

The Bicycle Oriented Development (BOD): A New Tool in Urban Resilience

Dr. Steven Fleming

The University of Newcastle

ABSTRACT (maximum 120 words)

In the wake of the global financial crisis, the urban renewal of large brownfield tracts has been put on hold. Since many of these sites flank the same waterfronts and rail easements, that have given bicycle transit a foothold in car dominated cities, there is case for seeing them as bicycle oriented developments. Peak oil, congestion, awareness of preventative health, and emissions reductions goals are seeing cities set bike mode share targets as high as 50%. 8-House by BIG is the architectural offspring of planning focused mainly on cycling, permitting residents to ride home to 10 floor apartments, via a bike ramp. It provides us a glimpse of alternative urban solutions we might look forward to as cycling becomes a key mode of transport.

Keywords: urban renewal, sustainable infrastructure & transport, ecocities, bicycle transit

37% of trips in Copenhagen are taken by bicycleⁱ, and authorities there aim to increase that to 50%. In that context, a Transit Oriented Development (TOD) is not one where most people walk a few hundred meters to the nearest metro station; most use bikes to get there, potentially over distances many times greater than they could comfortably walk. On large brown-field sites in Copenhagen, particularly Ørestad, we are seeing the rise of what might be called the BOD, or “Bicycling Oriented Development”. The temptation though, is to skip the modal change altogether, and cycle from home to work, school or the shops.

8-House, designed by architects Bjarke Ingels Group (BIG) is the architectural offspring of planning focused mainly on bicycle transit. It is an enormous 61,000sqm mixed use development—the largest and most recent in Ørestad—with apartments arrayed in such a way as to make them accessible from sloping balconies, zigzagging their way from the ground to the roof. Why? Because ramped balconies allow residents to ride their bicycles all the way home, to their apartments, even if they live in a 10th storey penthouse. 8-House is a glimpse to a future when buildings do more to accommodate cycling, than they have done for driving.



8-House Copenhagen and Bikestation Washington. Photos by Steven Fleming.

Seldom would an architect celebrate cars now, the way Le Corbusier did with the Villa Savoye (with its ground floor tailored to allow cars to enter the volume of the house, park, and then leave). Now, car parks are camouflaged. The trend instead is to celebrate bicycle parking. The bicycle parking station that was recently built outside Union Station, in Washington D.C., despite its modest (80 bike) capacity, cost in excess of \$3,000,000ⁱⁱ. That was the price of an architectural statement underlining governmental endorsement for this mode of transport. Other architecturally conspicuous bicycle transit facilities include the McDonalds Bicycle Parking Station in Chicago's Millennium Park, (beside Frank Gehry's band shell), the Bikestation in Long Beach CA, the RBWH Cycle Centre in Brisbane, and the colossal Bike Flat beside Amsterdam's central train station. The walls of MVRDV's competition winning proposal for a House of Culture and Movement in Frederiksberg, Denmark, will double as frames to suspend and that way put visitors' bikes on display. The Danish Pavilion at Expo 2000 in Shanghai, was in the form of a spiral that cyclists could ride through to the roof. As part of the landscape proposal, Governor's Island in New York harbour will include 3000 wooden bikes, designed by the architects, West-8 in Holland, for free use by park users.

Bicycles emblemise values architects are eager to have conferred on their works: frugality, irreducibility; health; ecological sustainability, etc.. Governments enjoy their symbolism too, but more so the tangible contribution bicycle transit makes to the public health burden, urban mobility, emissions reductions, and the economy. The latest figures from England point to a £2.9b annual contribution to the nation's economy, through increased worker performance, reduced costs of treating obesity, and job creationⁱⁱⁱ.

Starting from base rates of 1 or 2% of all trips, governments throughout the developed world are setting bike modal share targets of 5 to 10% of all trips, primarily through the provision of on-road and segregated bike routes. Unfortunately, in countries where bicycling has not been a mainstream mode of transportation in living memory, voters are finding the idea of

reducing parking space, and road lanes, to make way for bicycles, totally alien. Given the political toing and froing around the car/bicycle contest for Main Street, it could be decades before the Dutch model of universal bike access extends to the rest of the world. A recent report by Victoria's Auditor General concluded that recent attempts to make cycling mainstream, had patently failed^{iv}.

Where we are seeing headway, is in cities with former industrial waterfronts, and disused rail routes, that have been converted into non-vehicular promenades and rail trails. Two standout cities are Portland OR, and Minneapolis MN, in the U.S.. The drawback of networks like these, is they do not match the Dutch ideal of segregated bike paths along shopping streets and to established institutions. People whose primary concern is getting from A to B, will more likely opt to drive, than cycle via a circuitous network of rail trails. However, we shouldn't discount the behaviour of cyclists motivated by fitness, or who would incorporate leisure rides into days filled with errands, or who would organise their lives around bicycle trails.

