

The Accessible City



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The Accessible City

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PREFACE

This booklet is an interim report on the international research activities of the CIB Working Commission No.101 (W101) for Spatial Planning and Infrastructure Development. 'The Accessible City' is one of the current work programs of W101, which was decided at the commission meeting held on May 8, 2013 in Brisbane, Australia as a part of the CIB World Building Congress 2013.

The basic concept of "The Accessible City" advocated by W101 is described in the overview section of this booklet. As an expert group on spatial design, we are convinced that this is a significant step for planning policy now and in the future in order to make urban spaces and society more open and friendly to all the people living in cities, as well as to restore the valuable places that tend to be lost due to motorization, commercialization and even the advancement of information technology.

However, the specific aspects of urban issues differ from country to country, as evidenced by the various chapter titles of this booklet. It is both inevitable and enjoyable for international discussions to accept and respect such diversity. By recognizing diversity and considering its origins, we can understand each other better and achieve fundamental commonalities.

This booklet, as the first edition, consists of seven articles from seven countries at present. In the future, W101 is going to call for more authors again, while promoting the concept of 'The Accessible City' to the world.

April, 2014

Editorial Members of CIB W101





Photo by Morten Gjerde

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OVERVIEW

The Accessible City should be a "City for All" where people can easily and impartially reach the services they need in the city without hindrance. The Accessible City should also have public places with a high-quality built environment that is open to everyone. The popularization of modern technologies, such as motorization and internet communication, surely increase flexibility and convenience for most people, but also tends to separate people into individual and personal, creating invisible barriers to people who do not use a personal car. It also tends to lead to desolation of public places where people would otherwise naturally meet face to face. Therefore, current spatial planning should make a greater effort to create and preserve city spaces as truly 'Accessible for All',

1. Main Concept

The main concept of 'The Accessible City' should be a "City for All" where people can easily and impartially reach the services they need in the city without hindrance. The Accessible City should also have public places with a high-quality built environment that is open to everyone. In contrast, the "Non Accessible City" has many places that are closed, divided, disconnected and automobile dependent.

It is widely considered that popularization of modern technologies, such as motorization and internet communication, surely increase flexibility and convenience for most people, but also tends to separate people into individual and personal, creating invisible barriers to people who do not use a personal car. It also tends to lead to desolation of public places where people would otherwise naturally meet face to face.

Therefore, current spatial planning should make a great effort to create and preserve city spaces as truly "Accessible for All".

2. Key Factors of the Research on the Accessible City

- **Land Use Pattern & Transportation Network**

Most residents need to be able to reach places that deliver daily necessities and fundamental services such as medical care and education in a short travel time, either on foot or by frequent public transportation services. The Accessible City should be designed on the basis of universal design and social inclusion, which means not reliant on only automobiles.

- **Making Places for People**

The Accessible City should have places that are open to the public at key locations in the city. The places also should be designed with high quality built environment. In such places, people share the space with others face to face, regardless of age, gender, race, occupation, and rich or poor, thus facilitating connections among people and preventing isolation of individual residents.

- **Diverse Places**

There should be diverse places in the city, so that each person with different preferences can find their own comfortable places to be other than their house, so that people sharing the same interest have the chance to meet each other and get together. The Accessible City provides places for all sorts of people somewhere in the city.

- **City Government that Can See the Faces**

In addition to smarter on-line application services and so forth, the city government should be more accessible, more transparent, more interactive and more flexible, as well as easier to visit, observe and engage with. The public buildings in the Accessible City should be located in or close to the center and sub centers of the city and should be designed so as to embrace people rather than exclude them.

- **Tools to Assess Accessibility**

Appropriate indicators to the level of accessibility of a city are needed. But shown above, the Accessible City has various aspects, including geographical features, aesthetic design, public services and social situations. Therefore, research to find common indicators that properly reflect the level of accessibility of the cities will be significant.



Australia

David Ness



Connections and Synergies between Parts of Cities: Doing More with Less

Integrated planning, where the relationships and synergies between various services and between facilities are explored, may not only foster increased human interaction, but also deliver services and facilities in a more efficient, effective manner. Applying principles of system thinking and 'ideas networking' enables synergies to be uncovered, enabling more outcomes to be delivered with less inputs. This necessitates changes in mindsets so that departments and divisions may understand the benefits of working together, coordinating services and sharing facilities, and empowering the poor as equal or lead stakeholders.

1. Introduction

Creating opportunities for people to meet and interact begins with an integrated approach to planning, where various agencies work together for common ends, rather than in isolation. Unfortunately, it is often the case that transport planners plan transport systems, housing agencies plan housing, health planners plan health services and facilities, education departments plan schools, recreation and sport departments plan parks and sporting facilities, and so forth. Such insular thinking and approaches often leads to separation of services and facilities, with little consideration of how services might interact and facilities might be juxtaposed or shared. Furthermore, planning of separate services and facilities may be an inefficient use of resources; it may add un-necessary built footprint and lead to waste and excessive cost.

2. Proposition

Hence, the proposition put forward by this paper is that integrated planning may not only improve opportunities for community interaction and accessibility of services, but also enable more

efficient use of resources (energy, water, land, materials), reduce cost, and reduce emissions and waste.

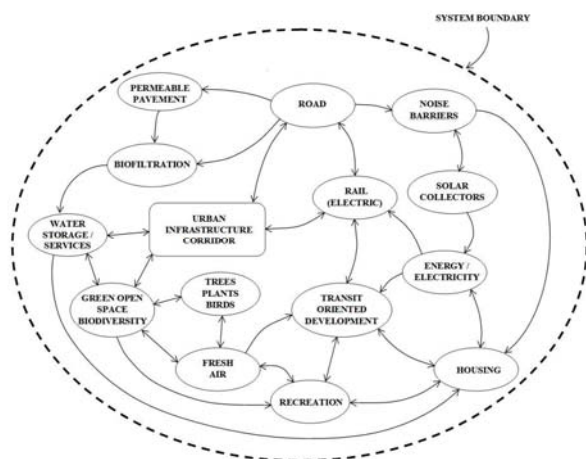
Breaking down the barriers between 'departments', and between 'divisions' within departments, may lead to improved community outcomes than may be achieved by more isolated, separate approaches. Cross-division and trans-disciplinary approaches to planning and projects may uncover creative synergies and innovative solutions, especially when accompanied by social inclusion, where 'win-wins' may result from cooperation among government, corporate and community stakeholders.

3. Theory

Alexander (1964) was one of the first to demonstrate that, in tackling complex problems (including urban planning), it is possible to uncover 'functioning linkages' between ecological balance, population growth, social conditions, the transportation system, and water and energy resources, recognizing that "each of these issues interacts with several of the others" (p.3). He introduced the notion of 'ideas networking', which



later was more developed as 'system thinking' (Checkland, 2001). This enables multiple perspectives to be taken of a particular problem, 'zooming out' for strategic planning and synthesis and 'zooming in' for in depth analysis. An urban transport corridor can be viewed from a narrow viewpoint, including the road or rail infrastructure, the traffic and so forth. On the other hand, by taking a wider perspective we can examine its linkages to land use planning, housing, biodiversity, and energy and water systems. As shown in the diagram, water from a road may be harvested by permeable pavements, bio-filtered and serve the natural environment, green recreational space and adjacent housing. Noise barriers may double as solar collectors, which provide energy for electric rail transport, transit oriented development and housing.



Integrated infrastructure systems (Ness, 2008)

To take an actual example, the active, beautiful and clean waters program in Singapore views water in a much wider sense than just water supply ('mono-use'). Rather, it demonstrates

'multi-functionality', using water to add urban vitality, recreational opportunities and economic growth potential, thereby improving the quality of life of residents. These principles can be extended to wider planning of services and facilities within a city, inclusive of the views of various stakeholders.

In this regard, 'soft systems methodology' (Checkland, 2001) enables stakeholders to express their 'world views' of a desired future, which can then be networked to discern linkages and clusters. Some may highlight the need for local jobs and services, while others may envisage increased walking and cycling routes. Such ideas may be linked to uncover synergies. For example, availability of local jobs, public services and shopping facilities, with ease of access from housing, will not only reduce travel demand, reduce congestion and emissions, but also promote walking, healthier lifestyles and social interaction.

4. Integrated and symbiotic planning

The OECD (2007, p.15) noted that various infrastructure systems such as transport, energy and water show signs of increasing convergence: 'the various systems interact ever more closely with one another and engender all kinds of synergies, substitution effects and complementarities'. This thinking is reflected by the UN (2011), which promotes integration across sectors and between institutions, leading to improved eco-efficiency.

The Swedish 'SymbioCity' concept (2013) is also based on symbiosis – 'the integration between two or more organisms in a mutually beneficial union', as is evident in natural ecosystems. To take a simple example, banyan trees and banyan wasps



benefit mutually from each other. Indeed, neither can survive if separated from each other. The tree relies on wasps for pollination, while wasps rely upon the tree as their habitat and foraging location for larvae. Such understanding has inspired industrial ecology, whereby various enterprises have a mutually inter-dependent relationship, with waste from one becoming the raw materials for another, within a holistically planned eco-industrial precinct.

SymbioCity regards urban areas in a similar holistic manner; it identifies the links between landscape planning, waste management, architecture, information and communications technology, urban functions, industry and buildings, energy, transport, water supply and sanitation. Unlocking the synergies between such urban systems then leads to a wealth of environmental and economic gains, including increased resource efficiency.

