Pantartzis, Federica Pascale and Andrew D. F. Price
Loughborough University

This research paper targets one of the most prominent design challenges in our society today: how the built environment can respond to the increasing numbers of people living with dementia, which is a progressive condition for which there is currently no cure. People live with dementia in their own home, care homes and other residential settings; they also frequently need access to community settings and services including health care infrastructures, day centres and local communities, many of which are not dementia-friendly. However, available evidence and appropriate stakeholder consultation can improve understanding of the needs of people living with dementia and how to better design the built environment to make them more dementia-friendly.

This paper outlines the dementia-friendly design principles and dementia-friendly core design features which have emerged from the 12-month DH England “Improving the environment of care for people with dementia” and were used to underpin the new “Health Building Note (HBN) 08-02: Dementia-friendly Health and Social Care Environments” and provide insights into the design process applicable a wide range of settings and spaces taking into account different types and stages of dementia.

Background

Reduced fertility rates and increased life expectancy are leading to aging populations with increased numbers of people aged over 65, with demographic profiles varying greatly between developing and developed countries (WHO – National Institute on Aging – National Institutes of Health 2011; UN – Department of Economic and Social Affairs – Population Division 2013). Ageing populations lead to increased co-morbidities, including a range of organic symptoms that occur when the brain is affected by certain diseases or conditions such as dementia, which have significant

impact on systems for health and social care provision. Older people occupy circa 70 per cent of acute hospital beds, find hospital environments challenging and have co-morbidities (coexisting medical conditions) including cognitive impairments, such as dementia, among their many complex healthcare needs which contribute to their longer Emergency Department (ED) waiting than younger adults as well as poor outcomes (e.g. length of stay, institutionalisation and mortality).

According to the World Health Organization (2015) dementia is “a syndrome due to disease of the brain, usually of a chronic or progressive nature, in which there is disturbance of multiple cortical functions, including memory, thinking, orientation, comprehension, calculation, learning capability, language, and judgement. Consciousness is not impaired. Impairments of cognitive function are commonly accompanied, and occasionally preceded by, deterioration in emotional control, social behaviour or motivation.” Dementia is caused by a variety of diseases and injuries that primarily or secondarily affect the brain, such as Alzheimer’s disease or stroke, and it mainly affects elderly people; however, it is an abnormal condition and not part of normal brain ageing. According to Age UK (2014), there are over 100 types of dementia which have different symptoms and rates of progression. Around 60 per cent of people living with dementia have Alzheimer’s; and around 20 per cent have vascular dementia. There are other less common forms of dementia, such as dementia with Lewy bodies and Frontotemporal dementia.

Given the current rate of ageing population, the number people living with dementia is expected double by 2030 and more than triple by 2050s (ADI 2014), with consequent increase in service provision demands. The size of the challenge and diversity of existing settings requires a long-term strategic response and fit-for-purpose infrastructures (DH 2015). Whitaker (1952) defined a hospital as

Dementia is caused by a variety of diseases and injuries that primarily or secondarily affect the brain, such as Alzheimer’s disease or stroke and it mainly affects elderly people; however, it is an abnormal condition and not part of normal brain ageing.

“a public service institution”, “a physical property” and “all the people” who populate the healthcare facility. Nevertheless, in the 21st century, social care facilities also need to be brought into consideration as well as family and carers, who devotedly assist their relatives to meet the daily challenges created by health and social care settings.

The use of the term (health care) environment nowadays recognises and addresses the whole set of “interdisciplinary aspects” that create the so-called “health architecture”. The provision of fit-for-purpose care environments requires going well beyond traditional concepts and definitions of what constitutes a hospital. New and innovative approaches to care transformation are needed and emerging based on integrated care delivery which encompasses many different settings, such as: acute care facilities, nursing homes, residential care homes, day centres and local community facilities. All of which are combined in a collect way to deal with complex conditions and deliver more personalised (i.e. patient/resident centric) care that satisfies the individual needs of people living with dementia (Hadjri, Faith et al. 2012).

There is also increasing recognition that patients, especially those with complex conditions, need to receive an integrated package of treatment. Solutions such as integrated and co-located primary (e.g. large acute hospitals) and secondary care (e.g. General Practitioners (GPs)) are now integral to new care systems but add layers of complexity and reinforce the need for novel design solutions. More “continued” and “coherent” support packages (Antonovsky 1996) are required to fulfil the needs of peoples’ complex and multiple needs. Comprehensibility, manageability and meaningfulness should drive a salutogenic approach to design of care environments (Antonovsky 1987; Dilani 2008).

The Kings Fund highlighted poor space utilisation and care often being designed around the estate (Appleby, Ham et al. 2010), not the other way around, which is not surprising since the estate has traditionally been unable to change at the same rate as technology and care delivery. Healthcare facilities are

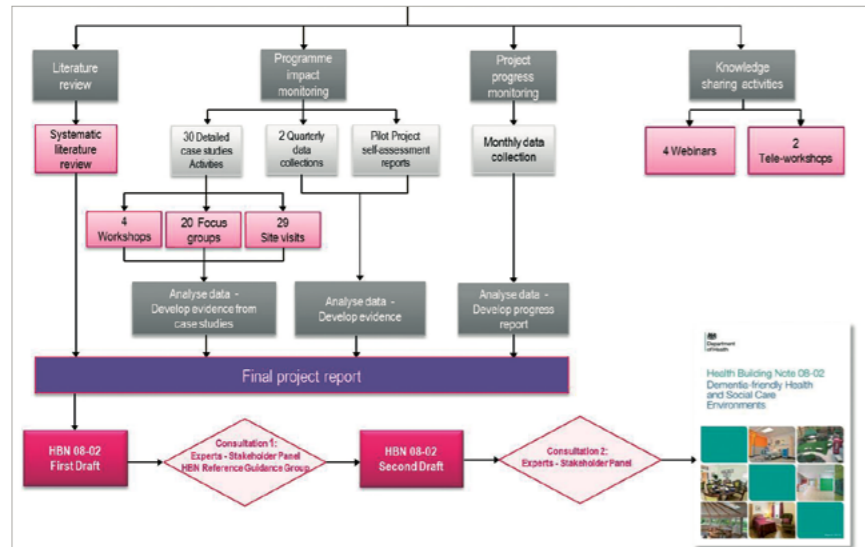
complex, multi-specialist/acuity and traditionally designed around specialties/departments rather than patients, with patients flowing through and between spaces (and settings) to receive diagnostics, treatment and on-going support. The built environment needs to accommodate continuous change resulting from: health and social care boundaries increasingly becoming less rigid; service provision changes due to ageing populations; changing society (e.g. reduced family support networks); and increases in co-morbidities. New design processes need to emerge which take due account of flexibility and continuous change by allowing for changes in spatial layout, function and patient volume.

Recent research has demonstrated the importance of the built environment to the quality of care and the wellbeing of people living with (Kovach, Weisman et al. 1997; Lawton 1997; Brod, Stewart et al. 2000; Day, Carreon et al. 2000). However, many published scientific research findings, relating to the impact of the physical environment on people living with dementia, are more than 15 years old and most of the experimentation was conducting specialist dementia unit or care homes (Fleming and Purandare 2010), however. With this understanding, awareness and proactive national approach, in 2013/14 the Department of Health England invested £50 million to deliver the National Capital Programme “Improving the environment of care for people with dementia” which also provided evidence on the impact of built environment interventions on the quality of care which underpinned the new “Health Building Note (HBN) 08-02: Dementia-friendly Health and Social Care Environments”.

There is also increasing recognition that patients, especially those with complex conditions, need to receive an integrated package of treatment.

Methods

This study adopted a mixed research methodology, which combines quantitative and qualitative research methods: a comprehensive literature review; the Dementia Capital Programme pre and post-pilot project quantitative data collection; case studies; interviews; focus groups; and workshops. The findings were used to develop a HBN for the Department of Health, England, which underwent an iterative peer-review process with stakeholders and experts from the USA, Australia, Norway, Finland and the UK.



DH Dementia Capital Programme & HBN 08-02 delivery plan

Peer-review process

The HBN 08-02 underwent a two stages consultation process, prior to the completion of the document. The first consultation included a national HBN Reference Guidance Group, who mainly addressed issues in relation to the structure and format of the document, and an international Dementia Stakeholder Panel, who included: patient and resident representatives; design and practitioners; National Health Service (NHS) and social care service providers; Royal College of Nursing and Royal College of General Practitioners’ representatives; and academic and research experts. The second consultation process

involved only the international Dementia Stakeholder Panel, who refined the second draft of the document and addressed further specific details.

Innovative and overarching features of HBN 08-02

The HBN 08-02 is the first expansion of the HBN 08 series on long-term conditions/long-stay care. It is intended to provide guidance for the design of dementia-friendly environments in all health and social care settings where people living with dementia need to access, navigate and stay. This guidance also provides useful guidance to all those stakeholders who might be new to the dementia condition and/or those who seek to expand their knowledge in an area that their routine institutional duties do not cover.

After careful consideration of the information emerging from the pilot projects, case studies and stakeholder consultation, it was agreed that the guidance should comprise: introduction to DH guidance and the regulatory framework; explanation of the type and stage of dementia that could influence design requirements; design principles; core design features; case studies; and the need for a long-term strategic approach to benefits realisation.

This paper focusses on the principles, features. The design principles report overarching design considerations, applicable both for any type of care settings, aiming to provide care environments able to help people living with dementia make the best of their remaining abilities. The design features explain how components and elements of the built

Pre and post-project data analysis

The selected 115 pilot projects funded by the DH Dementia Capital Programme provided six-month pre and post-project completion data that captured the impact that the completed interventions had on people living with dementia, carers and families. Metrics and improvement measures were identified to demonstrate the impact of the interventions on people living with dementia, staff and relatives, such as: slip, trips and falls and unit costs of these; length of stay; staffing (sickness, attendance, absences, recruitment, efficiency, agency staff); readmissions; violence and aggression incidents (injuries for staff and their cost implications); medication; complaints from patients, relatives or staff; location of discharge (e.g. patients back at home); and impact on other patients. These metrics were related to the characteristics of the patients/residents sample, as each project was requested to provide the number and severity level of people with dementia in their setting for the period of the data collection.

Case studies data analysis

Regarding the qualitative aspects of the research, 30 case studies were selected as they included innovative interventions relating to: 1) built environment; 2) supportive technologies; and 3) integration along the care pathway. Case study data collection included 4 workshops, 29 interviews and 20 focus groups. This was in addition to the data they were already collecting as pilot projects. Data were organised in an open coding process, analysed and sorted under different subthemes.



HBN 08-02 to develop dementia-friendly environments

environment can contribute to make the care environments more dementia-friendly. The eight health and social care case studies selected were selected to represent different settings and were presented at the end of the HBN, thus providing useful examples of how some of the suggested design principles can be applied and which might be more appropriate to specific settings.

Dementia-friendly design principles

“Given the demographic implications of ageing and the expected increase of the number of people with dementia, the provision of care environments which meet their needs becomes critical” (Hadjri, Faith et al. 2012). Most people (circa 66% in the UK) with dementia live in the community (Brodaty and Donkin 2009; Alzheimer’s Society 2013). Given the complexity of the dementia challenge, it has become increasingly important to make communities more dementia-friendly; which means communities are “more inclusive of older people and those with dementia, and support them to live independently and well” (Alzheimer’s Society 2013).

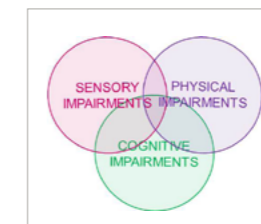
This means that the need of a more dementia-friendly is not limited to hospitals and care homes but to a large variety of social care setting working in the community, such as day centre, respite centre. Additional layers of considerations need to take into account that: dementia is a progressive condition and people living with dementia present increasing disability and dependency; there are different types of dementia, which can have different symptoms and rates of progression; and dementia does not only affect older people, but also people younger than 65, only in the UK there are now 17,000 younger people living with dementia (Alzheimer’s Society 2012). Therefore, the care environment has to be able to accommodate different needs and requirements.

To meet the above challenges social and health care sectors are under increasing pressure to provide a variety of acute, long-term and community settings better able to meet the manifold and changing needs of people living with dementia. The variety of required and existing settings combined with the different needs of the individual living with demen-

tia, justifies the development of a set of Dementia-Friendly Design Principles which can be tailored for a given context (i.e. setting and individual needs). The lessons learnt from the DH Dementia Capital Investment

Programme, a comprehensive literature review, and the analysis of pre-existing principles (Marshall 2001; Cunningham, Marshall et al. 2008; Cunningham 2009; Fleming 2011) were undertaken to enable the research team to develop a first set of principles. Emerging evidence suggested that dementia can reduce human abilities in several ways and created impairments that can be grouped as:

- **Sensory;**
- **Cognitive;**
- **Physical.**



Impairments related to dementia condition

Subsequently, the design principles were developed around these three groups. The aim being to develop a set of patient/resident-centred design principles applicable to any type of health and social care setting, thus presenting design strategy that responds to sensory;

cognitive and physical needs. It was recognised that the prioritisation or ranking of these principles may change and tailored as a direct response to the dementia challenges faced in different settings. Once this first a set of design principles was developed, another comprehensive literature review identified for each principle: the challenges related to dementia and ageing; specific issues related to different stages and types of dementia; and research-based design practise able to provide an answer for those challenges. The design strategies that were identified in this way were also compared with the results of the Dementia Capital Investment Programme, in order to identify those strategies supported both from the literature and the programme.