For people who might take access to bike routes into consideration when deciding where to buy or rent houses, or who might even think about bike routes when deciding where they would most like to work, or send their children to school, it could prove a happy coincidence that former rail routes, and post-industrial waterfronts, also connect many of the large brown field sites that are currently earmarked for urban renewal. If those sites are developed with housing, public institutions and places of work, cycling enthusiasts could find themselves occupying new, parallel cities, where once there were networks of rail lines, factories and wharves.

At the moment, designing urban renewal projects (outside Holland or Denmark), in the belief that keen cyclists will be the main users, might seem skewed, or futuristic. By even the most generous estimates, 9 out of 10 trips in America's most bike friendly major city, Portland Oregon, are made using public transport or cars^v. Given those numbers, it seems fitting that Portland's largest new brown-field development, the South Waterfront project, only makes modest provisions for cycling: on-road routes in the dangerous door-zone; and a proposed waterfront promenade, with no definite date for completion.

Planners have been in the habit of looking at urban renewal projects on brownfield tracts, first and foremost in terms of public transport (even though riding on busses and trains does not increase health). Their order of priorities has them next giving consideration to organising and hiding roadways and parking (even though driving negatively impacts urban

mobility and the environment). Ample attention is usually given to enhancing the pedestrian experience, or, moreover, mitigating the body's deficiencies, in the city, without a bike. To mitigate against the slowness of walking, streetscapes are contrived to be as interesting as big buildings permit. Pedestrians' vulnerability—due, again, to their being slow—is compensated for by planning to increase passive surveillance.

The bicycling experience comes as afterthought. Urban designers have it in their power though, to impact the bike modal share, by moving the cycling experience to the top of their list of priorities. Their volition is limited in established areas, where drivers are using their votes to jealously guard lane space and parking rights. On the brown-fields though—where rail trails and waterfront promenades happen to be appearing as well—planners have a blank slate, and could realise a hitherto unimagined new kind of city, that is principally invested in bicycle transit.

Some cyclists, if they have left-wing or counter-cultural leanings, would see only developer architecture being built on these sites. And some developers, if they assume cyclists are poor or outside of mainstream society, might not recognise this as a group of potential keen buyers of properties on former industrial land. The special appeal of those developments is they flank the rail-trails and waterfronts that give safe, all-weather cycling, a foothold, in cities with road networks that are not safe for cycling in poor conditions.

If the significance of brownfields to cycling was understood in these terms, urban renewal agencies like The Portland Development Commission, would see it as a matter of urgency to tie promenades like the one on Portland's South Waterfront, to existing waterfront/rail-trail networks of bike paths. If that involved works on city-owned land, it would benefit cities like Portland to fund their completion. We know cyclists are two and half times more likely to use protected routes, such as waterfront trails, than on-road routes, no matter how well they are marked^{vi}. Completing such links would release flows of cyclists from densely populated new development areas, into segregated bike networks, raising a city's overall bike share, while at the same time making new developments of greater appeal to that segment of the market who are keen cyclists.

Ascertaining the size of that market is problematic, given the way bike share data is gathered. Parts of Portland have bike modal shares as high as 10%. Does that mean one half of all people cycle, but for only one fifth of all trips? Though it would be impossible to accurately predict the impact Dutch standard bicycle infrastructure would have, if delivered

to Portland, we could conservatively imagine half of those living in progressive neighbourhoods, using bikes for one half of their trips, pushing the bike share to 25%.

Now imagine if The Portland Development Commission eclipsed even Holland's best efforts, and spent more to please cyclists in the South Waterfront area than they have spent to please drivers. They could do that by providing covered and back-drafted bike routes. Ground planes could be undulating to help cyclists start and stop using gravity. Rather than conceiving streetscapes from the slow moving view point of a pedestrian, in the manner Gordon Cullen, for example, proposed, urban environments could be designed to look good from the arcing, leaning, fluid point of view of a cyclist. As energy prices invariably rise, we can imagine hyper bike friendly developments, incorporating new strategies like the ones just proposed, inspiring almost everyone living there to use bikes for almost all trips. A 90% bike share is not inconceivable, in areas designed to attract cyclists.

As mentioned earlier, 8-House in Copenhagen gives us a glimpse into a possible future, when ever-increasing numbers of cyclists have caused us to change the way that we build. The most immediately apparent possibility 8-House foretells, is for the replacement of other forms of vertical circulation, with bicycle ramps. It is generally held that Elisha Otis's plummet-proof elevator of 1852, opened the way for high rise construction. There are other means though, of lifting people up through the levels of high-rise towers.

The first 16 levels of The Marina City towers in Chicago, by architect Bertrand Goldberg, can be ascended by driving a car. The only disappointment is that drivers can only experience the spiralling car park this way, not the habitable parts of the building.

