



WORLD Sustainable Built Environment Conference **2017 Hong Kong**

Transforming Our Built Environment through
Innovation and Integration:
Putting Ideas into Action

Conference Proceedings

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International Co-owners



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- International Council for Research and Innovation in Building and Construction (CIB)
- International Initiative for a Sustainable Built Environment (iiSBE)
- United Nations Environment Programme (UNEP-SBCI, Sustainable Building and Climate Initiative)
- International Federation of Consulting Engineers (IFDIC)
- Global Alliance for Buildings and Construction (Global ABC)

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WSBE17 Hong Kong: THE MOST INFLUENTIAL GREEN BUILDING MEGA EVENT

The Construction Industry Council and the Hong Kong Green Building Council jointly welcome you to participate at the World Sustainable Built Environment Conference 2017 Hong Kong (WSBE17 Hong Kong).

Pre-eminent Conference Series

The Sustainable Built Environment (SBE) series began in 2000 and is now the pre-eminent international conference series on sustainable building and construction. The series operates on a three-year cycle with planning in year one, regional conferences in year two and a global conference in year three. Albeit strong competition, Hong Kong won the hosting right of the 2015-2017 cycle global conference, which will conclude the conference cycle by embracing all the top findings from the 20 regional conferences held in 2016.

About WSBE17 Hong Kong

With the theme of **Transforming Our Built Environment through Innovation and Integration: Putting Ideas into Action**, WSBE17 Hong Kong will bring together **1,800** green building advocates, policy-makers, academics, and industry practitioners from over **55 countries**. The three-day event includes conference sessions with top-notch speakers, and around 100 parallel sessions, with an exhibition alongside.



Organisers

Construction Industry Council (CIC)

The Construction Industry Council (CIC) was formed in 2007 under the Construction Industry Council Ordinance (Cap. 587). The CIC consists of a chairman and 24 members representing various sectors of the industry including employers, professionals, academics, contractors, workers, independent persons and Government officials.

The main functions of the CIC are to forge consensus on long-term strategic issues, convey the industry's needs and aspirations to Government, provide training and registration for the construction workforce and serve as a communication channel for Government to solicit advice on all construction-related matters.



Hong Kong Green Building Council (HKGBC)

The Hong Kong Green Building Council (HKGBC) is a non-profit, member led organisation established in 2009 with the vision to help save the planet and improve the wellbeing of the people of Hong Kong by transforming the city into a greener built environment. The Founding Members of the HKGBC include the Construction Industry Council (CIC), the Business Environment Council (BEC), the BEAM Society Limited (BSL) and the Professional Green Building Council (PGBC). Its mission is to lead market transformation by advocating green policies to the Government; introducing green building practices to all stakeholders; setting design, construction and management standards for the building profession; and promoting green living to the people of Hong Kong.



Message from Chairman of WSBE17 Hong Kong Organising Committee

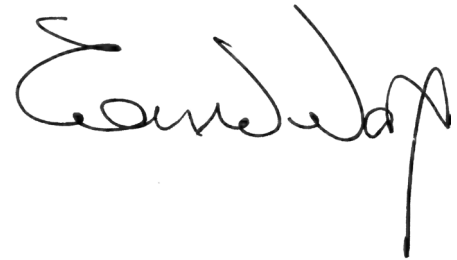
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It has been my great honour to work closely with all Organising Committee and Scientific Committee members, and the Conference Secretariat, to bring WSBE17 Hong Kong to life. Since winning the hosting rights in 2014, the Organising Committee has dedicated itself to creating the best world conference ever; one that can inspire in-depth discussions and create a long-lasting impact on the transformation of our built environment, particularly in the interconnected domains of 'Policy & Standards', 'Practice & Business', 'Science & Technology' and 'People & Community'.



The Committee has worked hard for many years to reach this moment. Now, all that remains is for me to wish all delegates an enjoyable, thought-provoking and inspirational time at this important conference.

The planet urgently needs our help. Together, we can create a brighter future for all mankind.

