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Dear Mr Delaney

Parliament of Victoria Inquiry into Environmental Design and Public Health

Arup is pleased to submit the attached paper, *Healthy cities in an ecological age*, in response to the parliamentary inquiry into environmental design and public health. The paper is co-authored by me, Arup's Cities leader in Australasia, and by Arup's former Director of Global Planning, Peter Head, and will be published in the July 2011 edition of the journal *World Health Design*.

Arup is an independent firm of advisors, designers, planners, engineers, consultants and technical specialists, and offers a broad range of professional services. Of significance to the nature of this inquiry, is Arup's current work with C40, a group of 40 of the world's largest cities committed to tackling climate change. We are providing technical expertise, sustainable integrated thinking and policy consulting to help each city become more resilient and to realise solutions that will help reduce greenhouse gas emissions and/or adapt to climate change, which will ultimately result in better health outcomes for individuals and communities.

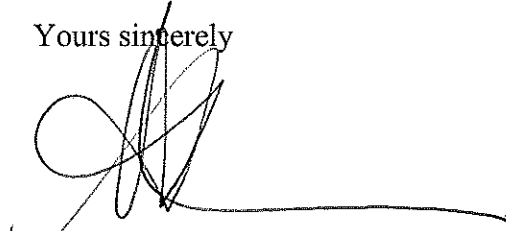
Climate change has the potential to have significant health impacts, particularly on vulnerable populations. Arup has been working with the Victorian Department of Health to understand the linkages between projected climatic changes and potential health impacts on vulnerable populations. In doing so, the Department of Health and Arup developed a methodology for assessing vulnerability at a State, regional or local government level.

Arup understands the impact that design has on health and considers that embedding health outcomes into the process of urban design, planning, management and delivery is essential to achieving sustainable, healthy communities. Indeed, Health Departments could become the 'engine room of urban development'.

The attached paper represents Arup's opinion in general on the importance of the link between environmental design and public health; a response to each of the Terms of Reference of the inquiry can be construed within it.

Any enquiries on our submission can be forwarded to me at andrew.wisdom@arup.com or alternatively I can be contacted directly on 03 9668 5499.

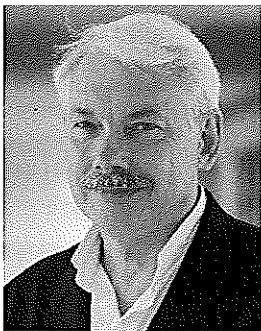
Yours sincerely



Andrew Wisdom
Principal

Healthy cities in an ecological age

The health issues of affluent industrialised cities, and the challenge of creating resilient cities for the post-industrial age, are really two sides of the same coin – which should guide how they are tackled



Peter Head
Director of global
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“Instead of being regarded as a drain on the public purse, health departments could become the engine room of urban development”

Our cities are essentially unhealthy places to live, characterised by heavy traffic, high levels of pollution, noise, violence, social disintegration and isolation. Notwithstanding major changes in the physical environment of our cities that have eliminated, or at least controlled the disease blights of the past, people in towns and cities experience increased rates of disease, injuries, and alcohol and substance abuse, with poor people typically exposed to the worst environments¹.

This has created a huge and escalating drain on resources in industrialised countries. As cities are now home to more than half of the world's population (and significantly more in highly urbanised countries such as Australia, US, Canada and the UK), the challenge of overcoming the health burden of cities developed and managed along agricultural-age and industrial-age lines is increasingly pressing.

There are ways to tackle these challenges. As designers we have a significant role to play in developing and articulating solutions and helping to implement them. Design for healthy cities involves a shift in focus toward the notion that “health is a state of complete physical, psychological and social well-being; not only the absence of illness”⁴. The Ottawa Charter for Health Promotion (1986)⁵ declared that “to reach a state of complete physical, mental and social well-being, an individual or group must be able to identify and to realize aspirations, to satisfy needs, and to change or cope with the environment. Health is, therefore, seen as a resource for everyday life, not the objective of living. Health is a positive

concept emphasizing social and personal resources, as well as physical capacities. Therefore, health promotion is not just the responsibility of the health sector; but goes beyond healthy life-styles to well-being.”

This involves broadening our focus from hospitals to the communities they serve and the cities that nurture them. It involves moving towards the notion that our cities and their systems serve those who occupy them and not the other way round.