5. Case study: cooperative educational and community facilities planning

The South Australian Strategic Infrastructure Plan (2005) is underpinned by key principles, including close collaboration between government agencies on the management, use and co-location of assets. Shared and multiple uses of assets through co-location is strongly promoted, as is the design of adaptable and multi-purpose facilities - as illustrated by the following example.

A regional town in South Australia was served by three secondary schools, which had experienced declining enrolments, and a new centralized school was under consideration. At the same time, the regional technical and further education department

was considering expanding their services and range of courses, as was an adjacent university. In addition, the municipality was planning a new community library. Instigated by a government infrastructure agency charged with coordinated planning across government, the various parties were encouraged to converse and consider the inter-relationship of their services and facilities. It emerged that secondary students and staff could benefit by interaction with students/staff from the further education and university sectors, also the wider community. The opportunity for a joint, shared campus and library then arose, with the educational campus shared by the community, a concept that was greeted enthusiastically by the various parties. This would also reduce building footprint, overall cost, and achieve greater utilization of the shared space.

6. Equitable access and social inclusion

As the UN (2011) has emphasized, urban poor communities can and want to manage the development of their settlements. It has applied an integrated, participatory and bottom-up approach to pro-poor settlement in Asia, such as the Miraculous Hills Resettlement, Rodriguez, Philippines. The UN Economic and Social Commission for Asia Pacific (UNESCAP) worked with community organizations such as the Homeless People's Federation of Philippines, eliciting the needs of the marginalized via focus groups, visioning workshops and the like. Institutionalizing partnerships among local actors, including governments, urban poor communities, the private sector and development practitioners was an effective way to find 'win-win' solutions. The



Aga Khan award winning Citra Niaga development in Samarinda, East Kalimantan, exemplifies such an approach – with the underlying idea of ‘urban development without eviction’. The mixed use commercial development project was conceived through collaborations with central and local government, the private sector and, most importantly, with the low income inhabitants and street hawkers, all who are represented on a board. In addition to an open space for gatherings, a performance space and amenities, the project consists of house-shops for high to middle income earners, kiosks for low income level, and pavement stalls (*kaki lima*) for the lower income level. Profits from the sale of house-shops subsidized the development of the *kaki lima*. Although a certain percentage of the development is occupied by the low income vendors, providing security and profit for them and the local community, the developer also managed to earn a considerably higher rate of return. This shows how ‘win-win’ equitable solutions are possible through stakeholder partnerships and synergies (Aga Khan Development Network, 1986).

7. Conclusion

The paper has illustrated how integrated planning, which breaks down the barriers between bureaucratic ‘divisions’ and forms partnerships between stakeholders, can result in more community benefits with less resource use, less pollution and waste, and less cost. Synergies can be uncovered between various services and facilities, increasing opportunities for community interaction and making the city more accessible to all, not least the urban poor and marginalized.

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Brazil

Alex Kenya Abiko and Mario Barreiros



Urban Sustainability and Neighborhood Impact Assessment in Brazil

The Neighborhood Impact Assessment (NIA) is a tool that can assist both entrepreneurs and governments that are concerned with reducing the negative and maximizing the positive aspects arising from new building developments or related activities in urban areas.

Current Brazilian legislation is not however sufficiently comprehensive for this type of evaluation to be focused on environmental sustainability issues. In this brief paper we argue that environmental problems such as over-exploitation of natural and urban resources (water, urban structures, etc), global warming (CO₂ and methane), threats to human health and comfort (emergence of urban heat islands) and groundwater recharge could ideally be incorporated into relevant sustainability studies.

We conclude that the inclusion of sustainability requirements in NIA legislation could be an important tool for making newly urbanized areas - settlements, horizontal condominiums and social housing developments - more environmentally sustainable, as well as contributing to cities becoming more accessible

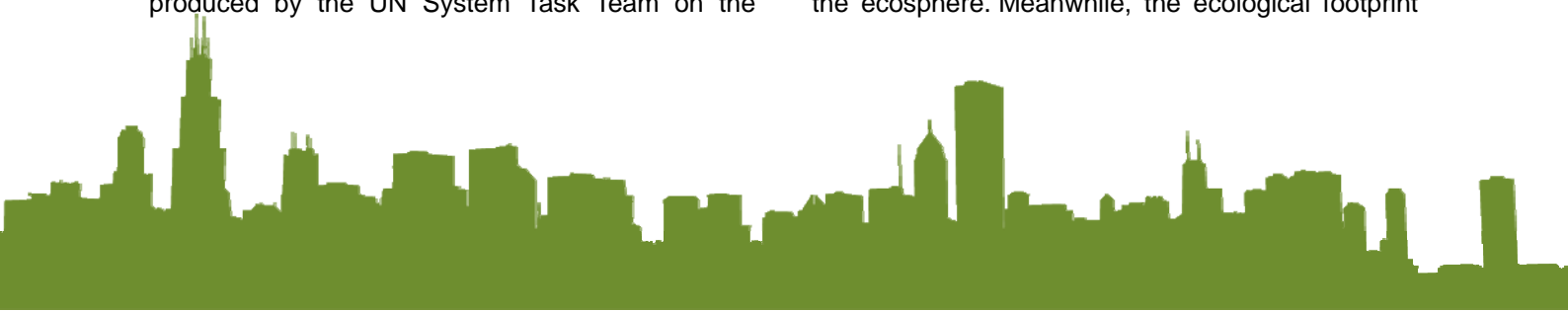
1. Urbanization Process and Sustainability

Since the publication of the landmark book "*The Limits of Growth*" by D.H. MEADOWS et al. (1972), we have witnessed growing concern by governments and the academic sector with the question of the finiteness, and consequently the sustainability, of natural resources. The threat of the depletion through excessive exploitation of the natural resources needed to sustain the activities of modern industrialized societies, and the receding likelihood of such resources being renewed, has become a major topic on the policy agendas of many countries, the UN and other international organizations.

Linked to the problem of natural resources exploitation, worldwide population growth (totalling 7 billion people in 2011 according to UN Habitat, 2012) is a further significant issue affecting the sustainability equation. According to the report "*Sustainable urbanization - Thematic Think Piece*", produced by the UN System Task Team on the

Post-2015 Development Agenda (UN Habitat, 2012), rapid population growth has advanced hand in hand with intensive urbanization at global level. In 2007, the UN calculated that for the first time in history 50% of the world's people lived in cities and towns, a percentage which has since continued to increase.

The impacts of urbanization are closely related to the issue of sustainability, given that natural resources are obviously required for cities and towns to take root and be maintained over time. These resources consist not only of building materials but also of the multifarious other inputs, including water and energy, needed for urban-based activities. These renewable or non-renewable resources in turn generate waste in the form of solid matter, liquid effluents or gases. REES (2012) argues that cities are increasingly unsustainable, and can in reality be likened to "Black Holes", consuming what is produced by substantial parts of the ecosphere. Meanwhile, the ecological footprint



forges ahead due to population growth and burgeoning consumption. Some countries have an ecological footprint 15 times larger than their entire territories. This is the case, for example, of the Netherlands. Rees is adamant in his view that calculating ecological footprints is important for planning sustainable urban development strategies. Sustainability is not confined to what is actually consumed by cities. The sustainability and environmental quality of urban areas are also seriously affected by the byproducts of consumption (solid waste, effluents, heat, particulate contaminants, etc). While construction and demolition waste is probably produced in greater quantities than household waste (AGOPYAN, JOHN 2011), raw household sewage, industrial effluents and other waste products entering water bodies are the major causes of the pollution of rivers and streams running through urban areas.

Even more disturbing, the release into the atmosphere of gases and particles from fuels burned in cities by transport, industry or in the electrical energy generation process, is increasingly responsible for climate change (CARTER et al., 2007), and evidence exists that this kind of pollution is also associated with lung cancer and cardiovascular and other diseases (POPPE III, ARDEN et al., 2002).

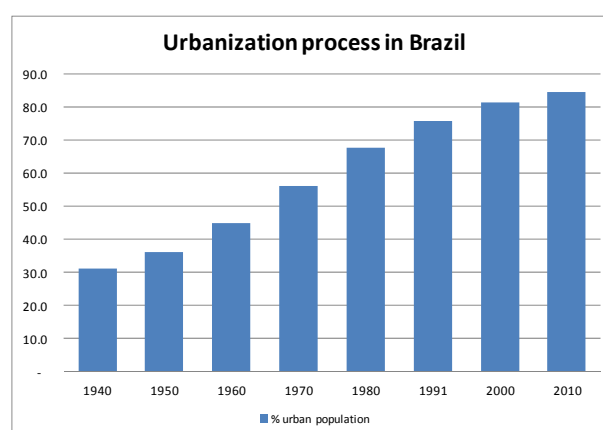
As for urban impacts, we also need to look at the problem of Urban Heat Islands (UHI), which are a product of the size and density of buildings located in urban areas. OKE (1967) shows that a direct relationship exists between the size of cities and heat islands, from which it can be deduced that erecting a new building or the development of a site

is bound to have a greater or lesser impact on ambient temperatures, depending on the size and scale of the particular buildings envisaged, the type of materials employed in their construction and their reflectance ratio. The link between UHI and summer storms studied by BORNSTEIN & LIN (2000) also needs to be taken into consideration. .