A handwritten signature in black ink, which appears to read 'Conrad Wong'. The signature is fluid and cursive, with a long vertical stroke at the end.

Ir Conrad WONG Tin-cheung, BBS, JP

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Message from Chairman of Construction Industry Council

Sr CHAN Ka-kui, BBS, JP

It is my great pleasure to offer a warm welcome to all delegates coming to Hong Kong for WSBE17 Hong Kong. The Construction Industry Council is proud to be a co-organiser of this important event, which provides a platform that inspires and enables transformation in both the construction industry and the built environment, locally and worldwide.



The Hong Kong construction industry has achieved a great deal in the last decade, from ground-breaking research to innovative new projects. We are delighted to share our experiences with delegates from around the world.

This landmark conference offers valuable insights from the six world renowned keynote speakers, as well as the collected wisdom and experience of the other 400 distinguished speakers. The three-day conference will lead to fruitful discussions and provide a strong foundation for putting ideas into action, which will benefit the long-term sustainability of communities around the world.

A black and white handwritten signature of Sr CHAN Ka-kui, BBS, JP. The signature is stylized and cursive, written in black ink on a white background.

Sr CHAN Ka-kui, BBS, JP

Chairman
Construction Industry Council



Message from Chairman of Hong Kong Green Building Council

Sr Bay WONG

The SBE16/17 conference series has, for the first time, expanded its focus from buildings to the overall built environment. It is fitting, therefore, that the series reaches its conclusion in Hong Kong, where our high-rise and high-density built environment poses a number of unique challenges. I believe that our experience in meeting and overcoming these challenges has great value for urban environments around the world.



This high-profile, global conference WSBE17 Hong Kong brings together more than 1,800 of the world's leading green building experts from 55 countries around the planet. I offer my sincere thanks to the Construction Industry Council for its wholehearted support in organising this important event, and to the Government of the HKSAR and the local construction industry for helping us to make this event a success.

On behalf of the HKGBC, I warmly invite you to join hands with us and work together to create a sustainable built environment in communities around the world.

A handwritten signature in black ink, appearing to read 'S Wong'.

Sr Bay WONG

Chairman

Hong Kong Green Building Council



Message from Chief Executive of the Hong Kong Special Administrative Region

Hon. LEUNG Chun-ying, GBM, GBS, JP

I am very pleased to welcome some 1800 green building professionals from about 50 countries to Hong Kong for the World Sustainable Built Environment Conference (WSBE), 5-7 June. This is the first WSBE Conference to take place in Hong Kong, and it is an honour to host this significant international event as part of our celebrations for the 20th anniversary of the establishment of the Hong Kong Special Administrative Region.



The theme of this year's Conference "Transforming Our Built Environment through Innovation and Integration: putting Ideas into Action", is both timely and apt. I have no doubt that the Conference's innovative ideas and collaborative efforts will help us build a smart and green Hong Kong and, in doing so, contribute to the growing global movement to combat climate change.

I wish you every success at the Conference and a memorable stay in Hong Kong.

A handwritten signature in black ink, appearing to be 'W. Leung', written in a cursive style.

Hon. LEUNG Chun-ying, GBM, GBS, JP

Chief Executive
Hong Kong Special Administrative Region



Message from Chief Secretary for Administration, Government of the HKSAR

Mr Matthew CHEUNG Kin-chung, GBS, JP

I offer my warmest congratulations to the Construction Industry Council and the Hong Kong Green Building Council on hosting the World Sustainable Built Environment Conference 2017 in Hong Kong. This year has a special and historic significance as it marks the 20th anniversary of the establishment of the Hong Kong Special Administrative Region. The conference is one of the flagship events celebrating this auspicious occasion.



Against the backdrop of a growing consensus on the need to combat climate change, global citizens nowadays have rising aspirations for an urban built environment which is sustainable, green and smart. As a vibrant, high-density and high-rise international city, Hong Kong is an ideal place for green building advocates, policymakers and academics from all over the world to come together and discuss how to build a sustainable future. Under the theme “Transforming Our Built Environment through Innovation and Integration: Putting Ideas into Action”, the Conference provides an invaluable platform for experts to share their expertise, innovative ideas, rich experience and insights on the common vision for sustainability.