Cars are too space hungry to have caught on as machines for lifting people through buildings. Bicycles though, require ramps hardly wider than those for pedestrians. If access balconies are open to the outside, like those of 8-House, they can eliminate the need for fire stairs, while even lifts could be elided. With his fanciful proposal for London, *The Cloud*, Carlo Ratti proposed towers with no means of vertical circulation other than ramps, that most users would ascend using bicycles.

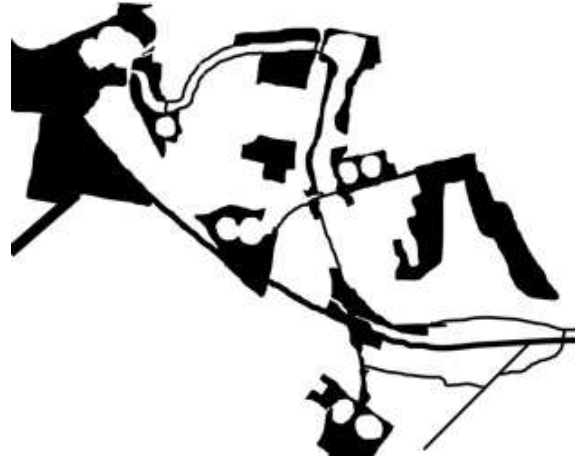
With its bicycle ramp, 8-House also foretells the possible return of an idea left on the scrap heap from Modernism, that of the street in the sky. Announced by Le Corbusier, it never quite gelled, because "streets" like the one in the Unite d'Habitation in Marseilles (1946 to 1952), with offices, shops and a hotel, were disconnected from streets on the ground. As streets go, Le Corbusier's streets in the sky worked about as well as the streets of

Manhattan would work, if the avenues were all taken away, and the only way of moving from one street to the next, was via the subway. The mere suggestion is maddening, yet precisely what Le Corbusier was promoting when he said an access corridor, reached via the dark vortex of a passenger lift, would somehow be an aerial street. The experiment—repeated with every new lift-access condo—seems poised every time to collapse into chaos, of the kind J.G Ballard imagined in *High Rise*, his dystopian novel^{vii}.

The access balcony in 8-House, by contrast, is more like a mountain pass than separate streets scattered across an archipelago of little islands. Admittedly, cyclists don't have an express route, or "avenue", via which to move vertically, in the quick manner one moves North and South in Manhattan. Cyclists in 8-House have to crisscross their way to the top. As they do, their experience is of an access balcony that is far more like a street, with the opportunities a continuous street affords to interact with anyone in a building, not just those who happen to live on your floor.

The possible ramifications of a bicycle borne populace extend beyond the design of particular buildings, to duties buildings have to their urban contexts. If far more people rode bikes, making cities safe and liveable would not be nearly as hard as it has been where most people walk or use cars. To start with, activating public space by encouraging cycling, is not the uphill battle that activating space with pedestrians has proven to be. Pedestrians move slowly. They bunch up. Planners can't spread them around, so at best call on them to enliven main shopping streets, and strips of cafés. But let's imagine a city where three quarters of trips were by bicycle, one quarter on foot, and cars were an oddity. Shops and cafes could be littered evenly across the whole city, just one at the base of each building. The Jane Jacobs ideal^{viii}, of throwing away zoning maps and encouraging a tossed-salad of functions, might actually have some chance of succeeding.

On the old streets of Amsterdam and Copenhagen, with streets and building stock dating to the era of horse drawn transportation, the bike modal share has plateaued at just over one third. Urban renewal sites offer an opportunity to develop ground planes, urban morphologies, and building typologies, for an age when many among us (the health conscious, the green and the busy) would rather live, work, shop and recreate in those parallel cities that are coming into focus as industry fades, because they offer safe cycling. Protecting these areas from cars, and investing in cycling as generously as we would otherwise invest in car parking and transit—because these are, after all, BODs—will greatly increase the resilience of the post industrial city.



The final two images show the potential of this theory if it were applied in Newcastle, Australia. Black represents bike paths (existing and potential) beside waterways and along working and former rail lines, plus under-utilized industrial sites and open green space. If it were densely developed, as a BOD running parallel to the car-centric city, the highlighted area could absorb population growth that would otherwise contribute to sprawl. The area shown could be crossed in 20 minutes by a cyclist riding at the average speed of someone in Copenhagen, ie, 20km p/h. Occupants of the BOD could enjoy hyper friendly buildings and bike routes, that would be the envy of, and a beacon to, those living in parts of the city overrun by vehicular traffic.

ⁱ *City of Cyclists—Copenhagen Bicycle Life*, City of Copenhagen, The Technical and Environmental Administration, 2009.

ⁱⁱ Adam Voiland, “Architect Discusses Union Station Bicycle Transit Center”, [interview with Donald C. Paine Jr.], in *Greater Greater Washington*, April 24, 2009.