Drainage is another important issue to consider vis-à-vis the environmental sustainability of cities. Altered rainfall patterns (heavier rainfall, etc) are for example current features of climate change (ASHLEY et al., 2005).

2. Urbanization and Neighborhood Impact in Brazil

According to the Brazilian Institute of Geography and Statistics (IBGE) 2010 Census, 84.3% of Brazil's population now live in urban areas. Of the country's 190,732,694 people, over 160 million live in cities. In the graphic below it is shown that this urbanization process had decreased in the last years but it is still an important issue.



Source: Brazilian Institute of Geography and Statistics (IBGE)



The most logical approach by government and society has therefore been to focus concern on improving urban living conditions. Concrete expression of this concern was the approval in 2001 of Law 10.257 which introduced the "City Statute" (CARVALHO; ROSSBACH, 2010).

The City Statute sets down official norms and standards governing the use of urban property in the public interest, basically to enhance the safety and welfare of citizens, as well as to ensure environmental balance.

FERNANDES (2010) points to the fact that the City Statute has been acclaimed internationally. Brazil was, for example, inscribed in the UN Habitat "Roll of Honour" in 2006, partly for having approved this law - which finally provided a legal framework for a series of wide-ranging reform proposals put forward by interested stakeholders and other sectors over many years against a background of social, political and legal dispute. All in all, the City Statute constitutes a key instrument for working towards the "Accessible City" - a place where services are available and within the reach of everyone.

One of the provisions of the City Statute is the Neighborhood Impact Assessment study aimed at analysing the positive and negative effects of construction/development projects or activities on the quality of life of the population living in and around urban areas.

This NIA should include details of at least the following:

- population density;
- urban and community amenities;
- land use and occupation;
- real estate prices;

- traffic generation and demand for public transport;
- ventilation and lighting;
- urban landscape and natural and cultural heritage.

The above are the minimum requirements called for by Federal Law. Local governments and councils are expected to use these provisions as a benchmark for pursuing their specific town planning interests, and in particular to ensure that spatial planning, for example, conforms to the criteria laid down for authorizing building projects and other activities.

Since the 1980s, Brazilian society has been aware of neighborhood impacts associated with environmental problems. Despite this perceived concern, the aforementioned City Statute fails to mention (or contain a specific provision on) questions related to neighborhood environmental sustainability. Nor does it make any mention of the positive contribution that well-planned and executed building developments or other activities could make to mitigating negative environmental fallout. A desirable list of topics that could have been incorporated in the Statute includes: greenhouse gas emissions (GHG), pollutants and particulates, solid waste, sewage, solar radiation absorption, infrared waves, soil sealing and other related topics. SHARIFI & MURAYAMA (2012) evaluated 7 methodologies for neighborhood impact assessments: LEED-ND (US); Earth Craft Communities-ECC-(US); BREEAM Communities (UK); CASBEE-UD (Japan); HQ2-R(France); Ecocity (EU) and SCR (Australia). These authors concluded that despite differences of approach due



to the different methods used and a degree of analytical subjectivity, the use of Neighborhood Sustainability Assessments could nevertheless prove to be useful for urban planning policy and decision-making. The authors make no secret of the fact that the NSA are still undergoing trials and improvement, but they are convinced that the assessments will make a positive contribution to developing awareness of sustainability in this particular area.

3. Suggestions of Technical Criteria for Assessing Sustainability with NIAs

The following suggestions are divided into two sections: (i) an assessment of the impacts associated with sustainability and (ii) the adoption of measures to mitigate the impacts that affect the sustainability of the particular development project or activity and the surrounding area (neighborhood).

The basic items to be evaluated are:

- A CO₂ footprint of the new development, taking into account the number of residents and mean CO₂ production per person;-
- Annual consumption of clean drinking water;
- Annual production of household sewage and its final disposal;
- Annual production of solid wastes and final disposal;
- Production of methane gas based on solid waste studies;
- Production of recyclable material and its disposal;
- Annual estimated consumption of electricity;
- Annual gas consumption;
- Annual projected volume of stormwater on the total

land area of the development project or activity;

- Total impervious area (and percentage) vis-à-vis total land area, and forecast volume of water in the rainy season;
- Contribution of the development or activity to the creation of a 'Heat Island' in the neighborhood, taking account of construction materials characteristics (rate of absorption and reflectance).

4. Conclusion

As we can see, the Neighborhood Impact Assessment (NIA) is a tool that can assist both entrepreneurs and governments that are concerned with decreasing the negative and maximizing the positive aspects arising from the implementation of a new building development or activity in urban areas.

However, current Brazilian legislation is not sufficiently comprehensive for this type of evaluation to be focused on environmental sustainability issues. We argue that, for example, over-exploitation of natural and urban resources (water, urban structures, etc), global warming (CO₂ and methane), human health and comfort (emergence of urban heat islands) and groundwater recharge could be incorporated into the assessment studies.

The inclusion of sustainability requirements in NIA legislation could be an important tool for making newly urbanized areas - settlements, horizontal condominiums and social housing developments - more environmentally sustainable, as well as contributing to cities becoming more accessible to



people as a whole.

Regardless of the existence of voluntary-type environmental certification regulations at the local government level, the provision of permits for new developments and activities should enable newly urbanized spaces to benefit from measures designed to ensure more sustainable occupation. This in itself would significantly improve overall quality of life for people living in Brazilian more accessible cities.

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Finland

Pekka Lahti



Accessibility Paving the Way to Global Cooling

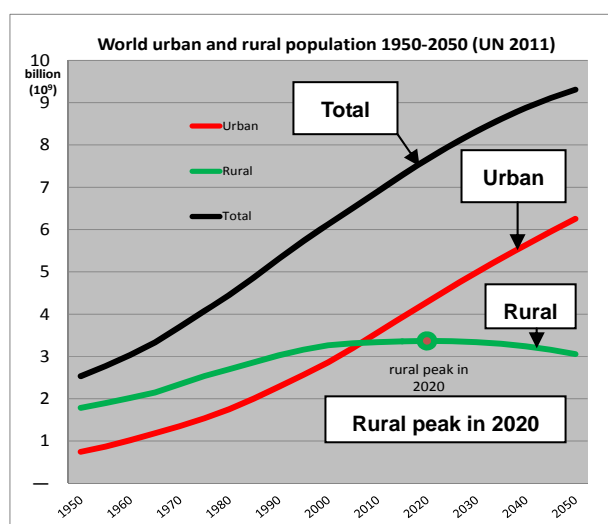
The cities are responsible not only for the majority of global greenhouse gases but also for innovations needed to solve the problem of global warming. It is perhaps impossible to predict whether there will be enough and soon enough novel technologies and eco-efficient innovations, but urban developers and designers have their specific task to promote urban eco-efficiency independent of that. Urban density can be increased, walking, cycling and public transport promoted. When accessibility is improved less infrastructure is needed and travel behavior will change.

1. The causalities between climate change, urban growth and urban accessibility

Urbanization is an expression of economic growth. New innovations are emerging especially in urban settlements. Big urban agglomerations are commonly known as platforms for new innovations and locomotives of national economies. In post-industrial society the main economic drivers and accelerators are information technology and new services networking together in complex and often unpredictable ways. The mixture flourishes especially in creative urban environment.

The current phase of urbanization is historically exceptional. Soon we will enter the era of almost complete urban dominance¹.

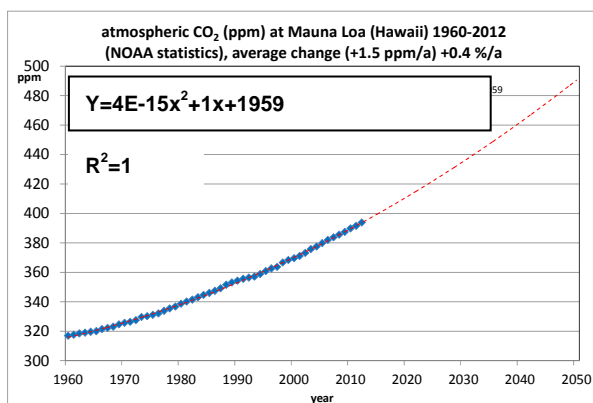
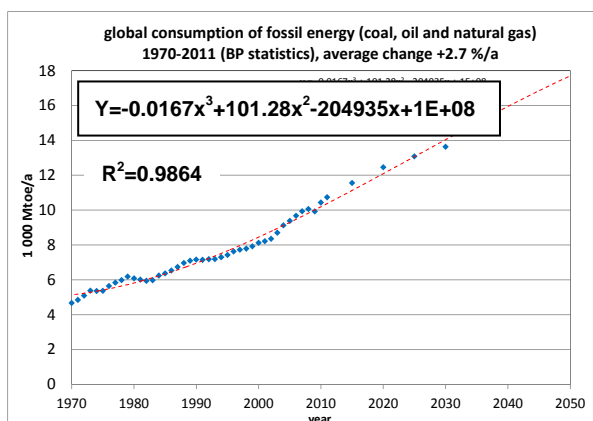
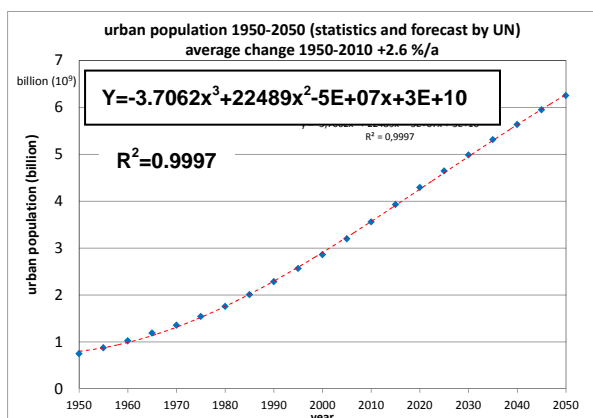
¹ According to UN statistics (2011) the world population has been mostly (over 50 %) urban since 2008. Moreover, according to UN prospects (2011) the rural population will peak rather soon (around 2020) and after that the world population growth is totally based on urban growth.