The Hong Kong Special Administrative Region Government is committed to turning Hong Kong into a greener metropolis. We have, in collaboration with the industry, spearheaded the development of a sustainable built environment. The wide range of initiatives already put in place include imposing mandatory requirements, providing the private sector with incentives, encouraging government departments to lead by example and driving behavioural change in society. On top of all these, we announced earlier this year Hong Kong’s Climate Action Plan 2030+, which not only outlines our longer-term action to combat climate change but also sets out the carbon emission reduction target for 2030. As a member of the global village, Hong Kong needs to respond proactively to this cross-sector, cross-domain subject. With this in mind, we will continue to work closely with various sectors of the community and the general public to make our city more climate-resilient in the long run.

I would like to take this opportunity to extend my deepest gratitude to the hosts, co-owners, organisers, sponsors and participants for making the event possible. I wish the Conference every success and all overseas participants a rewarding and pleasant stay in Hong Kong.

A handwritten signature in black ink, appearing to read 'Matthew Cheung'. The signature is fluid and cursive, with a long horizontal line extending to the right. It is positioned above the printed name and title.

Mr Matthew CHEUNG Kin-chung, GBS, JP
Chief Secretary for Administration
The Government of the Hong Kong Special Administrative Region



Message from Secretary for Development, Government of the HKSAR

Mr Eric MA Siu-cheung, JP

I am delighted to offer my congratulations to the successful organisation of the World Sustainable Built Environment Conference 2017 in Hong Kong which has come to its 7th edition.

The ascension of the Conference from sustainable building in the 2014 edition held in Barcelona to sustainable built environment in the current edition is a remarkable achievement of the campaign for sustainable development. The move from focusing on the significance of individual sustainable buildings to encompassing the constituent fabrics for the built environment will definitely enhance the performance of the construction industry in combating climate change. I am certain that the local industry and participants coming from all over the world have longed to share together their brilliant ideas and prominent achievements in the global movement. Our joint efforts will be crucial and instrumental in shaping the living environment for our future generations. May I extend my heartfelt gratitude to the Construction Industry Council and the Hong Kong Green Building Council for their great efforts and wish the Conference a resounding success.



A handwritten signature in black ink, appearing to read 'Eric Ma', with a long horizontal flourish extending to the right.

Mr Eric MA Siu-cheung, JP

Secretary for Development

The Government of the Hong Kong Special Administrative Region



Message from Secretary for the Environment, Government of the HKSAR

Mr WONG Kam-sing, GBS, JP

Let me extend my best congratulations to the successful organisation of the World Sustainable Built Environment Conference (WSBE) 2017 in Hong Kong. As a densely-populated world city where about 90% of the population lives in high-rise buildings, Hong Kong offers a unique setting for participants from around the world to discuss the challenges and strategies for sustainable built environment. The WSBE signifies the commitment to sustainable buildings which are important in preparing us to be “climate ready”. I am sure that participants will benefit from the discussions and exchanges that will help shape a sustainable built environment. My sincere gratitude goes to the Hong Kong Green Building Council and the Construction Industry Council for their outstanding contribution. I wish the WSBE 2017 a great success.



A handwritten signature in black ink, appearing to read 'Wong Kam-sing'.

Mr WONG Kam-sing, GBS, JP

Secretary for the Environment

The Government of the Hong Kong Special Administrative Region



Message from Secretary for Transport and Housing, Government of the HKSAR

Prof. Anthony CHEUNG Bing-leung, GBS, JP

I convey my warmest congratulations to the Hong Kong Green Building Council and the Construction Industry Council for the successful organisation of the WSBE17 Hong Kong Conference. Hong Kong is one of the most densely populated cities in the world. Driven by the vision to provide a better living environment for our citizens, the Government has been actively exploring new and innovative means towards green building development without compromising our environment. I sincerely wish all participants from round the globe to join hands in our common mission to “Put Ideas into Action” for a greener Earth with livable and sustainable environment.