The development of the design principles also underwent a two-stage consultation process, which included a large stakeholder panel and international experts to test, refine and validate the evolving set of design principles. At the end of this process, 12 design principles were developed and all the principles apart from Principle 1 (Provide a safe environment) have been grouped according to the three groups: sensory; cognitive and physical. Principle 1 was considered to

be an overarching principle, and includes safety considerations which are valid one or more of other principles which are as follows.

Tackling sensory impairments

Dementia can reduce the ability to see, hear, taste, smell and touch. People living with dementia can also find it difficult to distinguish and differentiate between simultaneous sensory stimulations and become confused. This can lead to greater risk exposure and the need for round-the-clock supervision as the disease progresses. Dementia-friendly environments thus need to promote Principles 2 and 3:

- **P2** Provide optimum levels of stimulation; and
- **P3** Provide optimum lighting and contrast.

Tackling cognitive impairments

Dementia can reduce the cognitive ability. This, along with difficulties in hearing, remembering and communicating, contributes to the person living with dementia experiencing difficulties in finding their way around and engaging with their environment and the people in it. The consequence is reduced ability to communicate effectively and interact in social settings. Dementia-friendly environments thus need to promote Principles 4 to 8:

- **P4** Provide a non-institutional scale and environment;
- **P5** Support orientation;
- **P6** Support way-finding and navigation;
- **P7** Provide access to nature and the outdoors;
- **P8** Promote engagement with friends, relatives and staff.

Tackling physical impairments

People living with dementia can experience reduced mobility and balance due to changes in the cerebral cortex. Day-to-day functions such as walking, standing and sitting become increasingly difficult as the disease progresses. The person living with dementia can also experience problems eating as the ability to chew and swallow is impaired. Dementia-friendly environments thus need to promote Principles 9 to 12 that:

- **P9** Provide good visibility and visual access;
- **P10** Promote privacy, dignity and independence;
- **P11** Promote physical and meaningful activities;
- **P12** Support diet, nutrition and hydration.

Dementia-friendly core design features

A corpus of literature has established how built environment design features can impact on the quality of care (Kovach, Weisman et al. 1997; Marshall 2001; Calkins 2009) and the experience of people living with dementia experience (Cohen-Mansfield and Werner 1998; Zeisel, Silverstein et al. 2003; Morgan-Brown, Newton et al. 2012). The DH Dementia Capital Programme provided an opportunity to explore how spaces, environmental interventions and core design features can impact on Quality of Life (QoL) and support integrated health and social care delivery. In both health and social care settings, the focus of the pilot projects was largely on communal and circulation spaces, where people spend most of their time, thus demonstrating the importance of spaces for socialisation to help people living with dementia feel part of a community.

Interventions in sanitary spaces (e.g. assisted and en-suite bathrooms) and individual spaces (e.g. bedrooms) were also delivered to enhance QoL for residents and patients, emphasising the importance of privacy and dignity. The NHS pilot projects focused on flooring, colour coding and signage with significant emphasis on way-finding in hospital setting for people living with dementia. The social care (LA) pilot projects focused on signage, flooring finishes, lighting and furniture, with noteworthy works on colour coding, reminiscence objects and artwork to support cognitive impairments (Loughborough University Enterprise Ltd., IFF Reserach et al. 2014).

The development of HBN 08-02 involved analysing and rationalising the gathered evidence towards a systematic set of core design features which can be purposefully designed for people living with dementia and categorised as follows (Department of Health 2015).

Construction elements

Construction elements (i.e. ceilings, doors, fixtures, flooring, walls, and windows and transparent panels).

- **The design of ceilings and ceiling finishes** should reduce vertical sound transmission and reflection in different types of spaces. The time patients and/or residents spend in bed or on trolleys should determine the need to: reduce glare and shadows from ceiling lights; and use ceilings that provide points of interest or locational and directional information at the line of sight and with identifiable size of fonts and pictograms. Ceiling heights can be adjusted to improve the acoustic performance of space and particularly in non-clinical

rooms and areas, where fixtures and space function do not require high ceiling solutions.

- **The design and specification of doors and door components** should enable people living with dementia to independently orientate, way-find and navigate space. Door closure systems should be designed to ensure smooth and quiet closures, to avoid unintended noise that could cause distress and anxiety to patients and residents when doors are operated, especially at night.
- **The design and specification of fixtures should** be of traditional and/or familiar appearance. High contrasting colours should be used and visible during the both day and night needs to reflect potential use. Where appropriate and desirable: people living with dementia should be able to use fixtures safely and independently and fixtures should be accessible, adjustable and flexible according to the needs of people living with dementia.
- **Flooring design and selection should be consistent**, matt, non-reflective and non-patterned floor finishes throughout the building to avoid confusion and encourage movement. Internal flooring should have a non-slip and non-shiny textures to reduce slips, trips and reduce injurious falls without causing confusion due to sudden and unexpected changes in flooring type and/or feel.
- **The design of walls and wall finishes should be** non-patterned, matt and anti-glare, with colour accents and feature walls used to promote calm and safe environments. The choice of materials and finishes should accommodate the needs of people living with dementia and reduce the non-institutional feeling of the built environment.
- **The design and installation of windows and transparent panels** should not compromise privacy and dignity. External glazing solutions should maximise views of natural outdoors and the skyline. Window openings should provide: fresh air, which can improve wellbeing; and suitable illumination and ventilation of all main areas. The use of windows and transparent panels can reduce distress and anxiety as they can enhance sight of activities in adjacent spaces.

Elements that can enrich the built environment

Elements that can enrich the built environment (i.e. artwork, decoration, furniture and fittings, reminiscence hardware and software, and signage).

- **Traditional pieces of artwork and more modern elements of artistic representation** (e.g. digital photography and photo-frames, projectors with sensory animated scenes) can support people with dementia live a life as close as possible to how they were living prior to the onset of dementia (e.g. eat, sleep, dress and do activities). Artwork selection should take into account culture, as different types of art may have different connotations for people from different cultural backgrounds, but allow personalised artwork in any setting aimed at promoting self-esteem and personal identity.
- **Decoration can enhance lighting and provide good colour contrast and a non-institutional homely environment**, with elements of soothing décor to help people living with dementia to orientate in and navigate around the building. Themes for decorative finishes should flow through all areas and across all spaces to avoid confusion and distress, and enhance the journey and personal experience whilst navigating the built environment, avoiding excessive use of patterns and clutter.
- **Colour-coordinated furniture and fittings can** support recognition and orientation, however, traditional and/or familiar shapes and sizes should be used to facilitate recognition and identification. Bright, simple and non-institutional furnishings should be used where possible, with due consideration given to softness and brightness. Fittings should be adjustable and flexible to the needs of people living with dementia. Sharp edges should be avoided in furniture and fittings to minimise risks of harm for people with dementia and the choice of layout should reduce space clutter.
- **Reminiscence hardware and reminiscence software** embedded within the built environment can be used to enhance sensory perceptions and enable people living with dementia to collect, promote and organise information in an individual and personal way. Staff and carers might be required to operate them while friends and relatives should be actively engaged and provide material to develop life stories aimed at prompting recall of positive personal life events, experiences and achievements to inform carers and enable person-centred care delivery.
- **Signage should be purposefully designed to** promote independence, orientation, way-finding and ensure inclusive access for everyone, avoiding clutter and information overload. Clear con-

trast and consistency should guide the design and choice of signage. Directional and locational signage should use clear symbols for people who do not read English or are unable to read or decipher words, while tactile signage can help those with visual impairments.

Technical elements

Technical elements (i.e. acoustics, colour and lighting) that could potentially be applied cross-construction element and to other elements.

- **Dementia-friendly acoustics should consider** locations where clear speech is important and where noise (unwanted sound) needs to be reduced or absorbed to ensure that distress and anxiety are minimised. Sound absorbent construction materials and finishes should be used for surfaces, fixtures and fittings whenever possible as they can contribute to quieter, peaceful and restful environments. Noise reducing design solutions and sound-effect technologies should be integrated within the built environment during the early design stages.
- **Colour design is a fundamental element** in dementia-friendly environments, as contrast sensitivity is the most consistent visual deficit in people living with dementia, and people with particular types of dementia may have to rely on their conceptual knowledge to identify individual items and thus use size and orientation in combination with colour. High-level contrast between the different elements of the built environment should also be used to support orientation, way-finding and creation of calm environments.
- **Dementia-friendly lighting should be designed** to provide control, create different moods and create calming environments, and to help regulating the human circadian system on to a 24-hour light-dark pattern. Type of light, colour of light, level of luminance, direction of lighting sources, reflection and diffusion, glare, system operability, flexibility of switching between different uses, fixtures, maintenance and upgrades, and energy consumption are all elements against which an effective and efficient design solution should be determined.

Conclusions

This paper has presented the results emerged from the DH England “Improving the environment of care

for people with dementia” and how they were used to underpin the new “Health Building Note (HBN) 08-02: Dementia-friendly Health and Social Care Environments”.

The paper has presented dementia-friendly design principles and introduced a set of dementia-friendly core design features to be applied in the future design of salutogenic environments to improve the QoL (e.g. slips, trips and falls; challenging behaviour and the need for antipsychotic medications; sleeping and eating habits; better interaction with the people around them) of people living with dementia, both in health and social care settings.

This research has demonstrated how a defined set of principles could potentially lead the design of environments of care able to help people living with dementia to make the best of their remaining abilities. It has also enabled to identify evidence towards a systematic set of core design features which can be purposefully designed for people living with dementia and categorised. The tangible outputs have been the Final Recommendations Report and the new HBN 08-02, which are widely accessible through the Gov. UK website.

Recommendations

The research conducted to deliver the DH Dementia Capital Programme and the HBN 08-02 has enriched the existent *corpus* of knowledge around dementia-friendly design of environments of care and has provided the opportunity to gather extensive evidence on what design solutions can improve the QoL of people living with dementia and how those solutions can be applied to different settings and different spaces.

Quality of Life of people living with dementia

Person-centric health and social care delivery in general can make a significant contribution to improved quality care and QoL for a person living with dementia. Health and social care facilities should provide therapeutic and healthy environments where the overall design of the building contributes to the process of healing and reduces the risk of healthcare-associated harm to people who are accessing them: “Primum non nocere - First do no harm” (Hippocrates, ca 460 BC - ca 370 BC). The design of dementia-friendly care environments should be: dementia specific; account for the different types and stages of dementia; and take into account new evidence, long-term studies

and contextual changes. It should achieve impact, change behaviour and have a designated audience.

Transferrable solutions

The scale of this research and the international peer-review process has shown that a set of principles and core features can be applied cross-settings, cross-spaces and also cross-countries, when the focus is on person-centric care.

Integration in health and social care design

As the gap between health and social care is progressively reducing and the built environment needs to respond consistently to the needs of people living with dementia, dementia-friendly design principles should guide the design process towards an *optimum* integration of health and social care environments, in order to reduce distress, anxiety and frustration when people living with dementia are in their own home, care homes and other residential settings and when they access health infrastructures, day centres and local communities.

Core features to support the design process

As the design process can offer the opportunity to transform different built environments (e.g. acute hospitals, care homes, sheltered houses, day centres and local communities) and increase the value of space towards a better use of resources over the future, a core set of features (e.g. lighting and flooring) should be at the basis to suggest effective and

efficient design solutions, which can be tailored to accommodate specific needs of a setting and to comply with relevant regulations for specific spaces, where different activities are delivered.

Limitations

Despite the many innovative aspects of this research project, a number of limitations must be stated as well. A longer timeframe to deliver a national capital programme and a longer term monitoring of the impact of the transformed environments on people living with dementia would enhance results validation. Although the research has taken in consideration international literature, guidance and expertise, further work needs to be developed at international level in order to suggest a more systematic way towards effective, efficient and transferrable design solutions.

Acknowledgements

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Use of dementia-friendly decoration, flooring and lighting design features in hospital ward



Dementia-friendly fixtures, furniture and fittings in open plan care home kitchen



Dementia-friendly features in an enclosed courtyard in acute hospital site

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She has collaborated with the Department of Health Dementia Capital Investment Programme, supporting the DH in the selection process, development of delivery confidence, quality measures and evidence gathering; and on the development of the new HBN 08-02 "Dementia-friendly Health and Social Care Environments".



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Can Salutogenic outcomes be achieved through public private partnerships?

Design for healthcare – Global examples reveal a way forward

By Ken Schwarz

Salutogenic outcomes and Public Private Partnerships (PPP) are not natural bedfellows. One focuses on the promotion of health and well-being, the quality of life and inspiration that lifts our spirit; it's about people and humanism. The other is a hard-driving, gloves-off process to reach an objective; it's about delivering an asset and service in the most direct and cost-effective way. Both are increasingly important to the development of our social infrastructure – particularly our healthcare infrastructure. We have little choice but to find ways of achieving one by means of the other. It is not easy and there are relatively few examples of complete success.

THE CONTROVERSY

PPP for healthcare has been controversial since it began and that is unlikely to change. There are many strong points in favour of it:

- Provides access to private capital.
- Integrates design, construction, maintenance and operation – encouraging long-term, whole-life thinking.
- Engages expertise of a wide range of integrated private sector disciplines for public benefit.
- Imposes discipline that results in on- time and on- budget delivery.
- Has achieved high-quality facilities and services.
- Numerous tests indicate it delivers value for money and spread of risk.
- Builds long-term contractual relationships for services delivery.
- Projects would not have been accomplished by any other method in many cases.