ⁱⁱⁱ Alexander Grous, *Gross Cycling Product* [Report], London School of Economics, August 2011

^{iv} Victorian Auditor General’s Report, “Developing Cycling as a Safe and Appealing Mode of Transport”, August 2011.

^v In a lecture at The University of Melbourne, Roger Geller, Bicycle Coordinator for the City of Portland, said 10% of trips there are by bike.

<http://harangue.lecture.unimelb.edu.au/Lectopia/casterframe.lasso?fid=204994&cnt=true&usr=not-indicated&name=not-indicated> accessed 25 October 2010. Summer bike counts have recorded better percentages crossing major bridges at peak hour, while census data indicate a lower figure: 5.81%. <http://bikeportland.org/2010/09/28/2009-u-s-census-5-81-of-portlanders-commute-by-bike-40251> accessed 4.9.2011.

^{vi} Anne C Lusk, Peter G Furth, Patrick Morency, Luis F Miranda-Moreno, Walter C Willett, Jack T Dennerlein, “Risk of injury for bicycling on cycle tracks versus in the street,” in *Injury Prevention*, 0.1136/ip.2010.028696

^{vii} J.G. Ballard, *High Rise*, London : J. Cape, 1975

^{viii} Jane Jacobs, *The death and life of great American Cities*, Harmondsworth:Penguin Books, 1961.

COMPREHENSIVE RESILIENCE IN URBAN DESIGN

Professor Gordon Holden

Griffith University, Gold Coast, Australia

ABSTRACT: *This paper engages with resilience in urban design by discussing knowledge that can be derived from case studies as being important contributions to innovation and hope, the core of resilience.*

The purpose of urban design is to sustainably add cultural, environmental and economic value to human settlements. In order to achieve this urban design must cover a broad scope of concerns, it must be comprehensive. Urban design knowledge cannot stultify but must advance through expansion, continual testing and refinement. Resilience in urban design knowledge springs from constant engagement with and adaptation of national and international ideas and examples disseminated through conferences, visits, study and reflection. In an attempt at comprehensiveness, current urban design examples from small scale to whole cities, all relevant to sustainable cities, are discussed under the five headings of - smart containment, smart growth, re-birth, building performance, and ecological urbanism. If a city expects to evolve sustainably and with resilience, urban design requires a comprehensive approach across the full scale from individual houses to the city as a whole, all of which is locally relevant. This can embrace the adaptation and transfer of ideas and knowledge that is widely available from other places. The challenge is to experiment and innovate and to strike the appropriate balance for application between place uniqueness and globalised culture.

Keywords: *Urban Design Knowledge; Urban Design Examples; Architecture Examples; Urban Design Sustainability and Resilience*

INTRODUCTION

The urban design discipline, which predominantly encompasses planning, landscape architecture, architecture, social sciences, urban economics and engineering, is the overarching field that can comprehensively and sustainably add cultural, environmental and economic value to human settlements. In order to achieve this urban design knowledge must not stultify, but must continually expand. Maintaining an active awareness of and willingness to adapt visionary trends, ideas and examples across a wide „comprehensive“ spectrum, is a key in achieving this.

In the book „The Art of City Making“ (2006) Charles Landry establishes seven city-making principles which emphasise the need for a creative approach to interpreting sense of place and making the particular place work best for residents. In explaining this he highlights that a city must be aware of what other cities are doing “go with the grain of local cultures and their distinctiveness, yet be open to outside influences. Balance local and global” and further, “learn from what others have done, but don’t copy them thoughtlessly” (p1).

Further reinforcing the necessity of awareness of trends, Newman and Jennings link the need for a city to be connected to the world of experience and ideas in their 2008 book „Cities as Sustainable Ecosystems“ “...visions are placed within a context that is more tangible than the global arena but that provides a basis for global concerns. Moreover the diversity of approaches enhances resilience” (p24)

In their book „Resilient Cities“ (2009) Newman, Beatley and Boyer point to several authors including Peter Hall, Robert Friedel, Lewis Mumford and Tim Gorringer who write in similar ways about cities successfully adapting to change by concluding “whatever it is called, the ability to experiment and innovate is the tissue of hope and the core of resilience” (p5).

This paper sets out to contribute to the process of learning from others by updating and expanding our stock of examples across a wide scope to feed our knowledge bank. It highlights what are considered to be important current trends and examples from which transferable lessons, each contributing to greater sustainability, may be gleaned thereby contributing to city resilience.