A handwritten signature in black ink, reading "Anthony Cheung".

Prof. Anthony CHEUNG Bing-leung, GBS, JP

Secretary for Transport and Housing

The Government of the Hong Kong Special Administrative Region



Towards a Holistic Approach to Retrofitting: A Critical Review of State-of-the-art Evaluation Methodologies for Architectural Transformation

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ABSTRACT

The building sector is well known to be responsible for a considerable part of the total European energy consumption. In the endeavor to implement radical reductions, there is an identified potential in addressing the existing building stock through deep renovations. These renovations make up complex, highly interdisciplinary systems. They involve stakeholders across a broad spectrum of disciplines and potentially affect the lives of a large number of occupants. The involved people bring different understandings of value in sustainability into a project and judge the outcome according to this understanding.

As a response to this, a number of sustainable assessment methodologies for the building industry, and specifically for that of retrofitting, have been developed to assist in the decision-making processes and ensure targeted results. However, these methodologies themselves represent a stance on sustainability as they assign weight to different sustainability indicators. As such, the same design may be assessed differently according to the chosen tool. As part of the research project RE-VALUE, this paper presents an evaluation of current practices in a Danish context through a systematic literature review of existing assessment tools. The paper presents the results of a meta-synthesis, which highlights the focus areas of the individual tool as well as patterns and relationships between the tools. **Based on the review we discuss a noticeable focus on quantitative, technical values in today's 'assessment practice' and put forward the hypothesis that there is a need to rank qualitative, 'non-technical' values alongside quantitative values in order to deliver significantly improved building performance, which benefits the people who inhabit the built environment.** This hypothesis is substantiated through an additional literature review, from which we propose a need to develop a holistic methodology for assessing architectural transformations in deep renovations.

Keywords: sustainable retrofitting, deep building renovation, architectural transformation

1. INTRODUCTION

The building sector is responsible for 40% of the total European energy consumption. In the endeavor to reduce this number, deep renovation of existing buildings has been identified as an important focus area (European Commission, 2014). Such renovation processes make up complex, highly interdisciplinary systems, which involve stakeholders across a broad spectrum of disciplines and potentially affect the everyday lives of a large number of people (Beim & Madsen, 2015). Subsequently, a deep renovation is not **'merely' about optimizing the technical performance of a building**, but prescribes a holistic approach, in which measures are considered for their interdependence rather than as separate elements in a traditional reductionist line of thought. A number of sustainable assessment methodologies have been developed to assist the decision-making processes and ensure targeted results. Many of these claim to have a holistic approach. However, it is the hypothesis of this paper that the models themselves represent **a stance on sustainability as they assign weight to different 'sustainability indicators'**. As such, the same design may be assessed differently according to the chosen tool (Tagliabue, 2016). The research project RE-VALUE has been initiated to shed light on available methodologies and the potential to further develop them into a model targeted retrofitting initiatives in Denmark (Kamari et al., 2016). As part of the research project, this paper presents the results of a literature review of existing assessment methodologies. The aim is to compare which sustainability indicators each methodology attach importance to, and to provide a synthesis of the findings, which can improve our understanding of the positioning of each methodology relative to each other.

The transformation towards a more energy-efficient building mass often involves radical changes to the built environment. Depending on the extent of the initiatives, these changes may affect the wellbeing of the people who inhabit the spaces (Acre & Wyckmans, 2015, Beim & Madsen, 2015, Hvejsel et al., 2015). As part of the literature

review, the paper examines to what extent each of the included methodologies address the implications of technical interventions on the perceived spatial quality.

The following section provides an overview of the methodological outset for the study. Section 3 includes a mapping of existing assessment methodologies, which forms the basis for a synthesis and discussion in section 4.