There is also a laundry list of potential pitfalls associated with PPP:

- Slow and expensive to procure.
- Long-term flexibility hampered by private sector landlord to public sector tenant relationship.
- Higher borrowing costs and shareholder returns diminish value for money.
- Promises made during bidding phase tend to be compromised during implementation, without a strongly protective contract.
- “Preferred Bidder is when the men in the suits stop saying yes, and start saying no”.
- Partnership of rivals with differing objectives.
- Inherent emphasis on the deal rather than on the product and service.
- Salutogenic aspects often overwhelmed by the multiplicity of competing objectives.

To ensure success it is essential that at the outset of every project the benefits and pitfalls of PPP are thoroughly considered and negotiated to ensure a sound platform from which to proceed – especially if salutogenic outcomes are to be achieved.

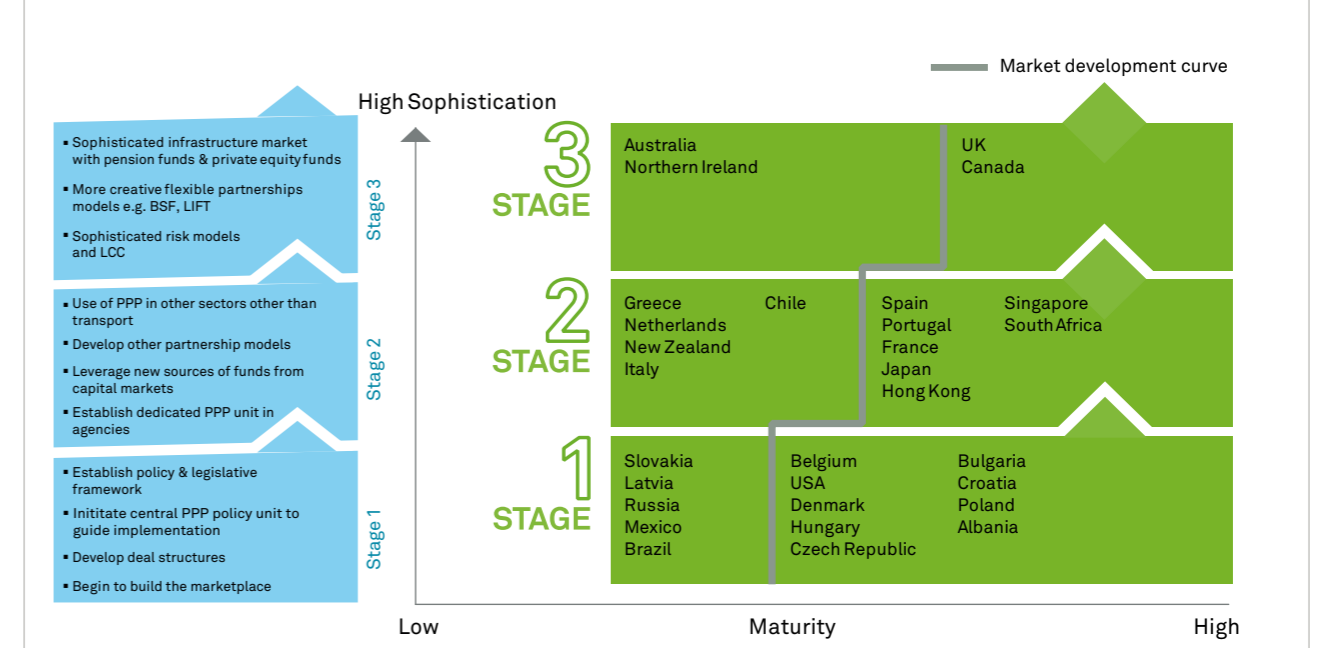


Fig. 1 Range of experience – Healthcare PPP

EXPERIENCE TO LEARN FROM

FORTUNATELY THERE IS A BROAD RANGE of experience to learn from. For nearly 20 years PPP has been applied to healthcare projects and its use continues to evolve around the world. Figure 1 shows the relative experience that various countries have had with it. The chart reflects three stages of sophistication with the process:

Note that the UK, Canada and Australia are in the uppermost tier, where PPP is the principal means

Stage 1 involves setting up governmental policy and regulation frameworks as the basis of PPP, including a specialised unit to guide its implementation -which, together with private sector players, develops deal structures and builds a marketplace. Often this occurs first for basic infrastructure projects, such as transportation and water.

Stage 2 sees PPP extended to more complex social infrastructure projects including healthcare; the establishment of dedicated PPP units within government agencies; broader sources of funds from capital markets and wider partnership models responding to projects of varying size and complexity and a growing number of private-sector participants.

Stage 3 represents the development of sophisticated financing models and sources of capital including pension funds and private-equity funds; well-vetted model contracts and risk models and a group of participants on both the public and private side with expertise gained from multiple projects that operate at a high level of sophistication in the PPP market.

whereby major healthcare projects are procured and with literally hundreds completed. This reflects the largely nationalised healthcare systems of these countries, strong private-sector capability and political will. On the other hand the more fragmented and privatised healthcare systems, such as that of the US, have been far slower to take up PPP. However, more recently, some of the private not-for-profit healthcare systems, which often reach a size comparable to national healthcare systems, are beginning to see the benefit of single-source, integrated delivery methods for procuring, servicing and maintaining major capital projects – in effect PPP.

The lessons reported in this paper are from our examination of a broad spread of projects in northern and southern Europe, Turkey, Australia, Canada and Latin America. To ensure that we were comparing equivalent projects we selected examples that are of the same size and complexity, namely large hospitals where achieving salutogenic outcomes is most challenging. These are marked by the red asterisk on Figure 2, the Continuum of Healthcare chart.

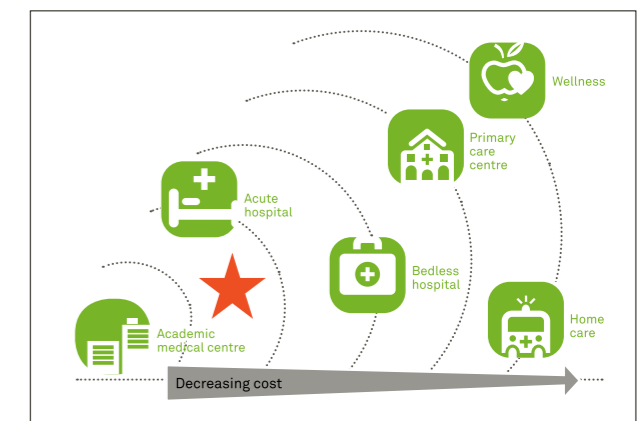


Fig. 2 Continuum of Healthcare

HOW PPP DIFFERS FROM TRADITIONAL PROCUREMENT

BEFORE REVIEWING SPECIFIC EXAMPLES and lessons, let's briefly consider the principal differences between traditional procurement and PPP. There lies the key to achieving salutogenic outcomes.

Traditional Procurement

When a public sector entity undertakes a major healthcare capital program, using traditional procurement, it assumes the responsibility, risk and authority for all aspects of the project, from defining its objectives and proving its viability, through all subsequent aspects – Design, Build, Finance and Operate (DBFO). Should it wish to do so, the public sector entity can use this position to affect salutogenic outcomes all along the way. Figure 3 shows the centrality of the public sector (end user) in the traditional procurement environment through all stages as it hires, instructs and makes direct payments to all of the principal suppliers and receives assets and services in return. In this model, whether or not a salutogenic result is achieved, the end result is in the direct control of the public sector entity and its representatives.

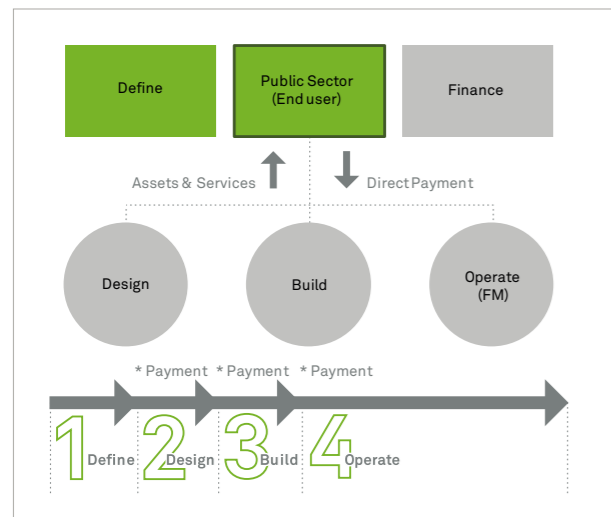


Fig. 3 Traditional Procurement

PPP Procurement

Figure 4 shows that undertaking the same project via PPP procurement differs substantially as to where the responsibility, risk and authority reside and consequently how salutogenic outcomes are achieved. Two principal models for PPP procurement have evolved. In both the role of the public

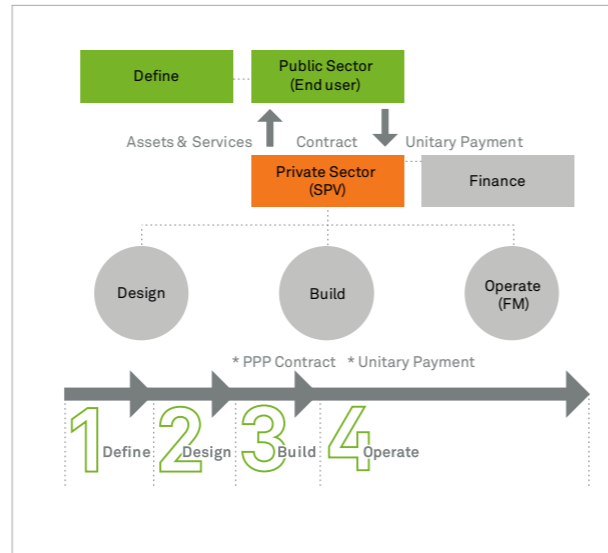


Fig. 4 PPP Procurement

sector (end user) is largely focused on defining the project in all of its aspects and running a competition to select a preferred private sector partner who will be contracted to deliver it. Beyond that the role of the public sector is largely to ensure that the conditions of the contract are met. In PPP procurement, once appointed, the private sector entity (Special Purpose Vehicle or SPV) occupies the central role and has the responsibility and authority to hire, instruct and pay for all aspects of DBFO with the public entity making payments to the SPV and ultimately receiving benefit of asset and services from the SPV. The differences between the two models for PPP procurement do not change this fundamental fact. They do, however, influence how the project is defined prior to it being codified in the contract.

- Definition by Exemplar:** In this model the public sector defines the requirements, design and specification for the project in a highly prescriptive way, incorporating principal salutogenic features and often employing a planning and design team to work closely with the end users to do so. Because the public sector's requirements for the project are thus described, the competition between private sector bidders is largely focused on refining the Exemplar scheme and delivering it in the most expeditious and cost-effective way. The Preferred Bidder's proposal becomes the basis of the contract for implementation.

- Definition by Indicative Means:** In this model the public sector defines its requirements in a non-prescriptive way, often by stating desired outputs and other metrics, accompanied by descriptions of less quantifiable experiential objectives, such as salutogenic aspects. In this approach the subsequent competition between private sector bidders is broader in scope, often resulting in proposals that differ fundamentally from each other in their attempt to meet the owner's stated requirements. In the end the selected proposal is codified in the contract for implementation.

There is an ongoing debate between proponents of the Exemplar and Indicative approaches, the former claiming the advantage of increased user control of "their" scheme. The latter claiming that the public sector benefits from the broader scope competition between the private sector bidders, resulting in innovation that better takes into account the full range of forces that define a successful project. Infrastructure Ontario, the agency that administers PPP in that Canadian province, together with Turkey and Northern Ireland are proponents of the Exemplar process, whilst the provinces of Western Canada, the UK and Australia favour the Indicative approach. Successful projects have emerged from each. However, the following section on Steps to Successful Outcomes is based on the Indicative approach, because it requires more detail to understand and my colleagues and I believe it results in more innovative schemes, both in the realm of measurable aspects as well as experiential ones.

Commodity, Firmness and Delight Redefined

Evaluating the comparative merits of competing PPP proposals often tends to flatten Petruvius' measures of successful architecture, which have stood the test of centuries of use: Commodity, Firmness and Delight. In PPP, Commodity and Firmness tend to be coalesced into metrics that can be readily measured and compared – the work of spread sheets, such as areas, efficiency of flows, costs, energy use and certain measurable "evidence-based" aspects that affect experience, such as percentage of rooms with daylight. Although very important, without the influence of serendipity and delight, such measures can lead to cost-effective and functional, but otherwise dreary projects that PPP is often accused of – notably lacking in salutogenic qualities. It takes sophisticated and brave leaders of the public sector entity to achieve a balance of measurable and harder to define, experiential aspects that are necessary for truly successful outcomes.

STEPS TO SUCCESSFUL OUTCOMES

Figure 5 summarises the key steps required to achieve successful outcomes via PPP – especially salutogenic outcomes. They can be found in successful PPP endeavours globally – and conversely are found lacking in less successful ones. Most of these steps are in the realm of public sector responsibilities, because the public sector sets the rules of engagement and principles of working for all parties. That said, success can only be achieved when private sector teams fully support them and enthusiastically incorporate them into their activities.