As it happens, the challenge of providing for the health and wellbeing of those who live in cities has another side to it: the challenge of transforming cities so that

A snapshot of urban health issues in Europe²

- More than 92% of urban populations live in cities with levels of air pollution (with particulate matter) that exceed the WHO air quality guideline value
- Road traffic crashes kill about a hundred children and young people aged under 25 every day, and cause on average 35 non-fatal injuries for every death
- The prevalence of 11- and 13-year-olds who are overweight (including obesity) ranges from 5% to more than 25% in some countries
- Fifty percent of car journeys are under 5km, a distance that could be covered in 15-20 minutes by bicycle or 30-50 minutes by brisk walking
- Environmental noise is perceived as the most common stressor in urban areas
- At least one million healthy life years are lost every year from traffic-related noise in western Europe³.

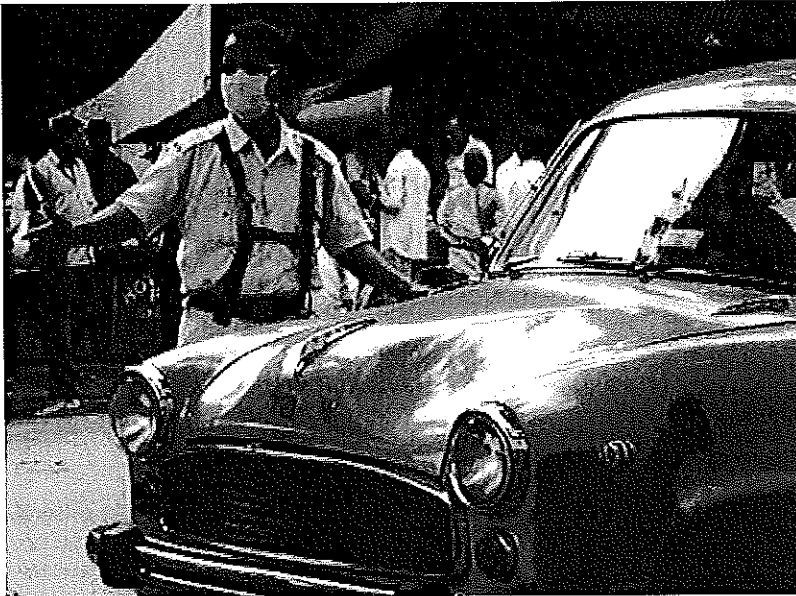


Figure 1: "Cities are essentially unhealthy places to live" -- with air pollution one of the greatest health risks

they can prosper in the face of the urgent demand to reduce the rate at which they generate carbon and the rate at which they use our finite resources.

Just as WHO articulated a holistic view of health, so the World Commission on Environment and Development (otherwise known as the Brundtland Commission) articulated the idea of sustainable development as "...development that meets the needs of the present without compromising the ability of future generations to meet their own needs"⁶.

The way we live now runs contrary to the demands of sustainable development in two key areas: the rate at which we generate carbon emissions and the rate at which we are using the earth's resources. We know we are generating carbon emissions at an unprecedented rate, and that the concentration of carbon in the atmosphere is growing relentlessly. There is general consensus that this is leading to climate disruption. While the politics are difficult, we know that our long-term future relies on moderating the rate at which we generate carbon emissions and that our short-term future relies on us adapting our cities so they become resilient in the face of our changing climate. The burden of dealing with the consequences of climate disruption falls disproportionately on low-income countries, even though they have contributed little to the causes, because many of these countries

are at particular risk from such consequences as flooding and spread of disease into new habitats. This introduces a moral dimension to the challenge.

As to our use of resources, the concept of an ecological footprint is useful as a measure of human demand on the earth's ecosystems. It represents the amount of biologically productive land and sea area needed to regenerate the resources a human population consumes, and to render harmless the corresponding waste. With our population projected to peak in the second half of this century at something like 9 billion, we can estimate that our maximum allowable ecological footprint is 1.44 global Ha per person. Almost all industrialised countries are consuming resources substantially in excess of this limit.

One of the benefits of the remarkable development achieved around the world over the course of the 20th century has been the marked improvement in standards of living that has accompanied it. The Human Development Index (HDI) is one way to measure this. HDI is a comparative measure of wellbeing, especially child welfare, based on life expectancy, literacy, education and standard of living for countries worldwide.