The global population prospect until 2050 by UN (2011) shows that the big picture is urbanization and after 2020 the global growth is totally urban.

This creates an interesting ecological dilemma, which can be called *the ecourban paradox*. On the other hand the increased productivity allows increased consumption of materials and energy (often interpreted as growing living standard and welfare) creating environmental problems like pollution, global warming, loss of biodiversity etc.



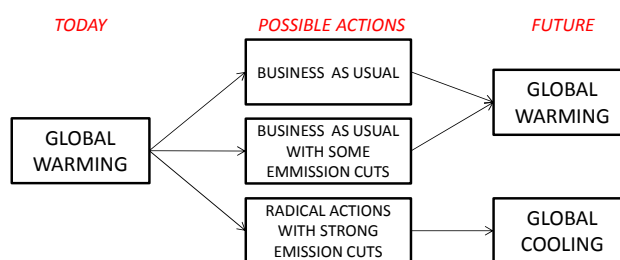


Statistical trends describing the strong correlation between three global phenomena: urban population, consumption of fossil energy sources and atmospheric carbon dioxide (Lahti 2013 based on UN, BP and NOAA statistics)

On the other hand urbanism creates new arenas and social networks stimulating scientific,

technological, social and ecological innovations. Some of them like solar power, bio fuels, fuel cells, low-carbon buildings and vehicles, distributed energy networks, carbon capturing, recycling of water and waste, hydroponic urban agriculture, telework etc. are expected to solve the environmental problems.

The crucial question is: can or will the new eco-efficient solutions replace the old ones rapidly enough to turn the curve of increasing atmospheric CO₂e level to a decreasing track? If yes, then global warming will finally turn into global cooling.

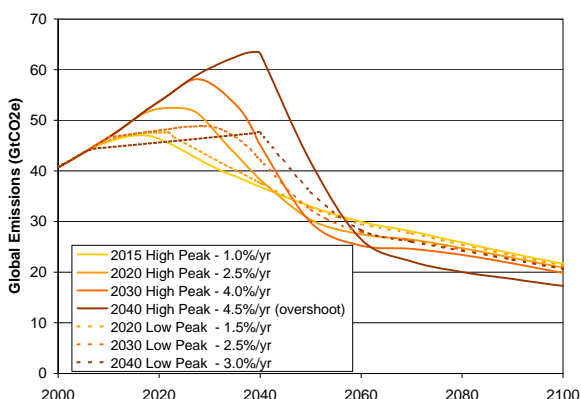


Options to global warming or cooling

2. Billion dollar question

Sir Nicholas Stern (2006) showed that the global warming can be stopped to the level 500–550 ppm CO₂e by 2050 using only one percent (-1...+3.5 %)² of the global GDP to investments in new technology and other innovations – “if we start to take strong action now”. The later we start the harder it gets.

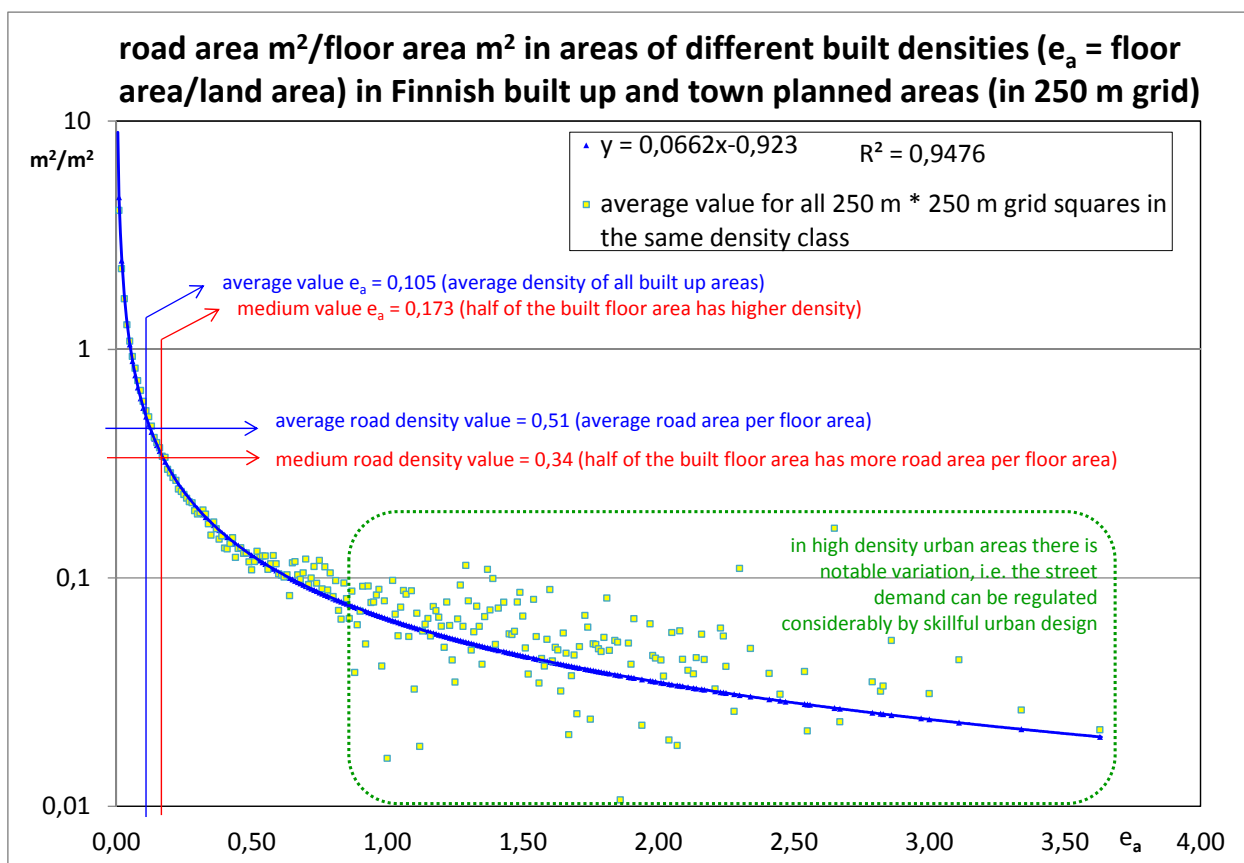
² actually Stern himself later (2008) doubled his estimate to two percent because of updated data on carbon emissions (Jowit & Wintour 2008)



Meinshausen's (2006) six scenarios of possible emission cuts (%/year) on how to achieve the required level of carbon emissions 500–550 ppm CO₂e by the year 2050 (Stern Review 2006).

The global GDP³ in 2013 was approximately 87 billion international dollars and during 2015 it will reach 100 billion international dollars (IMF 2013). One percent of this is one billion dollars. Can global warming be stopped by one billion dollars and what is the specific role and share of urban planners and designers in that endeavor?

Different urban forms and development patterns require different amounts of materials, energy and produce different amounts of emissions and other impacts.



*Higher building density (e_a) requires less infrastructure (like roads and streets) per capita than lower density. The correlation is very strong. Evidence from Finnish built up areas (total of 339 million sq.m floor space and 3 223 sq.km land area) in 2013 is based on data from official sources (Building Register and Digiroad) aggregated in 250 m * 250 m grid (Lahti & Rehunen 2013).*

³ Gross domestic product based on purchasing-power-parity (PPP) valuation of country GDP



Generally, expanding urban agglomerations require ever more extensive technical infrastructures, transportation, energy and water systems. Larger daily urban areas mean growing average distances between homes, jobs and services. This creates greater traffic volumes and larger space needs for transportation and other technical infrastructure. Increasing fuel consumption and emissions per capita follow.

However, higher urban densities require less land and infrastructure than lower densities, provide higher accessibility, shorter distances and lower energy consumption and emissions.

Higher densities, shorter distances and better accessibility support also walking and cycling thus decreasing the need for using cars and other motorized vehicles increasing urban eco-efficiency, resilience and global cooling. Travel behavior has its health impacts as well. Recent study in the city of Oulu showed that the farther from the city centre people live, the higher is their weight index⁴. The impact starts from 5 km and is still effective in the distance of 180 km. The closer to your job and services you live, the more probably you will walk, cycle or use public transport. Urban planning and design matters.