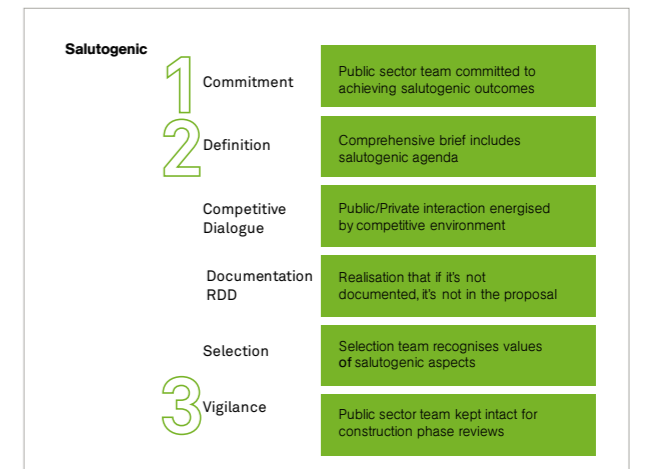


Fig. 5 Favourable Outcomes

1 Commitment: The public sector team must be committed to achieving a balance of measurable and less measurable experiential outcomes. This is often achieved by team leadership that includes a Design Champion, who ideally has a strong position on the Board of Directors and a Project Manager, who has experience of PPP procurement. Leadership should be supported by specialists in key disciplines, of equal caliber to those employed by the SPV bidders. These are often obtained from the private sector.

2 Definition: Whether by Exemplar example or by Indicative description, the public sector entity must clearly define its objectives for the project – in both metric and experiential aspects – with emphasis on salutogenic objectives, if these are to be properly recognised.

3 Competitive Dialogue: A competition is organised to enable bidders to interact with the project team and users in order to optimise the quality of each competing scheme. This is particularly important in the development of salutogenic

aspects which may have been difficult to fully define in the initial brief. It is in the interest of all bidders to tune their proposals to users' requirements which may evolve as schemes become further developed. Similarly it is in the interest of the public sector to encourage innovative, high-quality schemes from bidders, so that if other factors like costs or commercial arrangements become paramount, the preferred bid will include a favourably- designed scheme.

4 Documentation (and Reviewable Design Data):

The competitive bidding process encourages the inclusion of features, such as salutogenic aspects, that may not be justifiable in purely functional and cost terms. Experience shows that these may be compromised following the selection of the preferred bidder, unless they are fully documented as part of the bid and contract – or are specified as Reviewable Design Data (RDD), subject to further public-sector review and approvals. In the highly competitive environment of PPP bidding, bids are based on specific design and service proposals. It is best to proceed on the basis that: "If it's not documented, it's not in the proposal or contract".

5 Selection of Preferred Bidder:

Assuming that the above steps have been taken and that they are reflected in the evaluation and selection criteria – particularly the representation of salutogenic objectives – the selection of the preferred bidder should result in a favourable scheme. If not, it is too late for this to be remedied.

6 Vigilance:

Too often a crack team from both the private and public sector sides, that has progressed a favourable project to implementation stage, will move on to the next enticing project, thereby compromising its good work on the earlier project. The most successful projects benefit from vigilance by those who are deeply knowledgeable and committed, ensuring that the promises of the contract are adhered to in full. This includes ensuring that the RDD, which often involve aspects that contribute to salutogenic environments, such as detailed interior design, colours, materials, wayfinding, art and landscape, are fully implemented in the context and spirit in which they were conceived.

Matched Teams: In each of the above steps it can be expected that strong private sector teams will include experts in each discipline of DBFO. Therefore, it is essential that the public sector team is equally well

constituted to ensure parity – even if this requires reinforcement by private-sector specialist consultants (Figure 6). In cases where the public sector is inadequately represented in the management, evaluation and negotiation of PPP deals, it is unlikely to secure a successful outcome. This is particularly true of salutogenic aspects which, due to the fact that they are partly subjective in nature, require expert advocacy at every stage.



Fig. 6 Matched Teams

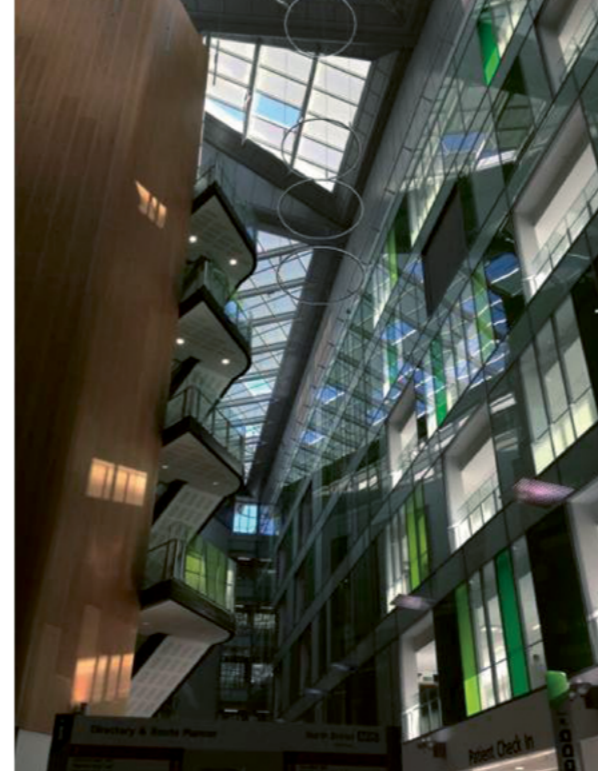
SUCCESSFUL OUTCOMES; EXAMPLES

THE FOLLOWING PROJECTS are examples of successful outcomes of the PPP process. Each survived the challenge of rigorous competition in a broad range of issues comprising DBFO proposals which require high scores in functional efficiency, operations and maintenance, cost effectiveness, as well as hard-fought financial and commercial terms – all summarised in the unitary payment that reflects value for money. In addition, each of these projects, in its own way, embodies salutogenic aspects that enhance the lives of all who use them and the communities of which they are a part.

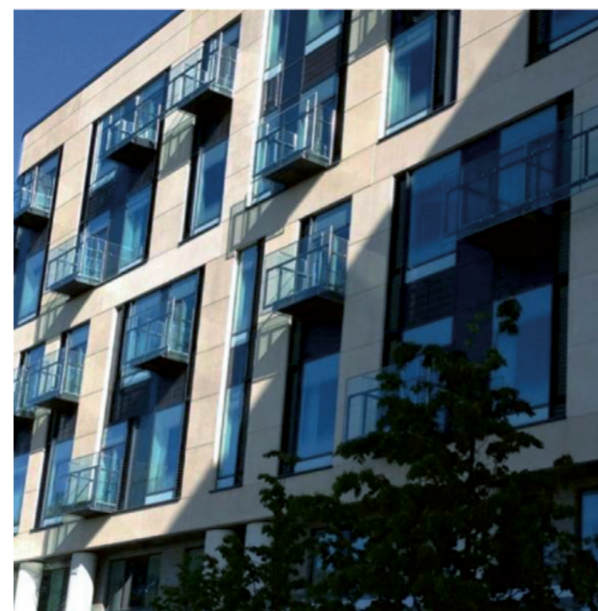
The projects featured below reflect the global spread of successful PPP schemes. For each an outstanding feature is described, along with a key aspect of the process that contributed to its success. Note that nearly all resulted from adherence to a process reflecting the six steps outlined above.

Southmead Hospital, Bristol, UK

This project, completed in 2014, entailed the replacement of two regional hospitals within one major facility totalling 800 beds. Despite its size it is simple and clear to navigate, aided by a light-filled gallery running its length, from which all clinical services are reached. Three clusters of wards to the north are connected by bridges to related diagnostic and treatment areas to the south.



Southmead Hospital, Bristol, UK

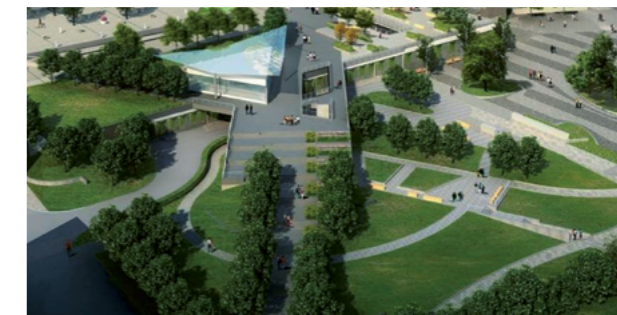


Large windows and louvered panels that can be opened for natural ventilation. Southmead Hospital, Bristol, UK

All clinical areas are arranged around 13 outdoor and indoor courtyards that ensure an uplifting, light-filled experience for all users. Contributing to comfort and sustainability, the climate-controlled patient rooms also have large windows and louvered panels that can be opened during long parts of the year for natural ventilation. The low silhouette and residential detailing respects the character of the surrounding neighbourhood. The success of this project directly reflects the commitment and ability of experienced participants, from the public



Royal Liverpool University Hospital



Public square serving entrance to hospital and future bio-medical complex – provides civic amenity

and private sectors, to drive for an exceptional outcome. The team was guided by a carefully crafted brief that included, by Indicative means, a vision of the high quality environments required by the users.

Royal Liverpool University Hospital, Liverpool, UK

Currently under construction, this 1000-bed facility is the third generation of hospital on this site and is particularly important as a key part of the Knowledge Quarter, an economic and cultural engine for the revival of the historic industrial city. Given its limited site, resulting from the need to maintain services of the hospital that will be replaced, the new facility is configured as a 16-level stacked plan. What is unusual, however, is that the entire complex is organised around two great courtyards that enable extraordinary single-point wayfinding to all clinical areas and maximum natural daylight.

These salutogenic features are further enhanced by a major public square that serves the principal entrance to the hospital and a related master-planned biomedical research complex that provides a significant public amenity. The strong public sector team coming to this project with experience of a comparable PPP endeavour chose to convey its requirements via non-prescriptive, Indicative methods – thereby encouraging design innovation from the bidders. Similarly, all of the members of the winning private sector team were highly experienced in multiple large-scale PPP schemes. All participants were committed to the ethos of creating facilities that combine high-efficiency and cost-effectiveness with salutogenic environments.



South West Acute Hospital, Enniskillen, Northern Ireland



Large Garden courtyard, South West Acute Hospital

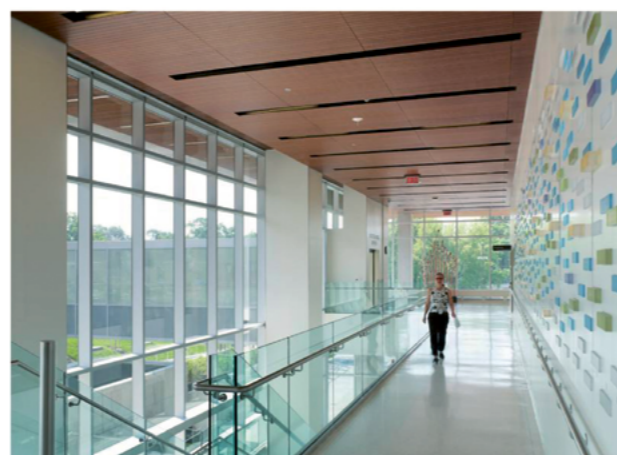
South West Acute Hospital, Enniskillen, Northern Ireland

The replacement for the regional medical centre, exhibits a refined response to its site and ample salutogenic features, within the low-built structure organized around three large garden courtyards. The process for achieving this scheme differed from the Indicative requirements issued by the public sector for Southmead and Liverpool which encouraged new and inno-

vative solutions from the bidders. Enniskillen followed the hands-on work of John Cole, Chief Estates Officer of Northern Ireland, that has resulted in a series of thoughtfully-designed and built PPP hospitals – based on Exemplar schemes, issued through his office, that are intended to closely guide bidders. Interestingly, in the case of Enniskillen, the highly-experienced winning bidder defied the Exemplar and offered an innovative solution that was judged to be better.



Bridgepoint Hospital, Toronto, Canada



Landscaped roof areas and naturally lit circulation spaces, Bridgepoint Hospital



Playful facades, Melbourne Children's Hospital

Children's Hospital, Melbourne, Australia

Although the PPP process for healthcare is relatively new in Australia, with its first projects completed only within the past few years, it is built on a strong local design tradition and sophisticated construction industry. In addition, the procedures and experience provided by a wave of PPP professionals from the UK have enabled the PPP industry to reach maturity fast – as exemplified by the Melbourne Children's Hospital. The playful facades set the stage for the positive distractions of the child-friendly environments within, including features like a giant multi-level tropical fish tank. Some have declared this to be one of the most successful children's hospitals in the world.

Bridgepoint Hospital, Toronto, Canada

This is an example of the level of quality that Infrastructure Ontario and a dedicated private sector teams have achieved in a PPP process that places greater emphasis and less deviation from the prescribed Exemplar design resulting from the definition phase (formally known as the Compliance Phase in Ontario) and refinement of that scheme during the bidding phase.

The medium-rise scheme, reflecting its tight sight and planning restrictions, features innovative window arrangements derived for patient satisfaction – and ample, naturally-lit circulation spaces, together with landscaped roof areas that add grace and amenity.



Melbourne Children's Hospital

Each of these successful examples, and others like them, are from countries that have refined their PPP processes to reveal the steps to success that we have found to be important – and particularly to enable salutogenic outcomes through PPP.

LESS FAVOURABLE OUTCOMES

UNFORTUNATELY THE MAJORITY of healthcare PPP projects fail to achieve the quality of the above projects. Although specific reasons may vary, in most cases the diminished results correlate with the lack of adherence to the steps to success that we found to be essential.

From Developed Countries:

When developed countries with experience of PPP fail to achieve salutogenic outcomes, it is generally due to a lack of commitment to these values and a will to pursue them. It begins in the Definition phase where these values are not featured as primary objectives. It continues during the Competition, Documentation and Selection phases where they are not promoted through guidance and scoring – and into the Implementation phase where they are not vigilantly enforced. The result is what one would expect: functionally serviceable and perhaps cost-effective facilities that are otherwise dull and uninspired. They leave us asking, “Could we not have done better?”