Five trends are identified that relate to city sustainability. Each is developed further with case studies, discussed at the level of principles rather than attempting deep explanations. All of these trends are seen to potentially contribute to sustainable resilience. Using the word „potentially“ implies that the examples may be adapted or adopted in a range of locations and to varying degrees. The paper does not provide specific applications, seeing this as the task of others who may gain awareness from the paper and be provoked into searching wider than otherwise for solutions. The final heading „sense of place“ reminds us, as Landry (2006) does, to connect current knowledge about exemplars to the local scene:

- 1. SMART CONTAINMENT
- 2. SMART GROWTH
- 3. RE-BIRTH
- 4. BUILDING PERFORMANC
- 5. ECOLOGICAL URBANISM
- 6. SENSE OF PLACE

The examples fall within Newman et al's (2009) „Ten strategic steps towards a resilient city“ items: 3 – Target public buildings, parking and road structures as green icons; 4 – Build transit-oriented, pedestrian-oriented and green-oriented developments together; and, 8 – Regenerate households and neighbourhoods. The paper is structured to highlight examples and its style is notational, to accompany the power-point conference presentation.

1. 1 SMART CONTAINMENT - INFILL

Many communities have vacant parcels of land within existing neighbourhoods that lend themselves to residential development.

Housing development on these infill lots not only increases the affordable housing supply, but also revitalizes declining neighbourhoods and expands a community's property tax base. Providing financial and regulatory incentives to offset the costs of development can help encourage construction of affordable housing within these parcels.

A benchmark example in Toronto is by architect Lawrence Dodd (see below).

Investigations into barriers to infill development are underway in Australia which show that the following topics need revision: Construction Costs; Tax Reform; Land Supply; Development Approval Timeframes.



Image credit - www.worldarchitecturenews.com/index.php?fusea...

1.2 SMART CONTAINMENT - DESIGNED SUBURBAN INTENSIFICATION

Australian architect John Gray at Victoria University Wellington, New Zealand, conducted research into suburban intensification for a case-study area of 2.3ha which houses about 41 people/ha at 2.1 people per dwelling unit resulting in 75 people and 36 dwelling units (Gray and Hoare, 2010).

Under Wellington's existing „containment“ regulations the area could support 48 dwelling units, which at 2.1 people/household equals 101 people, an increase of 35%

If the example was carefully designed to achieve habitable-code standards, accounting for topography, existing building, privacy etc. the capacity of the area could be 78 dwelling units, which at 2.1 people/household equals 164 people, an occupancy increase of approximately 120%.

About 1600m² could be given to gardens for food production.

The Wellington example would require planning and building code relaxations, a unique design approach and neighbourhood cooperation.

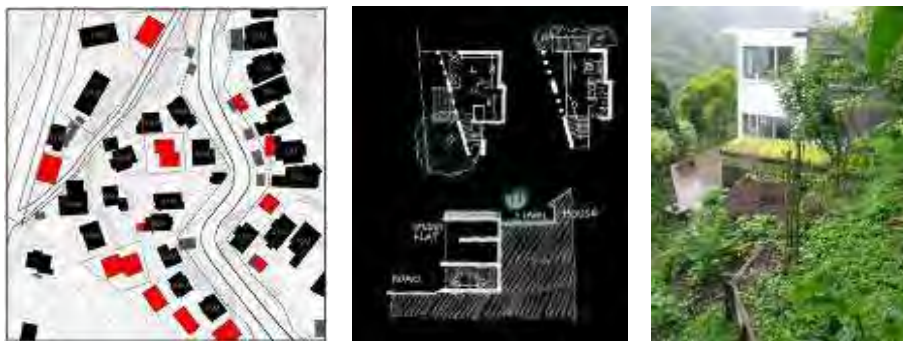


Image credit – John Gray

1.3 SMART CONTAINMENT – MELBOURNE'S VISION

The „Melbourne 2030 Strategy: Planning for Sustainable Growth“ shows that the city can accommodate the projected large growth of an additional million people sustainably without extending its boundaries. It can do this through intensifying habitation along transport corridors and by upgrading the suburbs to be more self-sufficient and sustainable.

Approximately 6% of Melbourne is given to urban corridors (3%) and activity centres (3%) [retail/service/cultural including city centre]. The projected growth is targeted in these areas to avoid loss of sense of place of the suburbs.

Illustrated is a corridor as it is currently and it's possible future....showing the potential of corridor-intensification and infill. Five-story mixed use buildings with sub-centres spaced along corridors provide a solution.

Six ingredients are needed: A Mix of Uses; Higher Density; Strong Connectivity-Good transport; High Quality Public Realm; Distinctive Local Character.

Compared with incremental growth on the edge of the city the economic saving of this contained intensification could approach 110 \$Billion over the next 50 years.



Maribyrnong Road, Maribyrnong study area, currently



Possible future

Image credit – City of Melbourne, (2009)

2.1 SMART GROWTH

Towns and cities are at a crossroad. Down one path is urban sprawl. This leads to endless roads, long commutes and traffic jams, high social and infrastructure costs and loss of farmlands and open space.