2. METHODOLOGY

The evaluation of existing sustainability assessment methodologies is performed as a systematic literature review of 7 selected methodologies. The overall aim of the review in section 3 is to identify to which sustainability indicators each methodology assigns weight. The methodologies have been included in this paper for their relevance to retrofitting in a Danish context. They do not necessarily target retrofitting initiatives, but encompass such projects **as part of their scheme. In order to provide a set of 'lenses' through which to map** the sustainability indicators in a similar way, the paper leans on the three pillars of sustainability, emanating from the 1987 Brundtland Report: social, environmental and financial sustainability (World Commission on Environment and Development, 1987), adding a fourth parameter addressing process-oriented indicators. The findings of the mapping are communicated **through diagrams, which depict the indicators relative to these 'lenses' and a timeline which indicates where in the renovation project the given methodology can be applied. Parallel to this study, the paper 'zooms in' on the social pillar and examines to what extent each methodology addresses the implications of technical interventions on socio-cultural aspects, focusing in particular on the perceived spatial quality. The concept of 'spatial quality' is highly complex in character and has been addressed by several scholars and practitioners through the years. In this paper we focus on the spatial quality in the understanding that architecture is a phenomenon which influences our sense of wellbeing and behavioral patterns (Bek & Oxvig, 1997). It lies beyond the scope of this relatively short paper to unfold the concept of spatial quality. Rather, it is the aim to identify if the included methodologies consider spatial quality indicators. Section 4 presents a meta-synthesis of the individual findings, with the objective to position the assessment methodologies relative to each other and identify potential knowledge gaps, with special attention to spatial quality.**

3. MAPPING OF EXISTING ASSESMENT TOOLS

3.1 DGNB-DK

The DGNB-DK tool is a Danish version of the DGNB tool, developed by Green Building Council Denmark in 2012. The purpose is to secure quantifiable standards, which makes it possible to certify buildings **based on a "scoring system". The methodology is not targeted renovations, but has been applied to such projects (DK-GBC, 2016).** The model has a relatively even distribution of social, economic, environmental and process-related sustainability indicators. **It addresses the concept of spatial quality in the subsection devoted to "social quality", e.g. attention to daylight factor, plan layout and to 'aesthetics' through evaluation of whether the project has been put out to tender in an architectural competition and through attention to building integrated art (Beim & Madsen, 2015) (Figure 1).**



Figure 24: Top: indicators relative to process and social, environmental and economic sustainability. bottom: timeline.

3.2 AktivHus (Active house)

AktivHus is a national initiative from 2015, based on the international ActiveHouse principles (AktivhusDanmark, 2015). The methodology is intended as a design strategy and certification tool. The methodology targets new buildings as well as retrofitting projects (ibid, 2016). There is a visible focus on environmental indicators. Social aspects of sustainability are here reduced to attention to indoor climate. The methodology does not consider economic aspects. Beim et al. points out that the methodology does not consider cultural aspects - in this paper addressed under social sustainability - or more process-related aspects of a retrofitting initiative (Beim & Madsen, 2015) (Figure 2).



Figure 25: Top: indicators relative to process and social, environmental and economic sustainability. bottom: timeline.

If evaluating the methodology in terms of attention to spatial quality, this is 'only' addressed as a matter of quantifiable indicators related to indoor climate.

3.3 SAVE

SAVE was developed in Denmark in the late 1980's and is now administered by Kulturstyrelsen (The Danish Agency for Culture) (Beim & Madsen, 2015) (Kulturarvsstyrelsen, 2011). From 1992-2007 it served as the basis for development of 90 "Municipality-atlasses" in Denmark. The purpose of the methodology is to assess the level of preservation value in buildings or urban environments. (Kulturarvsstyrelsen, 2011). The methodology has a clear focus on culture-historical aspects. It includes weighting of economic aspects, but only a limited focus on the environmental value (Beim & Madsen, 2015) (Kulturarvsstyrelsen, 2011). The evaluation only focuses on the existing building, and is not considering potential renovation initiatives, including the potential implications on the perceived spatial quality (Figure 3).



Figure 26: Top: indicators relative to process and social, environmental and economic sustainability. bottom: timeline.