From Developing Countries:

PPP can be particularly attractive to developing countries that lack the public sector skills and experience

to organise and manage complex infrastructure projects. They see the benefit of the single-source DBFO/PPP model. However, as we have seen, this model requires guidance and oversight to deliver favourable outcomes. A weak public sector authority, undue political influence and an unbridled private sector can short-change the benefits of PPP, often just barely achieving functional efficiency and cost effectiveness – and rarely achieving salutogenic environments. In most cases for developing countries, the best remedy may be for the public sector to engage knowledgeable private sector consultants to run the program for it, thus ensuring achievement of the best results. The opportunity to develop major infrastructure projects is too infrequent and too important to squander on poorly defined ambitions, poorly-managed processes and poor oversight.

THE WAY FORWARD

As mentioned earlier, PPP has been controversial since it began. That’s unlikely to change. Therefore, at the beginning of each project the benefits and pitfalls of PPP must be thoroughly understood and negotiated within the context of the project – especially if salutogenic outcomes are to be attempted. We believe that the application of the steps to success that have achieved favourable outcomes in the most successful projects may be the best way forward for delivering these outcomes for all healthcare PPP projects:

- Commitment
- Definition
- Competitive Dialogue
- Documentation
- Selection
- Vigilance

For developed countries with experience of PPP for healthcare, one hopes that papers like this and related conferences may inspire the incorporation of salutogenic values in all stages of the PPP process.

For developing countries and those with little or no experience of PPP, we recommend making a priority of establishing a strong public sector team for each project, with the authority and resource to drive the process to the best interest of the host country. For some this will mean hiring consultants to do the bulk of it, while training their local public sector counterparts to take the lead in subsequent projects. □



Alder Hey Children's Hospital, Liverpool, UK



To close I call attention to the last image. It is of Alder Hey Children's Hospital in Liverpool, UK, which is under construction and scheduled to open soon. I recommend keeping an eye on it as the next salutogenic healthcare project to be completed through PPP.

Kenneth Schwarz

Healthcare Principal, AECOM

A Masters in Architecture degree from MIT, work at The Architects Collaborative where Walter Gropius was still active and a tour with the US Peace Corps in Peru where he became aware of the importance of socially conscious architecture preceded Ken's career in architecture for health which now spans nearly four decades. He is noted for the synthesis of innovative clinical planning and life-affirming environments in a framework of robust architecture and urban design. Teams under his direction have received significant awards in North America and internationally. Additionally, over a 20-year period, his teams produced groundbreaking projects for

public private partnerships in the UK, notable for innovation and environmental richness in a value-driven industry.

During his career Ken has been Principal and/or Director of architects KMD, Anshen+Allen, Anshen Dyer (London), NBBJ and now AECOM, where he is part of a team devising a single-source Design/Build/Finance/Operate offering for the development of healthcare facilities. In parallel with project-centered work Ken participates in research, publication and presentations with professional and industry groups that advance the art and science of healthcare architecture.

CREDITS

Southmead Hospital, Bristol, UK

SPV: Carillion Plc
Architect: BDP

Royal Liverpool University Hospital, Liverpool, UK

SPV: Carillion Plc
Architect: NBBJ/ HKS

South West Acute hospital, Enniskillen, Northern Ireland

SPV: Northern Ireland Hospital group
Architect: Stantec/Anshen + Allen

Bridgepoint Health, Toronto, Canada

Compliance Architect: Stantec and KPMB
SPV: Plenary Bridgepoint
Implementation Architect: HDR and Diamond Schmidt

Melbourne Children's Hospital, Melbourne, Australia

SPV: Children's Hospital Partnership
Architect: Billiard Leece and Bates Smart

Alder Hey Children's Hospital

SPV: Laing O'Rourke
Architect: BDP

Tall Solutions in a Dense City

Challenges in Design and Execution of Salutogenic Solutions for Hospitals in Hong Kong

Author: Vivien W.L. Mak

BACKGROUND

LAND SCARCITY IS SEVERE IN HONG KONG, a hilly city of about 1,100 square kilometers of land that accommodates a population of over 7 million and well known for its high density. Sites available for hospital development are often restricted. While some hospitals are fortunately situated in relatively flat and agreeable sites, others face the challenges of slopes, development restrictions and irregularly shaped boundaries. The challenge is prudent to both public hospitals, which are developed and operated by the government, and private hospitals alike.

As a result, hospitals in Hong Kong tend to be tall. It is not surprising to find the two tallest hospital buildings in Asia situated in this city.

Major public hospitals would give an impression of having generous sites. However, many of them are pressed by tremendous growth in demand, phased expansion, outdated existing infrastructures and limitations in site planning due to slopes. About 1/3 of the 42 public hospitals in Hong Kong are situated

on a sloped site, with various degree of topographical and geotechnical complexity.

Queen Mary Hospital, established in 1937 in Pokfulam, is a 1400 bed establishment operated by the Hong Kong Hospital Authority and the teaching hospital of the University of Hong Kong. It has been greatly expanded on its hilly site with two major expansion projects completed in 1955 and 1983, and is planning for further expansion. The Hospital's main ward tower, Block K, is a 28-storey tower of 137 meters of height, and the second tallest hospital building in Asia.

Private hospital developments strive even harder to build what they need. There are currently 11 private hospitals, and the 12th is due to open in early 2017. Most of the private hospitals were established by either foreign missionaries or independent groups and individuals from late 18th century to early 19th century to serve the community's needs. Some started as nursing homes and sanatoriums, others were small hospitals serving about 20 beds in the beginning.



Queen Mary Hospital, Pokfulam



Hong Kong Sanatorium & Hospital



Block A St. Paul's Hospital, Causeway Bay, completed in 2009

It is interesting that due to these historic reasons, a number of private hospitals are situated on the hills, commanding fascinating views and bound by a limited plot of land that used to comfortably accommodate services to fulfill their missions in the early days. The Hong Kong Sanatorium and Hospital is among them. The hospital has been expanded over the years and their latest extension, Li Shu Pui Block that was completed in 2008, soars 148.5m with 38 floors and is currently the tallest hospital building in Asia.

Hospitals that were founded since the latter half of the 19th century tend to be situated in relatively flat sites. Major public hospitals such as the Queen Elizabeth Hospital that opened in 1963, Prince of Wales Hospital that opened in 1984 and the latest North Lantau Hospital that opened in 2013, for example, have less problems in dealing with topography. However, the challenging factor of land scarcity has been consistently present in this city of high and fast growing population, and as a result these hospitals face development challenges no different than their counterparts.

With varying background in the development of hospital services and land acquisition, the public and private hospitals in Hong Kong each strive to maximize development potential of their given sites. As in other types of building development in Hong Kong, the design for hospital buildings need to fulfill statutory requirements and building codes, which could be stringent to the flexibility of architectural solutions at times.

Problem and Challenges

Optimizing development potential is one of the key challenges in statutory control of building developments in Hong Kong. In relation and from the perspective of town planning, the control of building mass is a major concern. In addition to existing building planning legislations controlling maximum building height and gross floor area, new restrictions on building height and floor area have gradually been imposed in statutory Outline Zoning Plans in certain districts of the city, and in new land leases. In certain cases, planning restrictions are a result of public consultation which provide neighbouring communities of hospital sites a platform to negotiate their wishes.

To ensure that the city is provided with a reasonable amount of trees and shrubs, there are also statutory requirements on the minimum provision of greenery and compensation of trees, should any on an existing site be removed due to a building development. Building and landscape design for new hospitals and hospital redevelopment projects shall take this into consideration and maximize opportunities to create desirable and healthy environments for the community and building users.

Within a tall structure, desirable work flow that is essential to the effective operation of a hospital needs the support of an abundant and well-planned vertical transportation system.

Given the limited area of development sites and height restrictions in various cases, the permitted site coverage of building sites would normally be maximized in the design process. Area that remains available at pedestrian level for planting could as a result be limited. Vertical gardens become a common solution, bringing greenery onto terraces, balconies, roofs and building facades. While the result is visually pleasing, planting requires particular attention in the design and application of waterproofing to the building, particular to water-sensitive areas in hospitals such as operating theatres, intensive care units and sterile stores.

Within a tall structure, desirable work flow that is essential to the effective operation of a hospital needs the support of an abundant and well-planned vertical transportation system. Adequate elevators must be allowed and strategically located, grouped and segregated. Additional transport systems such as escalators, dumbwaiters and pneumatic tube systems are commonly adopted. Special transport systems such as robotic delivery machines and boxveyors would also be considered and installed in some hospitals.

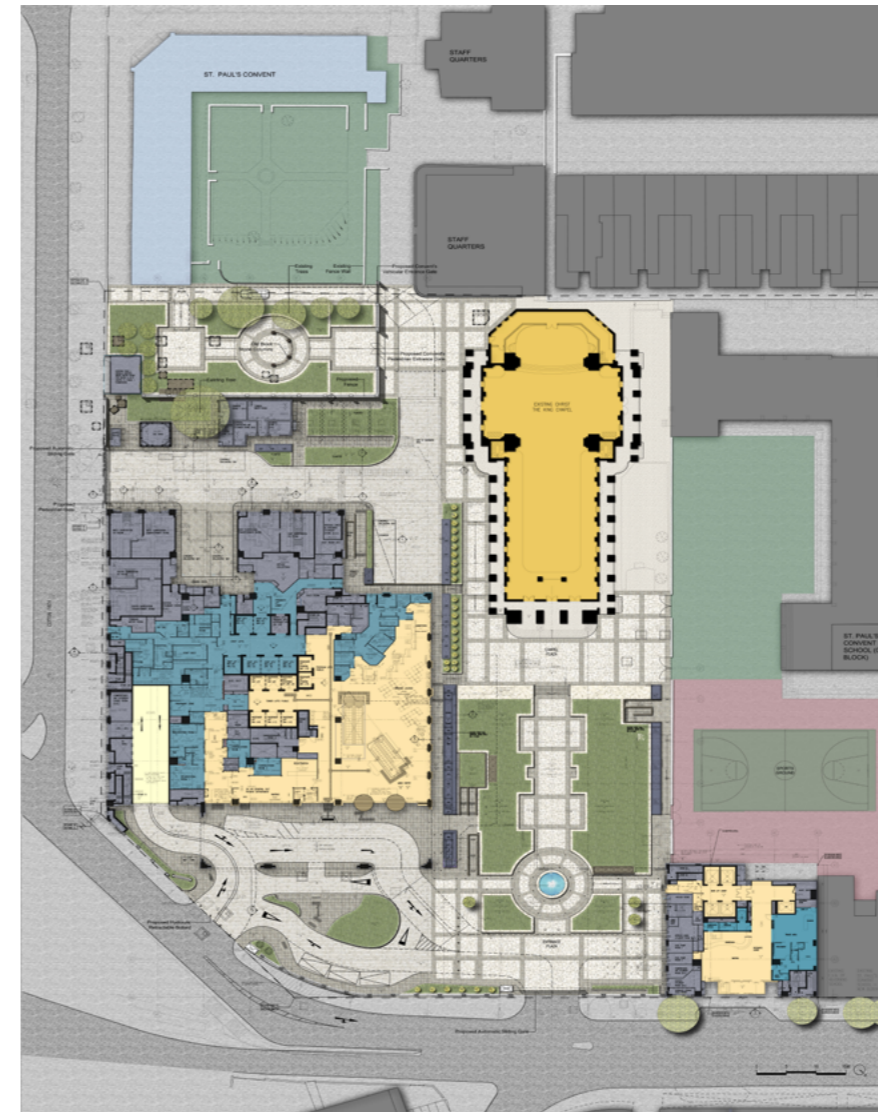
With the same token, adequate space shall be allowed for pipe ducts to house vertical pipe stacks and necessary air ducts that support a hygienic indoor environment. An efficient floor layout for a tall hospital should provide an optimized number of elevators and pipe ducts at logical locations, enhancing circulation and allowing convenient access for maintenance without potential disruption to the operation of the hospital.

Meeting these challenges and coping with planning and statutory requirements, several upcoming high-rise hospitals in Hong Kong have plans to demonstrate design excellence through salutogenic solutions.

ST. PAUL'S HOSPITAL, Causeway Bay

ST. PAUL'S HOSPITAL IS AN EXISTING 358-bed hospital founded by the Sisters of St. Paul de Chartres in 1898. The hospital shall be expanded to provide state-of-art facilities for outpatients and 550 inpatient beds.

The project is carried out in 3 phases to maintain continuous operation of the Hospital. Two new



St. Paul's Hospital, Landscape Master Plan

high-rise hospital blocks will be built in the first two phases to accommodate primary care centres, comprehensive clinical services and ancillary facilities. Phase 1 of the project, a new 20-storey tower with a 2-level basement named Block A, was completed in 2009 to facilitate decanting of patients and various hospital departments from the original hospital block to be demolished. Phase 2, namely Block B, comprises the future main hospital tower with a 3 level basement and is to underway with its superstructure construction. It is anticipated to be completed in Q3 this year. In Phase 3 an 80 years old hospital block will be demolished and replaced with a landscaped garden over a new basement extension to complete the master plan.

Inspired by the Gospel values, the Sisters of St. Paul commit to provide dedicated services to treat

patients equally and competently to restore health. They commissioned the redevelopment project in 2005 with the vision to upgrade the then saturated facilities with an innovative master plan.