Unfortunately, these improvements in standards of living have been accompanied by less welcome increases in carbon and ecological footprints. One of the challenges of the coming decades is to decouple the

two so that we can achieve improvements in standards of living without compromising our planet's resources. This is a particular challenge in countries like China, which are urbanising rapidly. In countries with already high standards of living, reducing ecological footprint without compromising standards of living represents a related challenge.

Cities contribute disproportionately to these problems: while they are home to half the world's population, cities consume over two-thirds of the world's energy and account for more than 70% of global CO₂ emissions. Cities are where we need to focus our attention.

Cities of the ecological age

Two things are needed: a target for change and a roadmap to get there. One way of articulating a target is Head's Ecological Age formulation⁷:

$$\text{Ecological Age} = [\text{CO}_2 - 80\%] + [1.44 \text{ g-Ha per person}] + [\text{increase in Human Development Index HDI}]$$

This links necessary action on reducing our carbon footprint and living within our ecological means with an improvement in quality of life. Even in countries with a high HDI, quality of life challenges remain pressing. The idea that we can effect major lifestyle changes while at the same time improving our quality of life is at once challenging and liberating. Our challenge is to "...convert a sprawling, polluted, congested 20th-century metropolis into a clean, free-flowing, low-carbon city able to survive all that the 21st century will throw at it. Most of the world's leading cities have evolved over many decades (London, New York, Paris). A few have been created in a concentrated burst of growth (Sao Paulo), but almost none have been 'planned'. But that is exactly what is needed now. If the 21st century is to be the 'ecological age', it will also have to be the age of municipal planning"⁸.

Janine Benyus' brilliant book *Biomimicry*⁹ provides an excellent guide not only to why but also to how we might design and retrofit infrastructure for the ecological age. Her approach is to adopt principles that mimic the biological system of which we are part, principles that support a virtuous cycle of benefit: use waste as a resource, use materials sparingly and do not draw down on resources. Behind these lies an ambition

to optimise rather than maximise systems. The question is: how do we do this?

Cities as systems

The way a city operates is the product and reflection of a complex interaction between its physical form and the social, economic and political drivers that influence it. The pressure to reform cities to meet the challenges provided by current and emerging economic, social and ecological drivers can be viewed in terms of optimising the city as a system that encompasses both its physical and social realms. We need cities to work well and efficiently.

It is clear we cannot be prescriptive about how cities should develop, but instead should concentrate on creating a development and governance environment in which resilient and effective solutions can evolve. The most effective way to achieve this is to adopt a holistic approach to how we think about cities and the way we plan them, develop them, manage them and live in them. In the past, when cities were smaller and simpler and the problems of the city condition were not so acute, they could be planned and developed effectively by addressing each system separately – so a health department or a transport department or a housing authority could, in the 20th century, deliver effectively on its remit. It is clear that in this century such an approach is simply not up to the task.

It is also clear that the linear, centralised infrastructure systems that worked so well for cities in the 20th century – transport, energy, water, waste, food, health – are becoming increasingly stretched and expensive and are probably no longer the most effective solution for the future as cities continue to expand. Projections for Australia, for instance, show its population approximately doubling in coming decades and we might expect most of that growth to occur in cities. The picture of workers living on the remote urban fringe in houses built on the city's former market gardens, spending ever-increasing amounts of their discretionary time travelling on ever-more congested roads and railways to jobs in the centre of the city, is not an attractive one.

If we think of cities as systems, we might think about how best to intervene in those systems. Renowned systems analyst Donella Meadows provides a framework with her classic 12 leverage points to intervene in a

"Local communities represent the lifeblood of healthy cities; their decline in the second half of the 20th century is one of the great tragedies of our era"

system, "where a small shift in one thing can produce big changes in everything"¹⁰. This framework is a means to reflect on those elements on which we need to focus to effect change. Meadows notes that we tend to spend an inordinate amount of time focusing on relatively ineffective leverage points and, given the complexity of systems, in many cases push things the wrong way.