3.4 Evaluering af kvalitet i boligbyggerier (evaluation of quality in housing)

The methodology was developed by the Danish Building Research Institute (SBI) in 2000 for the Ministry of Housing and Urban Affairs. The methodology focuses on residential buildings and aims to provide a holistic tool for evaluating the condition and quality of the building across disciplines, focusing on both qualitative and quantitative indicators (SBI, 2000) and (Beim & Madsen, 2015). Each of the 6 themes are evaluated in relation to

4 different scales in the building and by means of different methodologies, which are described as part of the concept. The methodology has a relatively even distribution of indicators across the three pillars. There is well-articulated attention to the more qualitative aspects related to 'spatial quality', however, focuses on the existing building rather than new initiatives (SBI, 2000) (Figure 4).



Figure 27: Top: indicators relative to process and social, environmental and economic sustainability. bottom: timeline.

3.5 Totalværdi-modellen (total value model)

The model was developed in 2012 by a partnership of local authorities and consultancy companies (Plan C). The model focuses on process management in the initial stage of an interdisciplinary renovation project, rather than the comparison of specific design solutions. As such, the model does not contain an absolute weighting system. Rather, it provides a digital framework with templates. In the model there is a relatively even focus on each of the **three sustainability "pillars", which potentially helps to point out and articulate indicators as a sort of "check list"** including both quantitative and qualitative considerations. However, it is up to the stakeholders to set up objectives **for assessment of design solutions in later phases. The term "architectural quality" is introduced, but not further elaborated** (Schunck et al., 2011). Beim and Madsen point out that the model has a limited focus on cultural aspects, such as building culture and aesthetic qualities (Beim & Madsen, 2015) (Figure 5).



Figure 28: Top: indicators relative to process and social, environmental and economic sustainability. bottom: timeline.

3.6 RENO-EVALUE

RENO-EVALUE is developed by Centre for facility management (CMF) (Jensen & Maslesa, 2015). It provides a tool for clarifying sustainability objectives in a renovation process, comparing alternative project proposals and for evaluating the level of sustainability after completion (Jensen & Maslesa, 2015). The main purpose is to provide **a process tool, which can identify each stakeholder's priorities and help establish common criteria for success in the early phases of large-scale renovation projects** (Jensen & Maslesa, 2013). The weighting is based on the **stakeholders' subjective evaluation. As with the Total Value Model, the model focuses on process-related issues in an interdisciplinary project.** The implications on the perceived spatial quality is assessed under the subsection **"product" through attention to e.g. indoor climate and comfort. However, the qualitative aspects of "Architecture and aesthetics" are not further elaborated.** (Figure 6).



Figure 29: Top: indicators relative to process and social, environmental and economic sustainability. bottom: timeline.

3.7 Arkitektur, energi, renovering (architecture, energy, renovation)

The concept was developed in 2013 by SBI in collaboration with Henning Larsen Architects. The aim was to create a design guide for architects and engineers, for the early design phase. The guide is based on the understanding that a holistic approach to renovation in terms of energy, daylight and indoor climate should also provide added functional, architectural and/or financial value. The guide is divided into three typologies: single-family houses, multi-storey dwellings and offices, and provides simple tools, suggestions for strategies and cases, which exemplify added value (Marsh et al, 2013). In general, there is an even distribution of indicators. When zooming in on the **architectural indicator, the recommendations appear to be less explicit, e.g. the strategy “improved spatiality”** (Marsh et al., 2013) and (Hvejsel et al., 2015). (Figure 7).



Figure 30: Top: indicators relative to process and social, environmental and economic sustainability. bottom: timeline.

4. FINDINGS AND DISCUSSION

In section 3, we have presented a review of 7 assessment methodologies. This section presents a synthesis and discussion of the findings in the review. The circle diagrams in each subsection of section 3 have served to illustrate that the methodologies address different sustainability indicators. For instance, AktivHus puts emphasis on environmental indicators and indoor climate, whereas the SAVE-methodology emphasizes culture-historical indicators. The RENO-EVALUATE methodology has a strong weighting of building process indicators, just to mention **a few differences. As such, the diagrams serve to indicate that ‘holism’ is a relative term. Despite the fact that many** of the methodologies are characterised as holistic by the developers (e.g. AktivHusDanmark, 2015 and Schunck et al., 2011), not all methodologies address *social, economic and environmental* sustainability as well as process-related aspects equally. This supports the initial hypothesis that the models themselves represent a stance on sustainability, which may affect the decision-making process and ultimately the outcome of the renovation project.