The hospital is set within the tranquil campus of the Convent, abutting the King of Christ Chapel and schools that are operated by the Convent. Visited by thousands of believers and students regularly, the Chapel has been hidden among building blocks for decades. The architectural design identifies the Chapel as a jewel and celebrates it, exposing it to be viewed and appreciated from the streets ultimately. By creating a landscaped garden at the front, the new master plan connects the Chapel to the public to mark its historic and social significance, creating a landmark for the entire campus at the scale of the community.

The master plan changes an enclosed institutional campus to one that is marked by two harmoniously designed new high-rises that maximize development potential, a historic Chapel that shall be admired, and green open spaces that everyone could enjoy. Patients, staff, students and teachers will be given a new

holistic experience of their healing, learning and work place integrated with greenery and vistas.

A new garden will also be built beside the chapel to maximize greenery and separate the hospital from the private convent. Existing trees of the site were retained as far as possible or transplanted within the campus. Roof gardens are provided for ward rooms at the podium floor of the new hospital block. These features provide positive stimulation and rest for the clinical institution.

Effectiveness

Located at the public front of the campus, Block A focuses in community engagement, providing preventive care services and special clinics. Core hospital services are housed in Block B and grouped as out-

patient services at the lowest zone for ease of access, surgical floors in the middle for efficiency, and inpatient floors at the top for security and privacy.

Visitors, staff and bed lifts are segregated and strategically located to enhance operation needs. Layout and details of the internal departmental layout are thoroughly discussed and jointly developed with end users and a health planning consultant under management of the architect. The overall planning achieves high effectiveness in work flow and circulation.

A spacious hall with a view to the garden and Chapel marks the welcoming entrance to the new hospital Block B. Clear and intuitive way-finding is enhanced by logical alignment of spaces and functions. After careful analysis of the projected demand in lift traffic and operation needs, a total of 17 elevators are provided to support the 22-storey high-rise hospital, divided into 4 distinct groups to serve visitors, staff and beds, radiology and oncology departments, and the surgical floors and sterile supplies department.



St. Paul's Hospital, the construction site abuts a historic chapel, three schools and a frequented hospital in full operation

Vertical transportation is enhanced by 4 pairs of escalators travelling through the lower 4 floors that serve an anticipated high volume of outpatients, and a special boxveyor system imported from Japan that works in a similar manner as a carousel, housed in a vertical shaft running through the tower. All such efforts is spent to ensure that the vertically stacked multi-floor hospital building shall function efficiently to reduce manpower, eliminate stress and increase clinical effectiveness.

Facades of the two new towers for St. Paul's Hospital are designed to be coherent with one another and with the Chapel. With a double height roof-top structure housing mechanical plant rooms, the overall structural height of Block B is about 111m. Proportion and individual fenestrations of the towers reflect the classical golden proportion to echo with the Chapel's architecture, and play a major role in visually scaling down the buildings. Daylighting to the hospital interior is maximized but well balanced with the external design and sizing of vision window panels to maintain privacy in a densely populated urban setting. Glazing for the curtain wall system was carefully specified and designed to optimize the indoor daylight quality and minimize power and cooling loads.

The construction site abuts a historic chapel, three schools and a frequented hospital in full operation. Disruption to daily operation due to construction activities has to be minimized. Deep excavation for the new 3-leveled basement that is over 20m deep demands considerable precaution against effect to the hundred years old Chapel. Works are carefully planned and sequenced to maintain uninterrupted services of the Hospital and schools. These pose administrative and design challenges to the project team on top of the complex project brief and requirements of the new buildings.

TSUEN WAN ADVENTIST HOSPITAL, West New Territories

TSUEN WAN ADVENTIST HOSPITAL was founded in 1964 by the Seventh Day Adventist Church on the hills of Tsuen Wan as a sanatorium and currently accommodates about 120 beds. It is the only private hospital in the West New Territories of Hong Kong. To provide comprehensive medical services and solve the existing shortage problem in healthcare and medical resources in the region, the hospital commissioned the design of an extension building in 2008 to provide comprehensive facilities for outpatients and 470 inpatient beds by end 2015.



Tsuen Wan Adventist Hospital

Situated on a difficult slope in close proximity of residential developments and schools, the extension project involves demolition of two existing buildings to make way for a new hospital tower that will house 450 beds, general and specialist out-patient departments, day surgery and operating theatres, a wellness and lifestyle management center, a chapel, and a 200-seats auditorium for communal and educational activities.

A remarkable episode in the extension project was a year-long postponement of construction work due to objections raised by surrounding residential developments against the erection of a 100m tall new structure, which they felt would adversely affect their air quality, ventilation, safety and well-being. Caught in the process of public consultation that was necessary for a land administration procedure for the development, the hospital and design team had no choice but to suspend detail design and preparation for tender, and to resolve the conflict.

The original design scheme was revamped as the architect looked for a solution that would maximize the horizontal clearance of the new hospital building from the neighbouring development. With an absolutely tight

and elongated site abutting a steep slope, the new solution was a 25 storeys almost shaped tower that would be farther away from its neighbours but taller than the original scheme. It surprised no one that the neighbours had great concerns on a tall hospital. The Adventist administration and the architect jointly justified the new solution with much explanation on the demand for clinical services, the optimized floor to floor height to house necessary services, and none the less, provision of a specially designed ventilation corridor through the 118m tall new structure that would result in a spectacular sky garden for the hospital.

The project took off with a fast track execution programme once green light was given. To maintain continuous operation of the existing hospital, preparatory alteration building works and a new temporary annex building with steel structure were planned and built while detail design for the new tower was being carried out. Construction of the new tower was split into two construction contracts such that the most unpredictable underground works including foundation, excavation and site formation works might first be commenced. The new hospital block is currently under construction and due to be completed in Spring 2016.

Well-Being

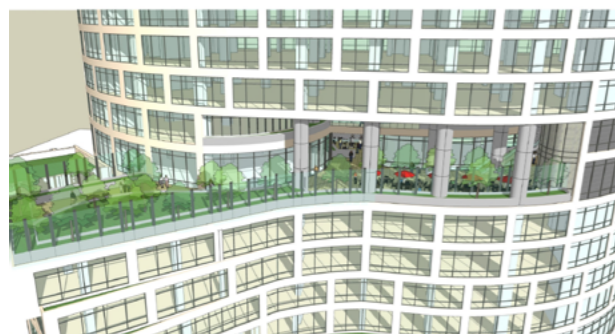
It is the Adventist's vision to promote wellness for body, mind and soul. Following their philosophy of "Total Health", the Hospital considers community health, preventive care and professional treatment their core tasks. The brief for the new building reflects these elements, integrating supportive environments for lifestyle management. Spaces for primary care will be located at lower floors to connect to and enhance the existing hospital building. Design objective for the Adventist hospital to achieve well-being is realized in the building form, spatial articulation, floor planning, integration of external and internal spaces, and the coherence of the interior design.

The site is set on the hill and surrounded by residential estates and schools. Salutogenesis is evident in the curvilinear form of the building, which maximizes usable site area and minimizes visual impact to the surroundings. Design of the building façade carefully articulates the proportion of fenestration and components, breaking down the scale of the exterior skin to achieve its harmonious integration

It is the Adventist's vision to promote wellness for body, mind and soul. Following their philosophy of "Total Health", the Hospital considers community health, preventive care and professional treatment their core tasks.

with the neighbouring buildings. Besides maximizing daylight, control in the sizing of windows preserves privacy of the hospital users and protects neighbours from exposing to the "inside views" of a hospital.

The podium houses all outpatient services in a simple floor layout to enhance way-finding. The main entrance hall is spacious, flushed with day light with views to the external landscape. It is directly connected to the chapel and auditorium that may serve communal services. Preventive care services, outpatient clinics, 24 hours clinics, and communal spaces are easily accessible at the lower floors. Maternity and surgical floors are located in the middle of the tower for efficiency. Separated by a sky garden at the podium roof, where offices and a canteen are housed, inpatient wards are located at the upper floors for better security, privacy and view.



Rendering of Sky Garden, Tsuen Wan Adventist Hospital

The sky garden created at the podium level carves a corridor through the new building to allow cross ventilation for the neighbourhood. It is strategically located to allow prevailing wind to reach adjacent residential developments across the hospital tower and to serve the hospital users at a meaningful location. The hospital canteen and administration office are located at this double height sky garden to become accessible and enjoyable places both physically and visually.

Completed with landscape treatment and communal activity spaces, the sky garden would be the key

green feature of the new building. Not only does it provide greenery for the Tsuen Wan Adventist Hospital, it is a green visual relief for the community. The double-height semi-covered garden conveniently located at the heart of the building will encourage hospital users to break away from indoor environments, utilize daylight, and explore the potential of engaging in health-promoting activities.

It is essential for a high-rise hospital to achieve high effectiveness in work flow and circulation. 15 elevators for visitors, staff and beds and supportive services are strategically grouped located to fulfill operation needs. Dumbwaiters will be used for vertical transport between the hospital kitchen and canteen, which are vertically stacked on different floors. A vertical refuse collection system is introduced to further alleviate the demand for elevators.

The new building adopts the most common technology in the local industry, being reinforced concrete structure. External walls are generally finished with beige ceramic tiles, which form a humble but distinguished outlook together with window walls that are arranged in a vivid pattern. Interior design for the new hospital aims at creating a leisurely and warm atmosphere that is essential for a healing place. As a result of the health-promoting design approach, the new building makes itself a landmark of the district, providing positive stimulation to end users and the community with design features that are pleasing and practical.

GLENEAGLES HONG KONG HOSPITAL, Aberdeen

GLENEAGLES HONG KONG HOSPITAL (GHK Hospital) is a joint venture project of Parkway Pantai Ltd and NWS Holdings Ltd with the collaboration of the LKS Faculty of Medicine of the University of Hong Kong. The 500 beds facility is due to be completed in January 2017.

Maximum building height, site coverage and gross floor area are expressively stated in the land lease of the new hospital lot, which is irregularly shaped and located next to an extensive slope. An elevated railway box structure that runs through the site presents further limitation and challenges to site planning. Coupled with phased possession of site that was determined according to construction progress of the railway and an established due date for operation of the hospital, there were not many viable options in master planning.

The chosen solution was a relatively linear 9-storey building mass that takes full advantage of the permitted site coverage and building height. Within these limits the height of each storey was carefully



Gleneagles Hong Kong Hospital, Aberdeen, Perspective

determined to ensure that both clinical services and the supporting building services installations are given adequate vertical space. All functions are to be housed in a compact and highly efficient manner. Placement of medical equipment is critically challenging in this site in consideration of radiation shielding and interference that may be generated by the railway and other elements within the building.

Visions

The new GHK Hospital targets to provide high quality clinical service to the local community as well as overseas visitors. Inspired by waves and colours of the rainbow, the master plan and external design of the new hospital express curves and fluidity in a well-balanced approach to remain efficient in spatial planning, and to blend into the hillside environment.

Clarity in the master plan is achieved by logical stacking and grouping of the hospital functions which enables intuitive way-finding and prevents stress due to excessive travel and disorientation. Outpatients and preventive care functions are located at ground and lower floors with appropriate pedestrian and vehicular access. Surgical suites, ICU and maternity delivery rooms are housed in the heart of the building. Patient wards are strategically housed in two wings to maximize daylight, views to greenery and the hills. The two wings are linked with a bridge to enhance work flow and circulation.

To support vertical circulation and enhance efficiency in horizontal travel, two sets of lift cores are provided for the new hospital. One at the south and the other at the north of the building to serve each patient ward wing, the lift cores anchor floor planning and circulation paths. In each set of the cores 4 elevators serve general visitors and 4 elevators serve hospital staff and bed transfer. In addition, 2 elevators are designated to serve the vertically stacked operating theatres, day surgery centre and CSSD. Two pairs of escalators are

provided to connect the main entrance hall to the outpatient clinic, imaging department and seminar rooms which anticipate a high volume of visits.

GHK's vision is to create a 5-star environment for healing with a timeless image. The expressive building mass and curtain wall system give the building exterior a touch of a resort environment, and becomes a landmark when viewed from multiple angles and distances. Glazing and cladding panels with specific colours create a positive visual stimulation to patients and hospital staff. Interior design for various wards and clinics is specifically developed to take care of users' needs in terms of comfort level and clinical treatment.

Enclosed by curtain wall with the interplay of various coloured and fritted low-E glass panels, the building façade is aesthetically pleasing and functional in maximizing daylight, minimizing heat gain and reducing direct sun glare for the comfort of the patients and staff. The selection of insulated glazing unit (IGU) was a result of careful study and comparison of different thickness and composition of glass units to optimize acoustic and thermal comfort.



Staff Cafeteria, Gleneagles Hong Kong Hospital

Landscape areas are extensively provided to provide a multi-level, green and active healing environment. Gardens at podium levels support well-being of both patients, visitors and hospital staff. All possible outdoor spaces including the main roof tops are filled with green vegetation to compensate the lost trees due to the development, to provide enjoyment and physical barriers where required to separate functional areas. Mental health ward, for instance, is screened off by trees to provide privacy. Pockets of private gardens are formed for patient rooms on podium level.

Well-being of the staff is equally important. Staff cafeteria, doctor resting lounge, staff landscape garden and common rooms are all designed to promote staff well-being with careful selection of materials, colour schemes and detailing to create a temporary sanctuary away from the stressful work environment.

Conclusion

While the new St. Paul's Hospital and extension of Tsuen Wan Adventist Hospital are housed in tall towers, Gleneagles Hong Kong Hospital that is given a different set of highly restrictive site planning conditions results in a relatively horizontal mass. They share the common limitations in space planning.

Review of the process and anticipated results of both design and construction stages of these three private hospital projects provides a vivid picture of how the projects could serve their communities with a healthy built environment despite of challenges due to slopes, building height and other restrictions. The three projects have fulfilled performance requirements with bespoke solutions that answer site-specific challenges.