In theory, urban growth can also take place without increasing the urban land area, but then new construction must happen only within existing urban boundary. Building density can also grow when

⁴ The data is from the ongoing doctoral study of Tiina Lankila in University of Oulu (Väyrynen 2013)



Pedestrian and cyclist friendly traditional European cities Amsterdam (Netherlands) and Lucca (Italy) (photos: P. Lahti 2009 and 2011)



using infill options (utilizing inefficiently built or totally unbuilt areas, brownfields, waste land etc.) and constructing vertically (on top of existing buildings or underground).

Scientifically and especially for the motivation of urban developers, it is interesting to find out relevant and effective causalities between urban form and carbon footprint. Urban growth as such is not a result of urban planning but socio-economic development. Instead, questions of land use and urban form, like overall building densities, street network pattern, sizes and shapes of building blocks and buildings, transport systems, location, amount and type of parking facilities and urban green areas etc. are natural elements of urban planning and design. Many of these have a close connection with accessibility.

Accessibility, and consequently transportation volumes, can be used as sub-indicators of urban eco-efficiency. Transportation is responsible for approximately 14 per cent of global greenhouse gases while residential and office buildings (their heating and electricity) are responsible for about 15 per cent (see for instance Baumert et al. 2005).

3. Tools to assess urban carbon footprint

Urban growth creates new economic values and

welfare to the whole community. Urbanization seems to be one of the central targets on the way to better living conditions. The urban population is growing even in the highly urbanized and old industrial countries in Europe and North America – and according to UN prospects (2011) it will grow at least until 2050. Due to growing living standard (floor space per capita) the urban built space is expanding even faster.

In theory the carbon footprint of urban development is rather easy to determine by subtracting the greenhouse gases released by the urban development from the greenhouse gases embedded (captured) in the urban environment including both carbon sinks in the built environment and urban green and blue areas. In order to allow comparisons between alternative plans or design schemes the result can be divided by the number of inhabitants or by the amount of built floor space (Lahti 2013).

The practical problem is where to get valid data for all relevant elements of the process in order to calculate the total and global net impact. The data is needed for all types of urban built form and for all phases of the life-cycle of urban development (including construction and operation of urban units as well as transportation). The specific impacts

<p>net carbon footprint of urban development</p>	<p>=</p>	$\frac{\text{ghg captured from the atmosphere (GtCO}_2\text{e)} - \text{ghg released to the atmosphere (GtCO}_2\text{e)}}{\text{number of inhabitants and jobs (persons) or total floor area (m}^2\text{)}}$
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Formula for global cooling by urban development (Lahti 2013). If the nominator (and the whole result) of the equation is positive, then the development contributes to global cooling. The bigger is the result, the more effective is the planned development option. The relative figure per capita enables comparison to an alternative option or a neighbouring area.



(embedded and released carbon per unit) are needed also in different geographical and climatic conditions.

4. Towards carbon neutral world and cities

Since the Kyoto Protocol in 1997 more than 200 countries have set their goals to mitigate the climate change. The latest EU framework on climate and energy for 2030 was presented 22 January 2014 by the European Commission. It sets the target to reduce greenhouse gas emissions by 40 per cent in 2030 compared to the level of 1990. The previous EU target (2007) was 20 per cent by the year 2020. EU's goal of reducing greenhouse gas emissions by 2050 is 80–95% below 1990 levels (EC 2014).

Many cities have already set their target to be a “carbon neutral city” in 2030 or 2050. To be able to assess and validate the actual development they need scientifically reliable tools and databases. A variety of tools already exist and a lot more are under construction (Lahti 2013).

If and when a reliable calculation result is available, it can be compared with the global average or with the neighbouring city or region. Those urban development plans and projects that can show a positive impact (decreasing level of carbon emissions) to the net carbon balance can claim that they are contributing to the global climate change targets. But *only if* the calculation includes *all elements* in the urban development process covering *all phases* of their life-cycle.

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Japan

Tatsuo Akashi



Land Use Suitability Assessment for Making Cities More Accessible'

The accessibility of a city in the spatial context is affected mainly by land use and transportation, such as how compactly the urban areas are formed, how optimally the regional service facilities are located and how densely and frequently the public transportation services are operated. The level of accessibility is estimated by such indices as the ratio of population who live in areas that are accessible to a certain service within a certain travel time on foot or by public transportation, without using a private motor vehicle, so as to measure the current state of a city, compare it with other cities and establish desirable targets for the city in the future.

1. Introduction

The concept of the Compact City has gained much attention in recent urban policy aspect in Japan, together with “urban renaissance”.

The compact city has been advocated in view of sustainability such as low energy consumption in European and other developed countries, but in Japan, the policy on the compact city is mainly driven by the perspective of the national population, which started to decrease since 2007, as well as rapid aging.

Looking the typical form of urban area in Japanese cities, especially suburban and local cities, have quite a few sprawled housing areas on the outskirts. In addition, important service facilities that attract many citizens such as retail stores, hospitals, libraries, halls and even the city government buildings are hollowed out from the center toward the suburbs. This occurred during the era of urban population growth, but still continues even after population growth has stopped. As a result, figure of urban area became more or less spread and scattered, and thus cities have become dependent on automobiles. However, now that the population is

decreasing over the long term, it will inevitably generate vacant houses here and there that cause inefficiencies in infrastructure services and maintenance costs will become a major burden in the near future, which we need to avoid.

2. Problems

Scattered urban formation is assisted by private cars, and as everyone knows, private car has been one of the leading industries of Japan. It is sure that private car expands mobility for large number of people, but it's not for everyone. We should pay more attention to the fact that there are people who are not able to use their private car, and even though automobile users are the majority, they are never a small number. Therefore, housing areas without frequent public transport services divide people depending on their mobility, and people who are not able to use their private car are excluded from many opportunities in their daily life, including for social interaction, due to the automobile dependent urban structure.

Seen from another angle, the market in a free economy tends to ignore the needs of the minority,



such as people without a private car, which we could call it as a “market failure”. Thus, urban area generally has a tendency to be spreading and scattering, become less accessible for people who do not use a car when it’s leaved, contrary to be more accessible for people who use car. Spreading and scattered tendency is seen in not only the locations of residential developments but also commercial, medical, educational and other public facilities. That is why the intervention of special planning is required, according to the context of the Accessible City.

3. Policy Direction

The policy direction of the compact city is described as “Redesign Cities to be Livable on Foot”. This means that cities should be accessible by public transportation, which is one of the basic aspects of the Accessible City.

According to this context, the term “compact city” does not necessarily mean the physical form of an urban area such as small and densely consolidated, but it means performance based condition of urban structure that residential sites and service facilities that necessary for everyday life should be located close together or should be connected closely by frequent public transportation. In other words, it allows diverse of urban form, for example, densely mixed use, linear or finger shaped with public transport axes, or multiple small urban areas scattered but connected with each other by frequent public transportation.

4. Indicators

Indicators for measuring accessibility have been

studied intensively, but few are designed for measuring the performance of a city in view of public transportation. For example, PTALs developed by Transport for London (TfL) is seemingly the most well known indicator, but it only stands the supply side of public transportation without where to go. In order to provide more appropriate indicators to describe the level of accessibility of a city in view of people’s quality of life, the author and NILIM members have proposed the following indices;

(1) Accessibility Index T

The first indicator, “Index T”, reflects the accessibility level of each part of the city in order to identify areas with good and poor accessibility (See figure 1). It is measured by expected transit time by public transportation including on foot, but not by private car, from each place in the city to a specific facility that provides a certain service to access. Technically, each location is denoted by a 100-m size mesh in principle that covers the whole habitable area of the city. Facilities to access are selected as basic services in terms of quality of life. Expected transit time includes expected waiting time in order to reflect frequency of operation of public transportation services.

(2) Accessibility Index P

The second indicator, “Index P”, estimates the accessible performance of the whole city. It is defined as the ratio of population living within a certain level of accessibility, for instance, within 30 minutes to the nearest medical service by walking and public transportation. The objectives of Index P are to put a measurable goal to improve the quality of life of the citizens of the city, as well as to



compare performance among different cities as a benchmarking indicator.

5. Places to Access

Quality of life in a city mainly consists of several different factors corresponding to services provided by specific facilities located at specific sites in the city. Accordingly, the performance of accessibility should be measured as the time taken to access to such facilities. The following basic facilities are selected.

(1) City Center

The city center means the place that represents in the city as a symbol where people have gathered historically. The place usually located in the downtown district, but form of the place is various such as traditional plaza, square, park, high street or even a symbolic intersection in the commercial district. Openness to the public at all times is a basic requirement. Such places can be accessed by all peoples, allow people to enter freely and to meet face to face, and sometimes play a role as a place for freedom of speech of citizens.

(2) Central Station

The central station generally serves as a gateway of the city. It is the nodal point that connects the city to other cities, so the time taken to get to the central station from any part of the city by public transportation reflects the accessibility of the place to other cities. Considering a factory or a business office in the city as a example, the time taken to travel by public transportation including waiting time from factory or office to the central station indicates its accessibility for visitors from other cities. The total number of employees within, for example, 30

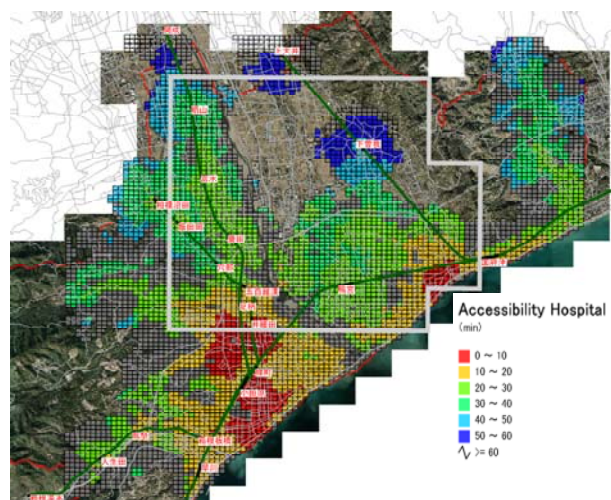


Figure 1, Accessibility Index T for Medical Services

minutes from the central station could be used as an indicator of job accessibility as well as part of the labor environment of the city.