Urban sprawl is widely spread-out development outside city centres, usually on previously undeveloped or farm land. It is characterized by having few people per hectare, homes that are separate from retail, commercial and industrial areas.

The spread-out nature of urban sprawl does not support public transportation. Urban sprawl homes are separate from places of work, shops and services, meaning that residents usually drive for all their travel. Continued sprawl threatens the health of our families, our communities, and ecosystems.

In the other direction is „smart growth“ which creates compact, higher-density communities supported by public transit, bike and walking paths, surrounded by productive farmland and green spaces, forests and wetlands.

Smart growth promotes exercise and cardiovascular health. It includes a mix of housing, commercial, and shopping uses. It is development that provides business opportunities and jobs, balances development and environmental protection, and encourages strong neighbourhoods.

2.2 SMART GROWTH - TRANSPORT ORIENTED NEW DEVELOPMENT

Varsity Lakes on the Gold Coast is a 343-hectare green-field site in Gold Coast City. The project's mixed-use precinct is synergistically situated next to Bond University.

A modified-grid system of residential streets creates walkable linked neighbourhoods that share institutional recreation spaces and which are train-station accessible.

The layout encourages optimum solar orientation of houses and passive surveillance of public areas.



Image credits - www.airviewonline.com.au/aerial/3649/lakes-Ae
www.southernbeaches.realway.com.au/index-tess...

2.3 SMART GROWTH - MIXED-USE URBAN INTENSIFICATION

„South-Bank“ Brisbane supports a rich mix of uses (culture, park-lands, recreation, restaurants, entertainment, exhibitions, retail, residential, education.....but is missing household food shopping.

There are clear visual links with the park and river. There are also strong physical links into adjoining neighbourhoods and across the river.

The rehabilitated Grey Street adds to overall coherence.

South-Bank has excellent accessibility across all modes including train, bus, ferry, pedestrians, bicycles, vehicles.



Image credits – John Byrne

3.1 RE-BIRTH - THROUGH RETRO-FIT and UPGRADING

It is significant that 95% of Australia’s existing buildings were constructed without sustainability considerations.

Keeping our existing buildings for as long as possible adds markedly to their life-cycle efficiency. But where possible, upgrading should be undertaken through retro-fitting that achieve sustainability goals.

Office buildings are already being re-fitted to comparatively higher performance standards, but more innovative solutions are possible including the „Evolvo“ competition entry which clips

prefabricated modules onto the exterior of existing buildings, adding a layer of green space for gardening, wind turbines or social uses.



Image credit – www.modool.net/?module=articles

3.2 RE-BIRTH THROUGH REDEVELOPMENT

The mixed-use Mizner Park, Florida, town centre demonstrates how suburban communities can create vital downtowns by redeveloping low functioning shopping centres. Mizner Park was a „dead“ internalised shopping centre surrounded by parked cars until its re-birth as a „Town Centre“ with regular streets and a wider range of mixed uses including apartments.



Image credits – andrewlainton.wordpress.com/.../

3.3 RE-BIRTH - THROUGH INFRASTRUCTURE TRANSFORMATION

Obsolete railway viaducts in Paris and New York have been re-borne to enhance liveability of those cities.

Paris has transformed the 1.5k, 70 arch „Viaduct des Arts“ to house arts and crafts workshops, galleries, showrooms, restaurants and café.

On top is the „Promenade Plantee“ which extends beyond the viaduct for 4.5k, sometimes through buildings, providing a green pathway connecting districts.

The 2.3k „High-Line Park“ in New York is a disused freight train line in the lower West side. Walkway, seating and native planting provide an urban outdoor experience that has contributed greatly to a renaissance of the neighbourhood.



Image credits - www.quora.com/Lazaro-Fuentes

www.ny1.com/.../

3.4 RE-BIRTH THROUGH ECO-CITY GREENING

In an eco-city, people and organisations adapt to a changing climate and act to build a sustainable future.

Such a city is compact, with high density of housing, business and cultural uses that sustain an effective public transport system, and walking and cycling above car use.

With excellent air quality and generous public open space and landscaping, biodiversity is supported and people enjoy the benefits of health and happiness.

City infrastructure and buildings generate and use renewable energy and feed into the metropolitan electricity grid.

Food is grown locally and creatively, using horizontal and vertical spaces on buildings and in private and public gardens.



Image credits - www.getartisan.com.au/news/view/641

en.paperblog.com/.../

3.5 RE-BIRTH THROUGH BUILDING ON TOP

By comparison with building anew, constructing on top of existing buildings contributes significantly to sustainability by providing:

- * low energy costs in demolition & disposal;
- * low building material waste;
- * materials savings - no need for footings - what can be built is limited by height & carrying capacity of the existing building;

- * Light-weight construction (steel frame with plantation timber frame) OVERALL 35% building cost saving.
- * increased number of city residents = fewer vehicle trips & less pollution for work trips;
- * increased pedestrian journeys gives greater community health at less public cost;
- * by limiting urban sprawl, overall journeys are shorter and the existing urban fabric is used more effectively – counter to decreasing household occupancy rate. OVERALL 33% increased city residency.