In Figure 8 the methodologies are positioned relative to each other. Along the “y-axis” we introduce a scale spanning from discipline specific tools with a delimited focus, e.g. preservation value or energy reduction, to holistic tools in the understanding that they consider *social, economic and environmental* and process-related aspects evenly. Along the “x-axis” we introduce a scale spanning from “design guide/process oriented” to “certification

system”, which serves to illustrate that the methodologies are targeted different stages of a renovation process. E.g., the TotalValueModel has a strong focus on project management in the initial phases of a renovation process, whereas DGNB serves as an elaborate certification tool, which can be viewed as less operable on the initial phases of a project.

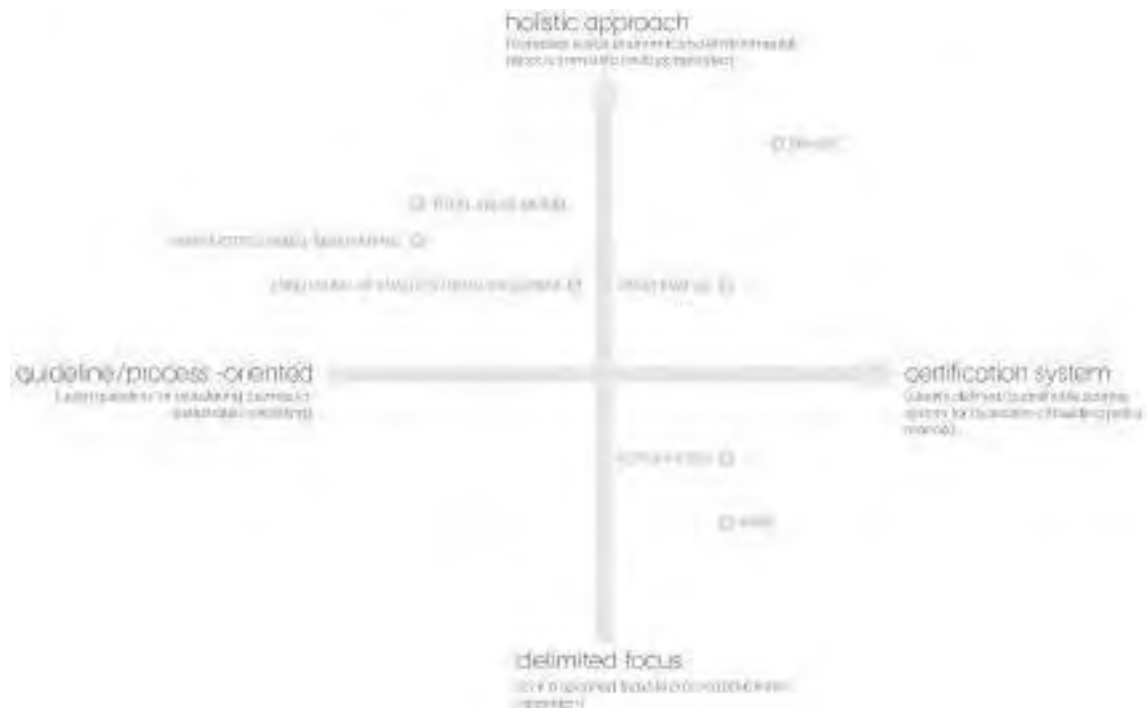


Figure 31: Graphical positioning of the studied methodologies for sustainable retrofitting.