(3) Hospitals

Access time to medical services is one of the most basic indicators that represent the quality of life in fundamental means, especially for an aged society. Recently, hospitals located in the center in the inner area of the city are tending to move to the outside fringe due to the growing demand for larger floor space. However, we should not underestimate the various effects of central or subcentral location of such facilities including on daytime pedestrians that make streets alive, enable frequent visits by family members that strengthen relationships and so forth.

(4) Elementary Schools

A group of elementary school children walking in line to school is common sight in residential areas in Japan. It reflects the good situation of the district physically and socially symbolizing safety and security for children from both traffic and crime. Walking to school is good both the physical and

mental development of children. Accordingly, residential districts for families should be designed sufficiently compactly to enable children to walk to school on foot, which is a basic requirement for accessible housing areas.

(5) Grocery Stores

Needless to say, foods and daily commodities are essential for living, but motorized society makes it harder for people without a private car to go out and buy goods, and can also cause solitude and social withdrawal for the elderly. Thus, physical accessibility to grocery stores can be used as an index for healthy everyday life. We should pay attention to the fact that the location of grocery stores principally subject to the market reflected consumer's total demand of the neighbors, but we should pay more attention to the fact that motorization often distort the choice of location of the stores reflecting only demand of consumers who drive a private vehicle and exclude the rest.

6. Land Suitability Assessment

As mentioned in the beginning, the population of Japan is starting to decrease, which means that the total area required for houses will continue to decrease by long time perspective, but without strict regulations on land use control, sprawled urban development in outskirts of urban areas, that caused by motorization, will continue, whereas there will be increase of vacant houses at the same time It will be required for spatial planning to specify which areas should be maintained and which areas should be de-urbanized as it's called "shrinking policy", but the decision to "shrink" an area will be hard and painful. In this context, the author has been developing a

planning methodology called Land Suitability Assessment (LSA). LSA was originally developed by KRIHS in Korea, and was mainly used to control urban expansion. However, a Japanese version of LSA should be emphasize on appropriate guiding the reform of existing urban areas including shrinking policy. Measuring and mapping the accessibility of every part of a city will be the key component of the LAS Japan.

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New Zealand

Morten Gjerde



Facing up to Nature: New Zealand cities are changing to become more resilient

Devastation caused by the spate of earthquakes that struck the Canterbury region in 2010-2011 has created an opportunity to transform the city of Christchurch. Efforts to make the city more resilient will also make Christchurch more livable. The paper discusses the background to key changes and touches on how learnings from the quakes are affecting other cities as well.

1. Introduction

Beginning in late 2010 the people of New Zealand were re-awakened to the precarious nature of their existence on these small islands in the South Pacific Ocean. From September 2010 and through the whole of 2011 a sequence of earthquakes and aftershocks continued to rattle the residents of Christchurch, largest city in the South Island. Also during the year a large earthquake and tsunami ripped through Japan's northern islands and several large storms swept across countries around the Pacific as well as other places. With acute awareness of the potential of natural disasters and many witnessing first-hand the frailty of buildings in their path, public attention has turned to how best to plan for future events such as these, because there can be no doubt they will strike again.

A majority of Christchurch's built heritage has been damaged beyond repair and over 1,000 buildings in the central area have been demolished. Nature can at times brutal as it exposes the frailties of our built environment during a disaster. Most of the buildings in Christchurch that failed were well below current structural engineering requirements (Canterbury Earthquakes Royal Commission 2011).

This is largely because engineering standards have continued to increase since they were first introduced following the Hawke's Bay earthquake of 1931. As higher standards are only applied to new building proposals or those caught by applications for a change-of-use, the vast majority of buildings fell below contemporary engineering safety standards. Another key factor contributing to vulnerability of buildings was poor maintenance. Field investigations following the two most devastating earthquakes highlighted the extent of deferred maintenance, concluding that this contributed significantly to the failures of loadbearing masonry wall systems. Leaks in rainwater systems and the building fabric generally had in many cases caused deterioration of ties and other forms of reinforcement in masonry walls. Reviewing all of the circumstances around building failures, it would appear that the citizens of Christchurch had been denied access to a safe built environment for some time.

Responses to the Canterbury earthquakes can be traced and discussed at two different levels. The first is focussed on the acute situation around Christchurch and its suburban areas. There is an



opportunity to rebuild the city by applying experiences gained during the past three years, both positive and negative. There is clearly a collective intention to build back better (Easton 2013). Following this, some of the responses at the national level are raised.

2. Access to a safer city

Redevelopment plans for central and suburban Christchurch emphasise the importance of urban form and the open space network. With a view to making the city more resilient, a natural tendency is to focus on the buildings. Certainly the new

structural codes will enable new buildings to be stronger so as to better withstand future shocks, whether by extreme weather, earthquakes or other natural phenomena. This *engineering* resilience approach seeks to resist disruptions to the stable state. However, informed by emerging research in the field of urban resilience, planning will also help ensure Christchurch is better able to “roll with the punches” when disaster strikes. An *ecological* resilience approach recognises the value of the city’s open space network and of the city’s developing polycentric form, among a range of other qualities (Allan and Bryant 2011). Public open



Figure 1: Diagram of the redevelopment plan for Christchurch's central city area. Note the green 'frame' south and east of the CBD, which will compress the area and provide useful open space.

Image source: Canterbury Earthquake Recovery Authority

spaces provided safe areas for people to assemble in the immediate aftermath and then accommodation for recovery to be managed from. The city's regular grid street system has a high level of redundancy built into it and so could accommodate disruptions and blockages during rescue efforts and in the period of recovery since.

Over the past two or three decades, Christchurch's urban form had been transforming from a traditional, hierarchical structure to a more polycentric form as suburban centres had been allowed to grow. While many lamented this transformation, the aftermath of the earthquakes has revealed its value in resilience terms. With most of the CBD out of commission, businesses have been able to relocate into surrounding centres with little disruption to their activities. The recovery plan recognises this, as the new CBD will be much smaller than it once was. As such it will not be much larger than several other centres in the Christchurch regional area, although its importance is recognised by the concentration of government and cultural activities it will host.

The events have also enabled better understanding of the risks associated with building on and around areas of swamp and the brittle hills along the southern edge of the city. Vast tracts of land have been declared unfit to be rebuilt upon, with central government stepping in to acquire vulnerable land from owners. Christchurch will retreat from the most risky land areas, not only reducing the city's risk profile but also returning these areas to a more natural state, enhancing visual amenity and recreation opportunities in the process.

3. Access to a more attractive city

As the city's suburban centres have developed more rapidly than the population and overall economy in recent times, many of the more marginal streets and buildings in the central area had suffered through neglect. It was widely recognised that the CBD was too large and recovery planning provides the opportunity for this to be addressed. The new city centre will be considerably smaller than previously, compressed into a 17-block area. This strategy is enabled by the introduction of a green "frame", which also substantially increases the area of open space accessible to residents. The heights of new buildings throughout the city's central area will be substantially lower than they were before the earthquakes. Lower heights will address concerns identified by research and through public consultation. It was found that the public are now understandably fearful of entering tall buildings and that they also disliked the streetscape effects created by these structures, provided for in the current city plan. Buildings in the reconstructed city will be limited to between 4 and 7 storeys in height. This should help distribute development to ensure a more consistently lively and attractive streetscape. The central city will be more attractive to walk around and it is anticipated more people will also choose to live there or in the area immediately outside the frame. Provision of residential accommodation in all central area buildings above ground level is now strongly encouraged in the recovery plan.

4. Access to the process

The plan for the recovery has been developed



through an inclusive process, where the views of the public and many specialised communities have also been canvassed. In a campaign known as *Share an Idea* more than 100,000 suggestions were put forward by the public. The process, led by the Christchurch City Council and Gehl Architects, produced a *Draft Central City Plan* (Christchurch City Council 2011) that was based on five key strategies that articulated public consensus. Adopting this input the reconstituted Christchurch will be greener, have a stronger built identity, be more compact, have a mixed of uses and be more accessible. Radical changes to the transport system were also proposed, including establishment of the first branch of a regional light rail system. As the plan went forward for government approval this was one aspect that was held back from what would become the *Christchurch Central Recovery Plan* (Canterbury Earthquake Recovery Authority), released in July 2012. The final plan developed detailed spatial planning of the city centre including ideas for key infrastructure projects that it is hoped will stimulate the largely private investment that will rebuild the city. The draft plan proposed an integrated plan for the central city, which the government led plan then went on to develop more specific ideas for infrastructure projects within. Although both plans were design-led, one of the authors of the original plan laments that the final plan disregards the smaller scale projects that help link the big moves (Brand and Nicholson 2013).