Image credits – www.e-architect.co.uk/architecture_competitio... – Graham Meltzer

4.1 BUILDING PERFORMANCE - ENERGY AUTONOMY

First Light is the name given by four Architecture Students at Victoria University in Wellington, New Zealand, for their finalist entry to US Dpt. Energy Sponsored „Solar Decathlon“ (Farrow, et al, 2009).

Solar Decathlon is a competition that short-lists twenty house designs by university teams internationally every two years. The designs are built and exhibited on „The Mall“ in Washington DC, educating a new generation of professionals & the public.

The designs must be liveable, completely solar-powered but must also blend aesthetics and modern conveniences with maximum energy production and optimal efficiency.

First Light includes electronic management of smart-systems including re-cycling, water collection, security, air-conditioning, ventilation, thermal performance and communications. It generates power for its own operation; it can re-charge an electric car and export power.



Image credit – firstlighthouse.ac.nz/featured/the-house/

4.2 BUILDING PERFORMANCE - GREEN OFFICES

Nearing completion is the 310m high „*Pearl River Tower*“ in Guangzhou, China, by SOM.

The sculptural façade directs wind to the pair of funnel-like openings at its mechanical floors at one-third and two-thirds the height.

Wind power in even mild conditions from different directions drive turbines to generate electricity for heating and ventilation.

The tower has a double-skin curtain wall for insulation as well as trapping heat for hot water.

Integrated solar collectors generate AC current for lighting & other needs. Daylight is „harvested“ for lighting.



Image credit – www.skyscrapercity.com/showthread.php?t=410543

4.3 BUILDING PERFORMANCE - SUPER GREEN OFFICE

In 2006 Australia’s first 6-star rated building „*Council-House 2*“ in Melbourne successfully set out to establish new performance standards for office buildings.

It gave reductions of: CO2 emissions by 82%; Electricity use by 82%; Gas usage by 87%: and Water use by 72%.

Productivity improved 10% compared with the previously occupied council administration building.

Four years later was Australia’s 250th 6-star or better building. The world’s first carbon-neutral better than a „perfect-score“ office building „*Pixel*“ in Melbourne.



Image credit - construction.com/CE/articles/0801edit-1.asp

4.4 BUILDING PERFORMANCE - PIXEL

Pixel by architects studio 505 and Grocon is self-sufficient for water and will generate surplus energy to neutralise its embodied energy.

Innovations include carbon neutrality, a vacuum toilet system, the anaerobic digestion system and reduced car parking. The water initiatives in the project mean the building could be self sufficient for water – in this context, the project is water balanced as well as carbon neutral.

The building features a new type of concrete which halves the carbon in the mix. Melbourne University designed the „living roof“ which re-introduces Victorian grassland species to the Melbourne area, and includes tracking photovoltaic roof panels. The multi-coloured sun shade system on the exterior of the building will provide the maximum amount of daylight into the office space, protecting it from glare and heat in the summer. While smart window technology ensures windows will open automatically on cool nights to enable air flow into the building. Electricity is generated by roof-mounted wind turbines.



Image credit – www.australiandesignreview.com/news/17810-Pix...

4.5 BUILDING PERFORMANCE - DELTA

Another project by studio 5050 under design development, is the proposal for DELTA a 50-unit residential tower designed to stand 10-12 stories atop a heritage bluestone building in Melbourne. The tower will be composed of prefabricated laminated timbers that will be locally sourced.

The project's carbon neutral design goes well beyond the materials used as it is seeking Passive House certification, it the most efficient building in the country.

The super-efficient shell is highly insulated, meticulously airtight, and features super high-efficiency windows. This sharply reduces the size of the equipment needed to heat and cool the building.

The prefabricated componentized system will make the building simpler to assemble on-site.



Image credit – inhabitat.com/.../

4.6 BUILDING PERFORMANCE - QUEENSLAND GOVERNMENT

Queensland Government Architects office „Project Services“ have recently completed the State's first 6+ green star rated building „Dandiiri Contact Centre“ at Zillmere.

Innovations in this building include significant passive design aspects – orientation, shading, mass and insulation, natural lighting and ventilation (selected areas), high ceilings as well as sealing against leakage. Other achievements derive from solar energy collection, recycled

timbers, avoidance of noxious gases from materials, and water collection for internal use and recycling.

Construction materials were carefully selected to reduce CO2 impacts (eg: 40% of cement was replaced with blast furnace slag).

External works include native plants and water management.



Image credit - www.gbca.org.au/newsletter_preview.asp?id=794...