If we ‘zoom in’ and address the methodologies with specific attention to the socio-cultural sustainability indicators, we see a general challenge in the methodologies when it comes to addressing the spatial consequences of technical initiatives in the early phases of a renovation process. It is well recognized that transformation towards a more energy-efficient building mass involves radical changes to the existing built environment, and thus potentially affects the perceived spatial quality amongst occupants (Acre & Wyckmans, 2015) (Beim & Madsen, 2015) (Hvejsel et al., 2015). A simplified example could be how an added mechanical ventilation system affects the height of a space, thus potentially affecting the perceived spatiality and access of daylight. Or how an added layer of exterior insulation may negatively affect the experienced coherence of a building to its neighbors from a culture-historical point of view. The other way around renovation processes may represent an opportunity to introduce new spatial qualities, e.g. improved access to private outdoor areas, which can help improve the receptiveness towards renovation amongst the residents of a building block. However, the ‘soft’ character of spatial quality is difficult to quantify, and, it seems, therefore more difficult to ‘operationalize’ as a part of the assessment methodologies on equal terms with e.g. indoor climate indicators. The methodology ‘Evaluation of quality in housing’ has a developed system for addressing spatial quality. However, the methodology has not gained currency – perhaps due to the complexity in use (Beim & Madsen, 2015). The methodology “Architecture, Energy, Renovation” on the other hand, is more readily accessible in the early stages of a project, but could be developed further to include more explicit strategies for addressing aspects related to spatial quality.

As such, the findings of this paper indicate a gap in the existing assessment practice. This indication is in line with the main findings of the report “*Værdiskabelse i bygningsrenovering*” (value creation in building renovation) by Centre for Industrialized Architecture in Copenhagen. In the report, Beim and Madsen stress the necessity of qualifying and describing the qualitative values about aesthetic, cultural and social values, in order for them to be addressed on equal terms with quantitative data (Beim & Madsen, 2015). This forms the outset for further studies in the RE-VALUE project, in which the theme will be explored through concrete case studies; firstly in a school renovation project in Copenhagen and secondly in a residential renovation project in Aarhus. The results of these case studies will provide insights into how to address qualitative, spatial aspects of energy renovations as part of a holistic approach to architectural transformation.

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10YFP Sustainable Buildings and Construction (SBC) Programme



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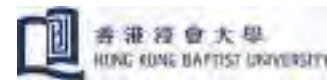
Highways Department



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Hong Kong Association of Energy Service Companies (HAESCO)



Hong Kong Baptist University



Hong Kong Construction Association



Hong Kong Environmental Industry Association



Hong Kong General Building Contractors Association



Hong Kong General Chamber of Commerce



Hong Kong Housing Authority



Hong Kong Housing Society



Hong Kong Institute of Construction Managers



Hong Kong Institute of Steel Construction



Hong Kong Construction Sub-contractors Association



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Hong Kong Institute of Urban Design



Hong Kong Productivity Council



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Parks Corporation



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RICS



Singapore Green Building Council



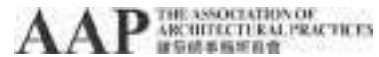
Sustainable Building Council
Bosnia and Herzegovina



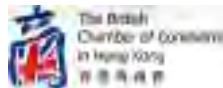
Sweden Green Building Council



The American Institute of Architects
Hong Kong Chapter



The Association of Architectural Practices



The British Chamber of Commerce
in Hong Kong



The Chartered Institute of Building
(Hong Kong)



The Chartered Institution of Building Services
Engineers (Hong Kong Branch)



The Chinese University of Hong Kong



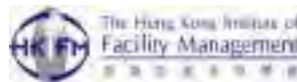
The Hong Kong Chapter of International
Facility Management Association



The Hong Kong Federation of Electrical and
Mechanical Contractors Limited



The Hong Kong Institute of Architects



The Hong Kong Institute of
Facility Management



The Hong Kong Institute of Housing



The Hong Kong Institute of Landscape Architects



The Hong Kong Institute of Planners



The Hong Kong Institute of Surveyors



The Hong Kong Institution of Engineering Surveyors



The Hong Kong Institution of Engineers



The Hong Kong Retail Management Association



The Institution of Mechanical Engineers (Hong Kong Branch)



The Open University of Hong Kong



The Real Estate Developers Association of Hong Kong



Vietnam Green Building Council



Water Supplies Department



World Green Organisation

Official Carrier



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