5. Rest of the country

As noted, the Christchurch earthquakes have awakened the whole country to risks associated

with seismic activity. Clearly there must be regulation to reflect the knowledge gained during the events. Christchurch has already become a hotbed for innovation, as researchers, product suppliers and developers team to implement projects based on new technologies. Attraction to new, resilient technologies is spreading around the country as the property market is leading the demand for safer workplaces and dwellings. Property owners are being pushed by regulators to improve the life safety of buildings and being drawn by a more savvy market.



Figure 2: The Harcourt Building in Wellington, which is threatened with demolition by neglect by its owner.

Image source: www.stuff.co.nz

As government regulators set deadlines for improving building quality, there are tensions developing between heritage advocates and

building officials. Few would argue against the need to make buildings safer in the aftermath of Christchurch but many of those structures requiring to be upgraded also have heritage value. Property owners are caught in this tension and many will favour complete redevelopment of sites containing heritage buildings on economic grounds. It will be interesting to see how this plays out over the coming decade. A high profile case has recently been decided in the Environment Court, upholding the Wellington City Council's decision to reject an application for demolition of a central building. As the owner claims poverty he has threatened to leave the building untenanted while he allows it to be slowly demolished by neglect.

6. Conclusions

New Zealanders will have access to a progressively safer built environment as fallout from the Christchurch earthquakes of 2010-11 influences decisions being made by central and local government as well as the market. This will see many at risk buildings demolished including a number that contribute to the country's built heritage. The tensions between public safety and heritage are yet to be resolved; indeed the battle lines are only now being drawn up as the full extent of at-risk buildings is becoming known. Economic circumstances are such that demolition is generally favoured over strengthening of these buildings.

The circumstances in Christchurch are much more acute, with the whole of the central city requiring to be rebuilt. Recovery plans have been developed to deliver a more resilient city that will also be more sustainable as a result. Key features of the plans

are a smaller, more compact city centre and significant areas of open space. The plans have been developed through extensive consultation with the community. As well as retreating from areas of known risk, the built environment will be constructed to the highest engineering standard. The citizens of Christchurch will have access to a safer and more attractive city in the years ahead.

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South Africa

Jeremy Gibberd



Neighborhood Facilities for Sustainability: Accessing Capability to Improve Quality of Life and Reduce Environmental Impact

This paper explores the concept of Neighborhood Facilities for Sustainability (NFS) as a way of improving local urban sustainability. It argues that local facilities that enable communities to access sustainable goods and services are a highly effective, but undervalued, way of improving quality of life and reducing environment impacts in urban areas.

The paper uses the Built Environment Sustainability Tool (BEST) to compare the sustainability performance of conventional greening interventions such as solar water heaters with neighborhood facilities. The paper finds that in some contexts access to neighborhood facilities may be a more effective way of supporting sustainability and further research should be carried out.

1. Introduction

Current conventional built environment strategies and interventions are unlikely to meet the scale of change required by climate change and social and economic infrastructure backlogs (Cole et al 2008).

Innovative approaches are therefore needed. Given limited timeframes and resources, strategies need to be highly effective and efficient. Some of the most effective programmes for addressing sustainability at a local level have been community-based initiatives (United Nations Human Settlements Programme 2011). If developed appropriately, these:

- Are responsive to the local situation
- Draw on local resources and capacity
- Develop local capacity and ownership
- Address local needs as well as climate change

Given the advantages of this approach, how can it be harnessed? A tool, called the Built Environment

Sustainability Tool (BEST) can be used to support local community-based initiatives aimed at improving sustainability.

2. The Built Environment Sustainability Tool

The Built Environment Sustainability Tool can be used to assess the sustainability capability (or the capacity of the built environment to support sustainability) of a neighborhood (Gibberd 2012).

It does this by measuring the extent to which the built environment within a neighborhood contains the required characteristics and configuration for sustainability. Sustainability in the tool is defined as the achievement of at least 0.8 on the Human Development Index (HDI) and ecological footprint of under 1.8gha (World Wildlife Fund (2006).

The tool is based on the premise that the process of undertaking local sustainability assessments and development and testing of interventions to improve this is an effective way of engaging communities in developing local sustainable development plans



(Ding 2005, United Nations Human Settlements Programme 2011).

3. Case study

The application of the tool can be illustrated through an example. The neighborhood selected for assessment is an informal settlement on the outskirts of Pretoria in South Africa. The neighborhood consists of informal houses loosely arranged in a grid as indicated in figure 1 and 2.



Figure 1. Case study site

There are no local education, health or recreation facilities. Sewage, piped water and electrical connections have not been established and water is brought in with tankers.

There is no public transport and travel using private providers is relatively expensive, resulting in increased costs for local goods, such as food, that are brought in. The area is characterized by high unemployment.



Figure 2. Case study area

4. Sustainability Assessment

An assessment of the area using the BEST is indicated as the red line and as 'Existing' in figure 3. This shows that sustainability capability in all areas is poor, with performance in 'Waste' and 'Food' being slightly better than other areas.

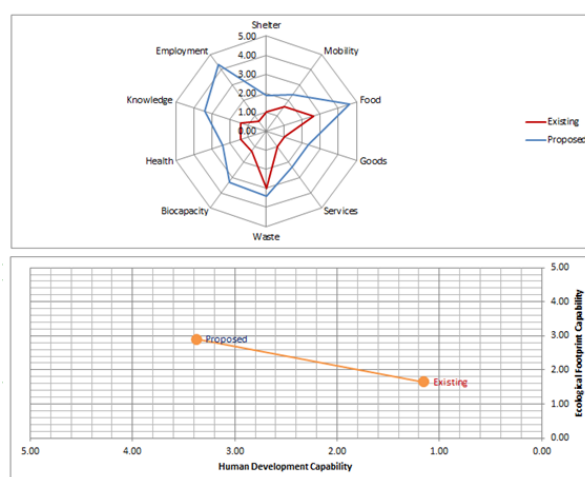


Figure 3. BEST report with 'existing' and 'proposed'

Given the assessment in figure 3, what are the most appropriate interventions to improve human



development and ecological footprint capability in this area?

5. Capability impact of sustainability interventions

Research using the tool indicates that conventional 'greening' interventions such as solar water heating and building envelope upgrade programmes may be less effective at improving local sustainability than more integrated neighbourhood facility solutions such as schools with shared access to information and communications technology (ICT) and community gardens (Gibberd 2013). This is illustrated in the figure 4. This shows existing capability performance of the area (Existing) before interventions A to D and the performance of the area after interventions (Proposed). It also shows the Ecological Footprint (EF) and Human Development Index (HDI) capability improvement as a result of the interventions (Difference).

	A Solar water heater installation	B Building envelope upgrade	C Community food gardens	D School with shared access to ICT	F All interventions
Existing capability					
EF capability	1.65	1.65	1.65	1.65	1.65
HDI capability	1.16	1.16	1.16	1.16	1.16
Overall capability	1.40	1.40	1.40	1.40	1.40
Proposed capability					
EF capability	1.71	1.71	2.28	2.14	2.89
HDI capability	1.38	1.60	1.93	2.27	3.38
Overall capability	1.54	1.65	2.10	2.20	3.14
Difference					
Capability improvement	0.14	0.25	0.70	0.80	1.74

Figure 4 Capability improvements for different sustainability interventions (A-F).

The school with shared access to ICT and community gardens creates capability improvements of 0.70 and 0.80. This is three or more times the levels of improvement achieved by solar water heater installation and building envelope

upgrades. So what can be learnt from this exercise? Are there implications for the type and nature of interventions that should be implemented at a local level to support sustainability?

6. Implications of the exercise

The first lesson is unexpected as it challenges conventional approaches to addressing sustainability and climate change which focus on 'clip-on' technologies such as solar water heaters, efficient fittings and intelligent controls. The exercise questions this approach by showing that accessible neighborhood facilities may be more effective at supporting sustainability than conventional greening interventions in particular contexts. The exercise also demonstrates the multi-faceted value of neighborhood facilities as a means for increasing local sustainability capability.

In the case study area, the school with shared access to ICT could be used to support the following impacts:

- Improved education through access to primary, secondary school education, tertiary education (through distance learning) and support for adult and ongoing learning
- Improved employment through access to information and administrative support for small businesses
- Improved provision of local services through access to information on health, education, legal issues and business opportunities.



Similarly the community garden facility could have support multiple impacts including:

- Improved low ecological footprint food through access to fresh local vegetables and fruit
- Improved self-employment opportunities related to gardens and related services
- Improved health through exercise
- Increased bio capacity
- Reduced waste through recycling of local organic matter for compost.

7. Conclusions

Some broad conclusions and recommendations can be drawn from this exploratory exercise. These are:

- Conventional technology-based interventions such as solar water heaters may not be the most effective way of supporting sustainability in some contexts.
- An analysis of the built environment characteristics and configuration is a useful way of determining appropriate interventions for improving local sustainability performance.
- Accessible neighborhood multi-functional facilities such as schools with shared access to ICT and community gardens may be an highly effective and efficient way of improving local sustainability. While these types of facilities appear particularly effective in poorly serviced urban areas such as informal settlements, they may be effective in a wide range of applications.