5.1 ECOLOGICAL URBANISM – FIRST SUSTAINABLE CITY

Masdar (Arabic „the Source”) in Abu Dhabi, a new city of 50,000 residents under construction will run entirely on renewable energy when completed in 2015.

Designed by Lord Foster in 2007 the compact, high-density low-rise city of 6 sq k will be completely free of conventional cars and their emissions. A fully automated electric Personal Rapid Transit System will provide a flexible alternative to private cars. Light rail links the city to nearby developments.

Compared to conventional cities there will be 75% less fossil fuel consumed, 300% less water, 400% less waste.

No resident will be more than 200m from essential facilities including shops selling locally grown produce.

The Masdar Institute of Science and Technology (in partnership with MIT) will use the city for research in advanced energy and sustainability.

Passive systems are incorporated: orientation to capture cooling sea breezes; perimeter walls to protect from desert winds. Courtyards and wind towers draw cooling breezes into narrow streets shaded from harsh sunlight...conjuring images of ancient bazaars.



Image credit - www.bustler.net/.../



Image credits – www.e-architect.co.uk/dubai/masdar_headquarte...
www.renewableenergyworld.com/rea/news/article...

5.2 ECOLOGICAL URBANISM – MANY MORE CITIES TO COME

Dongtan Eco City, China (top image) will increase bio-diversity and will create a city that runs entirely on renewable energy for its buildings, its infrastructure and its transport needs. The city will recover, recycle and reuse 90% of all waste in the city, with the eventual aim of becoming a zero waste city.

Dockside Green, Victoria BC Canada. Plans to become North America's first carbon neutral community, achieved through a combination of green solutions for buildings, transportation, energy and waste treatment.

The Eco-City Longrono Montecorvo in Spain (bottom image) foresees the construction of 3,000 social homes and complementary services program. The new neighbourhood achieves a CO2 neutral footprint by producing renewable energy on site.



Image credits - sustainablecities.dk/en/city-projects/cases/d... naturopoil.com/eco-city-development

6. SENSE OF PLACE

What can we learn from these examples? Many things but unless we transfer knowledge gained from case studies in ways that are relevant to our own place then we potentially contribute to deterioration of our sense of place....even by contributing to placelessness (after Relph, 1976) as discussed further with regard to the Gold Coast by Holden (Holden, 2011).

The importance for a city's resilience of developing place specific solutions was identified in reference to Landry (2006) and Newman and Jennings (2008). We know from examples such as the art museum and subway stations of Bilbao in Spain that innovatively designed buildings and services have resulted in strengthening sense of place and resilience notwithstanding the international origin of ideas and forms (Gospondi, 2004).

From this we may conclude that by seeking high quality design for small and large scale private and public elements then the city can potentially gain greater resilience through improved sustainability from selective transfer of ideas from elsewhere.

CONCLUSION

It is argued that if a city expects to evolve sustainably and with resilience, urban design requires a comprehensive approach, which is locally relevant. This can embrace the adaptation and transfer of ideas and knowledge that is widely available as demonstrated across the case studies shown. The challenge is to strike the appropriate balance for application between place uniqueness and globalised culture and technologies.

The paper selectively engages with physical, technological and visionary-policy driven examples of architecture and urban design across a wide range of scales from an individual autonomous house to entire cities. These are organised under sub-headings that are relevant to city sustainability. Many more examples are available and many of the ideas discussed may be adapted or transferred to other cities provided there is willingness, as Newman et al say (2009), to experiment and innovate, which is at the core of resilience.

BIBLIOGRAPHY

- City of Melbourne, (2009) *"Transforming Australian Cities – For a More Financially Viable and Sustainable Future – Transportation and Urban Design"* City of Melbourne.
- Farrow, A. Jagersma, B. Nuttall, E. Officer, N. (2009) *"Lifestyle: A New Zealand design proposal for the International Solar Decathlon"*, Faculty of Architecture and Design, Victoria University of Wellington.
- Gospondi, A. (2004) *"Urban Morphology and Place Identity in European Cities: Nuilt Heritage and Innovative Design"* in, *Journal of Urban Design* Vol 9 No 2, 225-248, June 2004.
- Gray, J and Hoare, C (2010) *"Suburban Sustainability"* The NZ Centre for Sustainable Cities, Wellington, 16 February.
- Holden, G. (2011) *"Sense of Place and Urbanity: Challenges and Interventions at the Gold Coast"* Paper presented at 4th Healthy Cities: Making Cities Liveable Conference, Noosa.
- <http://www.pixelbuilding.com.au/>
- Landry, C. (2006) *"The Art of City Making"*, Earthscan,
- Newman, P and Jennings, I. (2008) *"Cities as Sustainable Ecosystems"* Island Press.
- Newman, P., Beatley, T. and Boyer, H. (2009) *"Resilient Cities"* Island Press.
- Relph, E. (1976) *"Place and Placelessness"*, Pion.