Meadows' 12 places to intervene in a system, in ascending order of effectiveness:

12. Constants, parameters, numbers
11. The size of buffers and other stabilising stocks, relative to their flows
10. The structure of material stocks and flows
9. The length of delays, relative to the rate of system change
8. The strength of negative feedback loops, relative to the impacts they are trying to correct against
7. The gain around driving positive feedback loops
6. The structure of information flows
5. The rules of the system
4. The power to add, change, evolve or self-organise system structure
3. The goals of the system

2. The mindset or paradigm out of which the system arises
 1. The power to transcend paradigms.

Establishment of air quality or water quality standards are examples of intervention in the urban system through manipulation of parameters – item 12 on Meadows' list. While such measures yield long-term health benefits, their impact is indirect and slow-acting, as they rely on progressive modification to the urban system in response to tightening standards. This demands industry compliance from polluters and establishment of a regime of monitoring and enforcement to support and reinforce the declared standards. This is not to say such standards are not important, but simply that they are a weak means of improving the health of cities.

Contrast this with a change of mindset (item 2 on Meadows' list) reflecting a 'wellness' rather than 'illness' approach to health, a change from an exclusive focus on care to a mixed one that includes prevention. Such a change in mindset might drive integration of health and urban development policy agendas and attention, for instance, to the drivers of obesity (eg the creation of more walkable

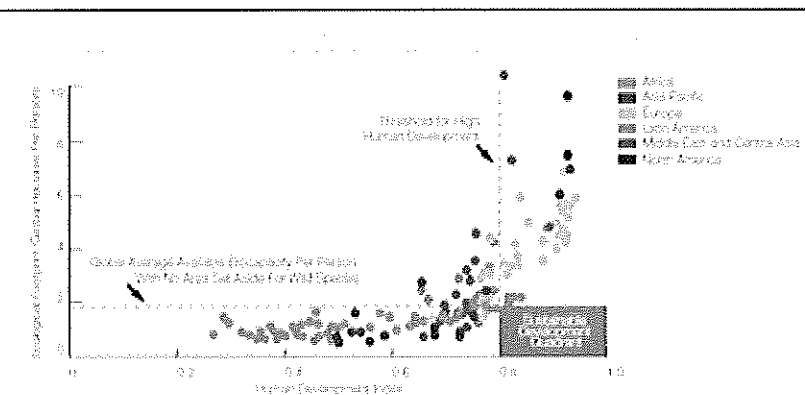


Figure 2: Human Development Index versus ecological footprint. Improving global living standards, without adding to our footprint, is one of the most difficult challenges we will face

communities, the encouragement and facilitation of routine walking and cycling, or the development of local sources of fresh produce), depression (eg attention to social isolation through more comprehensive public transport services) and marital breakdown (eg retrieval of discretionary time through attention to land-use mix to minimise long commutes). Imagine how effective that could be in reducing the overall demand on struggling health systems, with their ballooning budgets and challenging prospects in the face of projected demographic changes over coming decades. Instead of being regarded as a drain on the public purse, health departments could become the engine room of urban development.

Or contrast the recurring call for more hospital beds (item 10 on Meadows' list: the size of buffers) with a goal to minimise health department expenditure (item 3). The former may address a specific issue that has emerged in a region but is at best

Suburban health risks

Suburban sprawl has its consequences: parental absence and family breakdown are associated with excessive time spent commuting to places of employment and to mortgage stress. In fast-growing areas such as Wyndham and Melton on Melbourne's periphery, youth unemployment lies at 50% or higher, with high levels of attendant social and health risk. In some parts of Wyndham, as many as 60% of households have only a single parent.

"If the goal of the health system were amended to focus on optimising health outcomes, a different approach to the health task might well emerge"

a Band-Aid solution that does no more than address a symptom of health system malaise. The latter, in contrast, determines overall actions and budgets. If the goal of the health system were amended to focus on optimising health outcomes, a different approach to the health task might well emerge. Driven by a wellness approach to healthcare, a goal of optimising health outcomes might help drive the inevitable move to community-based care, not simply as a means to limit burgeoning costs but to improve health outcomes.