- It is recommended that further research on Neighborhood Facilities for Sustainability (NFS) concept is carried out, as this concept may offer a valuable mechanism for improving sustainability performance in a responsive way with limited resources.

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The Renaissance of Public Squares in North West Europe

During the latter part of the 20th century, the vast majority of city squares acquired unattractive images as empty spaces or as traffic islands. Communities need public spaces as places for assembly. They are the physical manifestation that each community is coherent and vibrant. The renaissance of public squares is part of reversing the erosion of the public sector and the public realm, and reclaiming the city for its people. The most recent advances are in the simulation of city centre design. There is confidence to be gained from visualisation of how squares will look, feel and be used; which can make a real contribution to the accessible city.

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1. Introduction

The aim of this paper is to address three major issues:

- Why there has been a decline in public squares
- Why it is important to re-introduce public squares
- How to re-introduce public squares

A framework for geometric criteria from a previous study (Giddings, 1996) is tested with new data from five exemplar squares in North Western European cities (Charlton, 2011). However, much of the research for this paper is in manipulating software that can simulate solar access and thermal comfort, wind flow, noise mapping and pedestrian movement as part of a holistic design (Charlton et al, 2008) ie, what is the effect of changing the geometry of squares on these qualities? This is a demonstration of how new public squares can be designed by simulating all the various aspects. Finally a vision is presented of how public squares could be designed in future – using virtual city models.

2. The Decline of Public Squares

Urban space has always been the place for the

community rather than the individual and therefore public rather than private in nature. Historically, activities that occurred in urban spaces have been representative of that settlement. They were places where the framework of society was formulated, and where economic activity thrived. Of all types of urban space, squares are the most characteristic of the values of the societies that created them. However, Krier (1979) articulates a general feeling that towards the end of the 20th Century, traditional functions had either become outdated or changed location and the public square had become synonymous with an empty space. The loss of symbolism in particular, was greatly lamented by Giedion (1962). The voids were often filled with vehicles and many squares presented an unattractive image as traffic islands. The loss of the squares as places for citizens, seemed to hasten the commodifying of cities in which they were viewed merely as commercial and retail opportunities; and the downgrading of the public realm by privatization (Giddings et al, 2005). There also grew a perception, mainly emanating from the United States that public spaces were dangerous places. This enabled the private sector to operate



a form of social control through segregation; and the attendant growth in private security enabled a reduction in police costs. What was left of public space was often rented-out by local governments for commercial purposes; and what has been termed cafe-creep (Kohn, 2004), spread commercial interests even deeper into the public realm.

3. The Importance of Public Squares

There is a growing body of evidence that public space is able to deliver a range of benefits across economic, social and environmental spheres. A high quality public environment can have a significant impact on the economic life of urban centres. The presence of squares and other public spaces become vital business and marketing tools: Companies are attracted by public places and these in turn attract customers, employees and services. Public spaces are open to all, and as such represent a democratic forum for citizens and society. They can bring communities together, provide meeting places and foster social ties of a kind that have been disappearing in many urban areas. These spaces shape the cultural identity of an area, are part of its unique character, and provide a sense of place for local communities. Squares, in particular, can reintroduce the kind of civil society that has been lost in too many cities (Woolley et al, 2004). According to Mattson (1999) citizens have made it clear that they need spaces where they can interact with fellow citizens. Lack of public space is an insidious expression of a lack of democracy. In the past, public squares were invested with symbolic power that could evoke pride and public engagement. A crucial role for architecture and

urban design in a democracy, is the creation of public spaces that encourage civic interaction and discourse. In many popular European cities, squares are part of mixed use areas that include residences above ground floor level; so that 24 hour occupation of buildings is maintained and natural surveillance provides for defensible space, re-assuring those using city spaces at any time – in a similar way to Newman’s (1973) proposals. Public squares have important social and cultural roles, providing people with places to meet, rest or stop and talk. These activities evidently take place where outdoor areas are of suitable quality. They also provide important focal points, which demonstrate that visitors have reached the heart of the city. Significant buildings need a context, and squares can be an expression of civic pride, historic power and importance (Chesterton, 1997). The significance of a renaissance of buildings and activities that define society cannot be over-stated; and the importance of bringing symbolic buildings back to prominent positions in city centres, and locating them in proper settings is at its core. This leads to the concept of a square for every symbolic building. Increasingly it is being recognised that identity and place have enormous roles in reinforcing society. City design requires networks of properly conceived streets and squares – introducing pedestrians to symbolic buildings, culture, entertainment as well as commercial activity. The re-introduction of public squares needs to be viewed as part of reversing the erosion of the public sector and the public realm, and reclaiming city centres from private interests for the benefit of communities. The central idea is that people need



spaces in which they can conceive of themselves as citizens committed to political debate and persuasion; and as neighbours with common educational and cultural needs. Without these spaces, citizenship wanes (Mattson, 1999).

4. How to Re-introduce Public Squares

Urban design is more than just providing any space between commercial and retail buildings. Spaces need to be comfortable places. As Chesterton (1997) points out, a space needs to offer shelter, particularly from the wind. Even relatively unattractive places have been successful where they offer sheltered open spaces in the city centre.

4.1 A Framework for the Design of Squares

A study undertaken to establish a framework (Giddings, 1996) included criteria for the three dimensional geometry of squares. The study was based on academic literature from Sitte (1889) to Tibbalds (1990), as well as investigating popular North Western European cities. A particular influence was Lynch (1960) with his well-known analysis of city centres through elements termed paths, edges, districts, nodes and landmarks. More recently, this kind of analytical approach has been developed into a multiple centrality assessment by Porta, Crucitti and Latora (2008). Their assessment examines the relationship between nodes and generates optimum locations within the spatial system. In the context of this paper, nodes are city centre squares. Another study (Charlton, 2011) selected five exemplar squares from different countries in North West Europe to further test the framework. The results supported its validity.

The restriction until recently, has been that although it was possible to analyse existing popular squares; the notion that a square designed to those criteria would be successful, had to be taken on trust. There was no guarantee that the microclimatic conditions would be favourable, and that people would be comfortable interacting with it. There is confidence to be gained from visualisation of how squares will look, feel and be used; and this will make a real contribution to the longevity of sustainable urban design. In addition to geometry - measures of temperature, wind and noise are also taken; to assess them against the following microclimatic criteria, and to validate the software modeling intended for incorporation in the design of future squares:

maximize number of days per year, when:

- temperature 13-24°C (Gehl, 2006; Pushkarev and Zupan, 1975)
- wind speed 0-8mph, as temperature increases (Cooper Marcus and Francis, 1997)
- noise 60dbA max – to avoid sleep disturbance (Sacre, 1993)

Table 1 Microclimatic Criteria for Squares in North West Europe

In this part of the world, it is not usual for the climate to produce temperatures of over 24°C; whereas uncomfortable wind speeds of over 8mph are commonplace. Thus the objective is to design squares that provide temperatures of more than 13°C, on as many occasions as possible, while minimising the number of days that the wind exceeds 8mph. Wind speeds of less than 4mph



are generally the most comfortable, and ideally would only increase to 8mph, as the temperature approaches the preferred maximum of 24°C. The other major part of the recent research is modeling pedestrian movement. In order to avoid claims that squares will remain empty spaces, simulated pedestrian activity related to the dimensions of a proposed square, the size, number and nature of openings, its detailed design; and the uses of its enclosing buildings are needed..

4.2 Software Modeling

A comparative analysis of microclimatic and pedestrian movement software was undertaken (Charlton et al, 2008) and the following were selected as the most accurate and compatible for the analysis and holistic design of public squares. There are a number of well-established simulation software systems that can only operate in two dimensions. A fundamental criterion in this case, was for three dimensional simulation. Thus the following software were selected:

solar access and thermal comfort	TownScope
wind analysis	Star – CCM+
noise mapping	Cadna A
pedestrian movement	Legion Studio + 3D

Table 2 Microclimate, Pedestrian movement and selected software

The software was applied to designs for a new square for Newcastle upon Tyne, in the North East of England.



Figure 1 Proposed Central Library Square

However, the computer power required to run the software was so great that the original notion of it providing a design tool for practice had to be abandoned. Nevertheless, the new generation of virtual city models could have building information modeling technology added to them to provide this service. Therefore it is this concept that provides a vision for the future, and the potential for an even more accessible city.



Figure 2 The Vision



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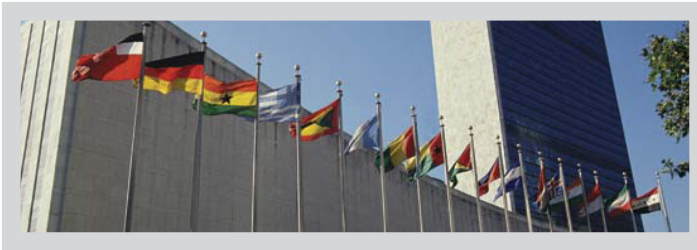
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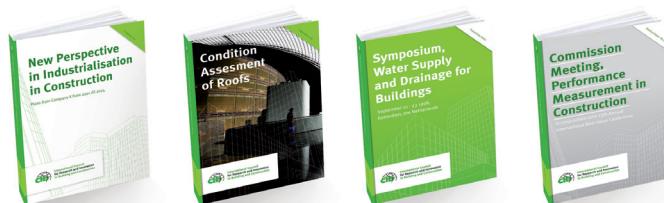
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