Effects of a fast track development programme on the evolution of solutions to the challenging sites could be significant. It is rewarding to find that opportunities have been captured in new hospital projects in Hong Kong to create efficient, user friendly and humane design in which health-promoting design features and architectural qualities are not compromised. □



St Pauls Hospital



Tsuen Wan Adventist Hospital



Design with Human Scale

Architecture is for the people.

Human scale is the fundamental element of our design. We turn concepts into sustainable reality that is aesthetically pleasing, planned for flexibility and detailed with practicality, optimizing well-being.



Viven W.L. Mak



Director of P&T Architects and Engineers Ltd and Registered Architect

Vivien Mak obtained her architecture degree from the Chinese University of Hong Kong. She began her career at P&T and is now a director. She is a member of the Hong Kong Institute of Architects and a registered architect. Vivien specializes in hospital and health care projects. Besides, she has been involved in different stages and other types of projects including commercial, residential, institutional and industrial buildings. Her experience includes extensive coordination and supervision of design and site work for various projects.



View of Lady Cilento Children's Hospital by Conrad Gargett Lyons as seen from Brisbane's South Bank Arbou

More than a hospital

The Lady Cilento Children's Hospital, Brisbane

By Adam Pustola

The new Lady Cilento Children's Hospital (LCCH) in Brisbane, Australia, is the country's first hospital fully embracing the principles of salutogenics in its design and thinking. Designed by a joint venture between Melbourne, based architects Lyons and Brisbane firm Conrad Gargett (as *Conrad Gargett Lyons*), this world leading facility has already garnered national and international attention for its patient and family focussed design. Adam Pustola spoke with Lyons Design Director Corbett Lyon, Lyons Principal Stefano Scalzo and Conrad Gargett Principal Ian Mitchell.

Brisbanites and Queenslanders like to think of themselves as different to the rest of Australia. In fact, the branding emblazoned on the river city's Public Transport catamarans promotes Brisbane as *Australia's new world city*. There is something palpably Australian about this place, perhaps it's the postcard perfect beaches and sub tropical climate or the laid back lifestyle so often associated with international perceptions of Australia.

When the Queensland Government came to name its new \$1.5 billion children's hospital, the decision to sidestep regal references and name the new facility after one of Queensland's own speaks volumes about

the city's confidence about its future. Lady Cilento, a Queensland pioneer of paediatric medicine, surgery and an advocate for wellbeing has come to represent Australia's latest remarkable offering to the design and health community in the form of a new children's hospital.

The 95,000 sqm tertiary and quaternary facility, located in South Brisbane, brings together all specialist children's and adolescent health services for the state of Queensland – an Australian State larger in area than France and Germany combined. The hospital founding CEO Dr. Peter Steer, now Chief Executive of Great Ormond Street Hospital for Children

in London, sums up his admiration for the project by describing the result as, "a unique world class healing environment for children and their families."

Pustola spoke with three of the project's key designers, Corbett Lyon a founding director of Lyons Architects and design director for the new hospital, and Stefano Scalzo one of Lyons' senior principals who led the day to day planning of design work on the facility and Ian Mitchell, Conrad Gargett's principal in charge of urban design and delivery. Together with other team members from Lyons and Conrad Gargett, Lyon, Scalzo and Mitchell oversaw every aspect of the project's design and delivery from its initial masterplanning, process re-engineering and briefing through to its detailed design and delivery.

In our wide-ranging discussion, we cover topics that go beyond the conventional description of hospital buildings. An exceptional process of stakeholder engagement, supporting an interactive planning methodology and the application of research in the design process are just some of the topics discussed. The project also affects genuine urban renewal while delivering many planning innovations supporting patient centred care and salutogenics.

We end our discussion by learning a little more of Lyon and Scalzo's role in world leading research with partners University of Melbourne reviewing the effectiveness of design strategies in achieving the positive patient outcomes most often aspired to by architects and hospital administrators.

AN ENGAGING PROCESS

AS PART OF HIS KEYNOTE PRESENTATION at the recent *Design Speaks* forum at the University of Melbourne, Corbett Lyon observed, "all architects who work in the health sector today can meet the minimum requirements prescribed in the Australasian Health Facility Guidelines – this is not our challenge. We need to embrace new methodologies or enablers which facilitate radical change to support the creation of salutogenic environments supporting recovery and healthy outcomes".

Lyon's focus here is on process and how the architect/client relationship can re-envision the modern hospital. Lyon knows a few things about challenging the status quo, having developed the eponymous Lyons Masterplan Workshop methodology over 15 years ago and more recently facilitating its use on the Lady Cilento Children's Hospital. The methodology invites stakeholders to articulate their project aspirations and vision instead of beginning with accommodation schedules and guidelines. "It's above challenging the norm", says Lyon.

The results speak volumes. Writ large across workshop records is a leitmotiv that imbues every aspect of the final project, not like a hospital. Lady Cilento Children's Hospital is indeed not like any hospital seen in Australia today, with its many salutogenic design features setting it apart. The fact that a client generated manifesto exists at all is exceptional and one that resonates in equal measure with patient, clinician and environmental objectives is spectacular.

With these high-level objectives set, the engagement process continued for over two and a half years and the design of the Hospital became synonymous with engagement and interactive stakeholder consultation. The functional design brief, also developed by Conrad Gargett Lyons with input from the client stakeholder groups, included new care models and care-informed design.



Improving the patient experience was a key focus in the hospital's design and planning

Stakeholder groups included representatives from across the care continuum and outside the silo, sharing their voices with patients and carers, ensuring that the process was empathetic as it was engaging.

"Together with the project stakeholders we studied and observed human interactions in other hospitals and public buildings, borrowing spatial concepts and ideas. We wrote a script for a day in the life of an inpatient ward today and then rewrote it to reflect how the client wanted it to be for patients and fami-

lies in the future. We even invented a new language to describe it— a nurses base became a *collaboration hub*, the hospital's information desk became the *conciierge booth* and outpatient departments became *neighbourhoods*," says Scalzo.

He continues, "The briefing and planning work undertaken during the early phases challenged many preconceptions of how things have always been done. Each stakeholder group was asked to critically review current practices and then identify what could be improved based on exemplar models from around the world".

In this environment, care models and design options evolved anew from first principles, based on world's best practice evidence seen through the eyes of patients and carers. Evidence based design was fed into the process early through a resident collaboration with Professor Franklin Becker of Cornell University, USA. Becker along with an intern, who was embedded into the briefing team, undertook investigative work and primary research in support of the evolving brief.

The managing contract procurement model gave further support to the collaborative design process. Design managers, balancing client aspirations with sub-contractor realities oversaw discussions, drawings and reports while facilitating the development of design through the construction of 1:1 prototypes and site visits to evaluate and assess the evolving designs.

PLANNING INNOVATION

LCCH INTRODUCES A WIDE RANGE of planning innovations to facilitate safe, patient centred and efficient delivery of care. As an example, the Emergency Department incorporates a no wait triage gate; the Outpatient Department evolves from a clustered neighbourhood model and the Paediatric Intensive Care Unit design supports keeping daily life going for parents and families during long-term hospital stays.

Following a review of current clerking processes in Emergency the new no wait triage model was developed to provide first line clinical intervention within a private and patient centred setting. Five gates, sufficient to meet peak capacity, allow for the simultaneous triaging of patients. With direct access to other treatment areas, the triage gate allows for the immediate processing of presenting patients, reducing stress for arriving patients and families

Dr Peter Steer describes the construction of the new hospital as "only half of the equation", highlighting the use of change management requirements of complexity bought upon the planning process by bringing together two existing paediatric hospitals, each with a long and proud history serving the Bris-



A colourful and vibrant 'neighbourhood' waiting area

bane community. The design process used harnessed opportunities for change – particularly in the planning of the new hospital's outpatient departments.

Through a detailed analysis of optimum flows, waste and specialist diagnostic machines, the conventional and single block of specialty dedicated consulting rooms was disaggregated and replaced with neighbourhoods of generic consult rooms with shared clinical work zones. To manage peak people flows and improve wayfinding, short flow neighbourhoods, (clinics for short duration consultations) are located closest to the hospital entry with the long flow neighbourhoods located in private settings further up the building and associated with a Long Day Lounge. In each case, patients and families travel shorter distances to appointments and clinicians come to them.

The hospital's Family Advisory Group and Youth Advisory Forums facilitated by the design team included representatives from former and current patients and the hospital's CEO. One of the youth advisors, himself a leukaemia survivor, described how this highly motivated group of young patients and carers provided inspiration and insight into the needs of patients and families, needs often not captured by rote hospital design processes.

This is particularly true of the Paediatric Intensive Care Unit where two long stay intensive care bays help parents and carers, keep life going. Each bay, designed with a view of the Brisbane River includes a family zone incorporating a recliner bed, cupboards, an ensuite bathroom, wireless internet access and meal facilities nearby. This innovation, supported by clinicians and families alike, goes a long way to redressing the indignities of conventional carer accommodation.

A MEMORABLE PLACE

RENOWNED AUSTRALIAN AUTHOR, David Malouf, in his acclaimed classic *Johnno* describes the rattling of trams through the Brisbane suburbs of Woolloongabba, transporting their human cargo to the busy wharves of South

Brisbane. Now the site of Lady Cilento Children's Hospital, the tramlines are long gone and only a maritime museum and the ornate former South Brisbane Town Hall (now Somerville House) remaining to attest to a bygone era that still resonates in the local psyche.

The Sisters of Mater Misericordie established their eponymous hospitals, here in South Brisbane and the hill that once rose here was, removed it is said, by General Macarthur's Pacific US Marines.

Lyon recalls, "The site for the new hospital, selected by separate process prior our engagement was rich in history even though it had fallen into disuse. It lay at the end of the landscaped South Bank Arbour, one of Australia's most vibrant and colourful precincts, itself testament to the successes of urban renewal." Mitchell adds: "We saw the opportunity to imbue the hospital and its site with the same vibrancy as the South Bank precinct. This was about learning lessons about civic architecture, fostering wellbeing and connecting to the uniqueness of place."

One commentator has described LCCH as an urban Acropolis, a type of man-made healing hill replacing the original Mater Hill. Seen from across the city, the hospital's distinctive terraced silhouette sits within



"One commentator has described LCCH as an 'urban acropolis', a type of 'healing hill'"

a bend of the Brisbane River and joins other hilltop building markers making up the city. Mitchell says, "locally, the hospital's enormous bulk pulls away from the prominent corner", an architectural gesture which allows the South Bank Precinct's civic program to extend across to the hospital site, incorporating a new civic plaza and child's playground. Here patients, visitors and the community can come together to view the ornate Somerville House, order a coffee at the hospital's cafe or take shelter from a sub tropical downpour under the hospital's buttressed verandah.

FOREFRONTING DESIGN

"Design work on LCCH began with research into the genealogy and typology of the contemporary hospital. We studied hospitals from the 1980s though to the present day and saw these as being largely functionally driven and medico-centric in their planning. The Queensland project was an opportunity to contest these prevailing paradigms; to radically rethink both the care model and the way in which the building might contribute to the city as a civic marker and as a touchstone for the Brisbane community," says Lyon.

The design concept for the hospital based on the idea of a *living tree* with the hospital's design, supports salutogenesis and the psychosocial wellbeing of patients and families.



A view up into the hospital's 'living tree'

A network of double height horizontal spaces (branches) radiate from two vertical atria (trunks) in the centre of the plan. The branch spaces extend beyond the street lines to form a series of framed portals and external balconies where users can view the city. Mirroring the building's urban concept, each branch is oriented toward a key city landmark— to the high-rise buildings of central Brisbane, to the adjacent parklands, to the distant mountains and to the Brisbane River.

The vertical and horizontal spaces in the tree comprise the principal public circulation system in the hospital. They create a mind map for the building users assisted by framing external landmarks that serve to orientate people within the building. Meaning and comprehensibility combine through design.

The branch spaces serve to connect inside and outside bringing natural daylight into the building. “Surprisingly we found through talking with children and young people that many of their fears about going to hospital are in part architectural. For example, we often heard ‘we cannot see what goes on inside’. Hospitals that provide little community connection or that are removed from people’s everyday lives and experience seem to perpetuate negative impressions. We sought to change that”, says Scalzo. When passing by the hospital’s portals, particularly in the evening, the hospital seems to be teeming with life, inviting connections and demystifying the hospital activities.



Spectacular portals framing views of landmarks around the hospital assisting wayfinding

Dr Steer has described the success of the living tree concept, “The consideration given to the community’s vision [for the hospital] has been fundamental to the project’s success. The design team has ensured the hospital is open to the community through major ‘portals’ that allow people both to see in and out from the facility. This not only helps with way finding while you’re inside the building but also builds community connections - something critical for a children’s hospital.”

FAMILY FRIENDLY

“I want to go home,” says Sienna Comber, “and so do I when we’re in hospital,” says her mum Fiona. Fiona and Siena tell their story in a cinematic animation commissioned by Queensland Health describing theirs and other patient and carers’ involvement in the hospital’s development. Their story resonates in

authenticity, as do the many others shared during the planning and design phases of the hospital.

According to one of the lead advisory group stakeholders “The consumer engagement program at LCCH demonstrated that by involving consumers early in the design process, the architect had the capacity to support a particular model of clinical care provision, especially with regard to the specific needs of adolescents and young adults.”

Scalzo shared many hours collaborating with members of the Family Advisory Council and Youth Advisory Forum and all agreed that the stakeholder engagement process for the hospital’s design, “is an example of the capacity patients and carers have to participate in a valuable and tangible way in the design process, when they are effectively and authentically engaged.”

Clinicians and the hospital’s administrators also responded. Fiona Brewin-Brown, Executive Director of the Hospital during its development lists some of the more innovative outcomes, “the design incorporates a large number of family facilities. These include family information areas and a Long Day



The hospital’s Long Day Lounge providing a place of respite for children and families

Lounge for people that may be at hospital for a long period during the day and need a space for respite.”

Other examples, include drawing desks with pencil recesses incorporated into custom designed public seating, and quiet rooms with views for families to share time with children in palliative care. Other spaces respond to the diversity of patient and family groups; spaces for indigenous groups to perform ‘smoking ceremonies’ to cleanse the spirits of children past, and outdoor areas to commemorate anniversaries with large family groups.

AN ENGAGING INTERIOR

IN HER EDITOR’S FOREWORD to *Australian Healthcare Design 2000–2015*, published by the International Academy of Design and Health, Kate Copeland observes, “At the end of the last century Australia embarked on an unprecedented level of capital investment in its healthcare infrastructure that has never been seen before and may never be seen again.” Today, in 2015, the results are in with many exemplary projects including a nascent salutogenic design approach.

Amongst these projects, the LCCH sets a benchmark as the first to adopt and use salutogenic thinking and design principles. Public areas, clinical departments, patient spaces, staff work areas and education spaces all reflect a design approach committed to recovery, health and wellbeing. According to Lyon, “along with our colleagues and collaborators, we sought to make the LCCH hospital experience an exceptional one, one that exceeded the community’s expectations of a hospital while meeting the budgetary and sustainability objectives set by our client.”



Arriving at the front door the overwhelming experience is one of intimacy and calmness



The hospital’s lifts combine bright colours and artwork to assist wayfinding

The overwhelming experience on arrival at the front door of the hospital is one of intimacy and calmness. People seem to be going about their business with quiet efficiency, mothers with prams and a second suitcase, fathers in work shirts accompanying children in school uniform and bright colour vested volunteers at the ready to provide a helping hand.

The public circulation spaces are generous and have a spatial arrangement that invites curiosity. Spaces are light-filled, affirming and stimulating and provide a backdrop for each of the hospital activities. All public spaces are double height and clad in timber with the hospital’s brightly coloured department entries assisting wayfinding. The colour signifiers to these entries match the colours used in the lift lobbies, forming part of the hospital’s intuitive wayfinding system.

Waiting areas and lobbies include custom designed sitting and play furniture, (designed by the architects) and are intimately lit and lined with sound absorbing materials and textures. Display vitrines incorporated into reception desks capture the imagination of patients and siblings. Colours inspired by the Queensland landscape and Queensland’s unique flora and fauna are used in clinical areas create comfortable calming environments.

Interwoven with these richly textured interiors is an arts program that draws upon the collection of the Gallery of Modern Art (GOMA) only a kilometre away. Lyon notes, “When the hospital’s art program was suggested we began with the idea of a cultural program that would build on the success of GOMA in engaging with young people. An Arts Committee was established and its first role was to select a curatorial panel. This panel identified a range of Queensland and other Australian artists to prepare significant new works.”

Within two years, the Lady Cilento Children's Hospital won a prestigious Art in Health Australia Award for Excellence in Architecture, Design and the Healthcare Environment and had appointed Lynne Seear, former Deputy Director at GOMA, as the Hospital's Arts Project Curator. Seear notes, "Modern research shows the positive role art can play in recovery. The provision of art programs in health care settings is now a worldwide movement, supported by academic disciplines in the field. They promote the power art and culture has in connecting with individuals as they encounter the stresses that are inevitable within health care system. Studies have found patients who are engaged with the arts experience have reduced hospital stays and a lower reliance on pain relief medication."



A Little Community of Australian parrots perch on ledges within the hospital's atrium

The results are remarkable. Emily Floyd's *A Little Community* of Australian parrots perched within the arrival atrium are as amusing as they are comforting. Each parrot looks inward from the atrium at the activities on each level, acting like a familiar friend showing patients and families the way around. Helga Groves' *River Branches* are printed on to the timber cladding panels of the lift shaft walls. They are engaging and avert one's gaze, albeit perhaps for a moment, from the goings on of the hospital. Another

significant piece, Richard Bell's *MeMe Dreaming* is a reminder to remain connected with ourselves and our place in the world.

As hospitals become more patient and family focussed, they also need to be equally supportive of staff wellbeing. Scalzo says, "Australia has built many new major tertiary, quaternary facilities over the past decade. These are designed to attract, retain and support staff working in these facilities. It is no longer enough to have the best state-of-the-art clinical facilities. High amenity, functional workspace environments, educational facilities and places for relaxation for staff well being is also high on the list. These kinds of facilities can engender cross disciplinary and collegial cultures required in the modern hospital."



The LCCH Clinical Directorate accommodation was modelled on contemporary Australian corporate offices

LCCH has an entire floor dedicated to staff. Walking through this level is like being transported into a modern day Australian university campus or large corporate office. The floor also includes a large flat-floored auditorium, simulation suites for teaching, tutorial and meeting rooms, and a separate research library nearby.

Workspaces are arranged in open plan clusters with custom-built joinery units providing adequate privacy for each desk. The workstations are generous in size, contemporary in look and responsive to individual needs. Scalzo notes, "We were very aware of the sensitivities, particularly amongst senior staff of moving to open planned workspaces. Through the design and prototyping process, and visits to many different office environments many of their concerns were allayed."

INTEGRATED HEALING LANDSCAPES

THE HEALING QUALITIES OF LANDSCAPES in modern hospital settings are well documented. Healing gardens and views to greenspace connect patients, families, visitors and staff to the natural world and its



View of the hospital's remarkable 'jungle' and 'epiphyte columns'

circadian rhythms. The challenge at LCCH was to identify landscape opportunities for a large hospital on a tight inner urban environment site.

According to Mitchell, "From the outset, we saw the relationship between the hospital's indoor and outdoor environments as intrinsic; it is part of the Queensland way of life. The building's stepped rooftops terraces provided a unique opportunity to deliver a range of landscape experiences, directly

accessible from the various levels of the building. Patients, their families and others don't need to travel far to be immersed in Queensland's unique sub-tropical flora and climate."

Landscape architect Katharina Niebler-Walker worked collaboratively with Lyons to develop these contemporary concepts. Niebler-Walker describes the hospital's gardens as green monoliths replacing trees on the roof; jungle gardens providing visual amenity



The vibrant children's adventure play 'mound' at LCCH



The 'secret garden' at LCCH with spectacular views of the Brisbane city skyline



The hospital is well integrated within the city structure as a landmark.

"The building's stepped rooftop terraces provided a unique opportunity to deliver a range of landscape experiences, directly accessible from the various levels of the building."

to mental health areas; secret gardens serving a multi faith area; an adventure playground mound for children and a staff garden for relaxation and celebration.

The landscapes are variegated, colourful and vibrant. Epiphyte columns and light trunks, custom designed shelters and outdoor furniture are integrated with ground covers and lawn areas to maximise opportunities for relaxation and respite. Views from the roof gardens back to the city and the South Bank parklands precinct are spectacular.

"The healing gardens also have a clinical function. The large rooftop garden on level six extends out from the rehabilitation gymnasium. The secret garden on level five is directly accessible from the ambulatory care areas and the intensive care areas open out on to their own outdoor fenced area", adds Scalzo.

The landscape areas also function as large heat sinks for the building. Other sustainable features include the use of active chilled beam air conditioning in patient bedrooms (providing high-energy efficiency and excellent infection control), natural ventilation to public areas, tri-generation building systems attuned to energy conservation and water harvesting used for irrigation.

A NEW RESEARCH PROJECT

FOLLOWING THE COMPLETION OF THE LCCH Lyons are embarking on a major research project to study and document the impacts of design on patient wellbeing. The research, to be undertaken with the University of Melbourne and three of its leading design researchers Professors Julie Willis, Philip Goad and Alan Pert.

"Modern hospital designs have tended to be very medico-centric and driven by considerations of function and efficiency which we have attempted to shift this thinking toward a more humanist view, to create environments which are supportive of a patient's psychosocial wellbeing. As a profession, we seem to have lost the idea that these buildings have enormous potential to improve peoples' condition, and reduce levels of stress and anxiety. So we and the University of Melbourne are undertaking this major research project to better inform future design thinking, and as part

of our continuing program of in-house research", says Lyon describing the groundbreaking research he and Scalzo have embarked upon along with partners.

The research project has already begun with a review and consolidation of existing evidence base research on environmental factors that have shown to most directly and positively support patient wellbeing. The research team will then use case study examples and client questionnaires to investigate which of these factors are most important in hospital design.

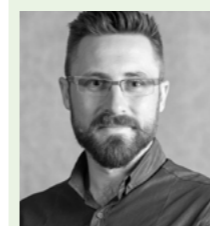
Scalzo looks forward to this aspect of the research. "The project's structured surveys and workshops

will provide a measure of how these groups, many of whom were consulted during their respective design processes, view the final designs and how well or otherwise they feel particular aspects of the environment contribute to a positive experience and to their perceptions of well being, he says"

The research team plans to disseminate the outcomes of the research work to architects, designers, and to healthcare providers.

This world leading research will build on the learnings and design strategies which have been embedded in LCCH and will provide a platform for the planning and design of future healthcare facilities. □

Adam Pustola



Adam Pustola is a Melbourne based architect and writer. He is an active commentator of contemporary Australian architecture and leads senior design studios at Melbourne's prestigious RMIT School of Architecture.

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SOCSO Rehabilitation Centre, Malacca, Malaysia



Administration Block

Medical Rehab Block and Sanctuary Garden



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- Sipetu District Hospital
- Thabazimbi District Hospital
- Letaba Regional Hospital

Zimbabwe

- The Avenues Woman and Child Hospital
- Selborne Hospital

Mozambique

- Nampula General Hospital
- Maputo Central Hospital

The Gambia

- Horizons Private Clinic (TA for AfDB)

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Australian Healthcare Design 2000–2015

A critical review of the design and build of infrastructure in Australia

International Academy for Design and Health (2013) Stockholm, Sweden

Review by Naomi A. Sachs and Mardelle McCuskey Shepley

In July, 2013, the International Academy for Design & Health held the 9th World Congress in Brisbane, Australia. Australia's proposal to host the Congress evolved into the book, *Australian Healthcare Design 2000–2015*, which was then published to coincide with the event. Alan Dilani, Founder and CEO of the International Academy for Design & Health, states in the book's preface, "Australia's successful bid to host the event reflects the huge amount of new healthcare building that is taking place across the region, and the body of research and knowledge that has developed there as a result...this book aims to communicate to the rest of the world that the region has some of the most advanced healthcare buildings of our time" (p. 12).

This richly illustrated book appeals to visually oriented designers, but offers valuable information for scholars and healthcare administrators as well. Many compelling contemporary international healthcare projects are featured in journals and books, but rarely do we get to see so many projects collected together focused on a specific geographic region, as is done in *Australian Healthcare Design 2000–2015*. The book serves as both a compendium and snapshot of the latest research, practice, and design in a large and diverse country. While Australia faces some unique challenges such as the vast distances between cities and the large number of rural community facilities, most issues are those facing every country and society: rising healthcare costs, patient and worker safety, an aging population, and rapidly advancing technology.

The World Health Organization defines health as "... a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (1948). Most medical care, and healthcare design, in the second half of the twentieth century followed the "pathogenic" and "biomedical" model, in which mind and body were viewed as separate rather than inextricably linked, and diseases were addressed primarily with pharmaceutical drugs and/or surgery. Healthcare practice and design is now moving in the direction of care that does not just treat the sick after the fact, but instead uses a more holistic preventive care model, encouraging health and wellness in all aspects and through all stages of life. The term "salutogenesis", first coined by Aaron Antonovsky in 1979, has begun to be adopted by members of the healthcare design community as an expression of this belief. This approach promotes health and well being — not just for buildings, but for all scales of design (cities, communities, landscapes). Salutogenic design and biophilic design are closely linked to concepts associated with evidence-based design.

The book is organized into two sections: Essays and Projects. Following the Introduction, which includes a preface by Alan Dilani, and Forewords by the editor and the sponsors, are 15 essays by a mix of researchers and professionals, all of whom have practiced in Australia. Their professions include design



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(architecture, landscape architecture, and engineering); medicine; healthcare administration; and research and teaching in higher education. Among the topics are behavioral health facilities, sustainability, and access to nature. The essays lend gravitas and credibility to a book that might otherwise be viewed more as a promotional piece on new healthcare design and construction.

The second half of the book is devoted to design examples. Thirty-five projects are described in narrative text and color images. Following these projects are 53 briefly documented "feature projects." Both the projects and "feature projects" are organized into categories of Tertiary and Acute Care; Women and Children's Health; Cancer Care; Mental Health; Regional Health; Community Health; and Science, Research, & Education. This organization is useful, as most people will want to see specific healthcare typologies.

Regarding shortcomings of this book, a few essays overlap in content. The narrative on the design projects tends to be laced with promotional phrases (e.g., "an abundance of nature") and does not always provide illustrations of the claims (e.g., "supports evidence-based design"). Regardless, the book is a compendium of useful information.

Australian Healthcare Design 2000–2015 is an important book that expands our knowledge of healthcare design and research in Australia. Global awareness would increase, and health facility design would benefit significantly, if additional countries or regions prepared similar references in the future.

Naomi A. Sachs



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Mardelle McCuskey Shepley



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