How design impacts health

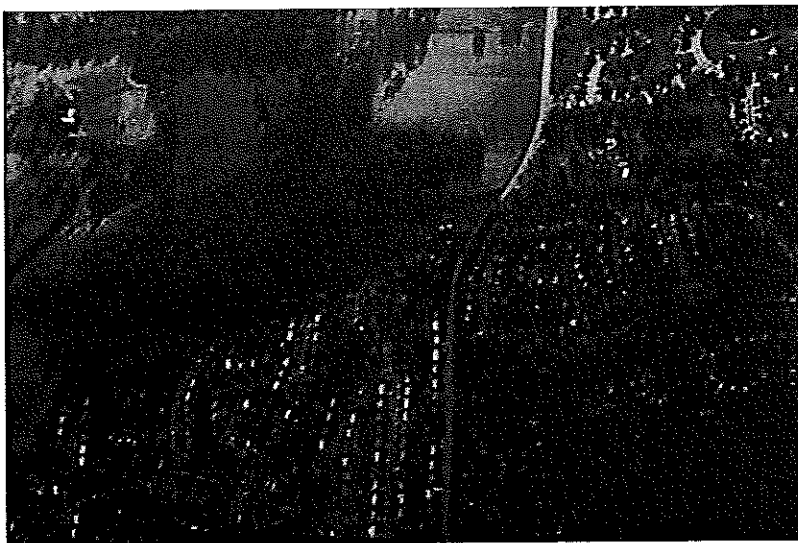
So, real change in the creation of healthy communities demands that we focus on those intervention points that have the power to change the way we think about our cities and the way we manage them. Thinking about the health task in isolation can result in little more than a desperate effort in many jurisdictions of doing more with less, of coping with escalating demands on diminishing budgets. There really is no alternative to adopting an approach that embeds objectives around healthy outcomes in the process of urban design, planning, management and delivery. Given a number

of the health and wellness challenges faced by western societies are the product of current urban form, health professionals have a substantial interest in available means of transforming that urban form.

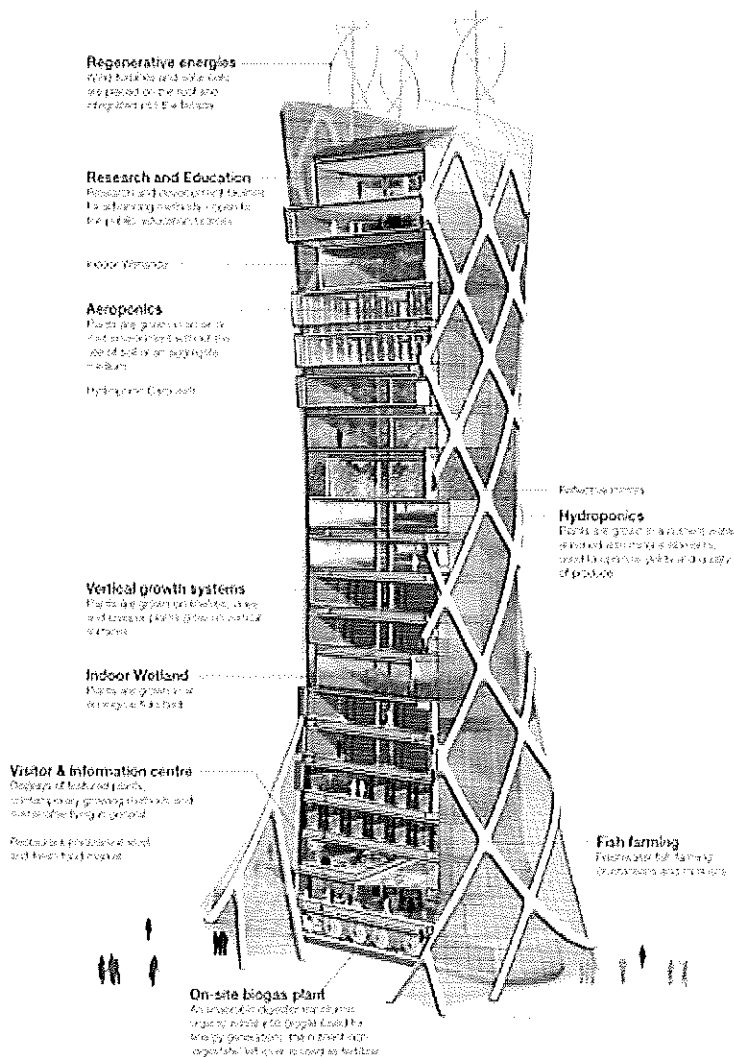
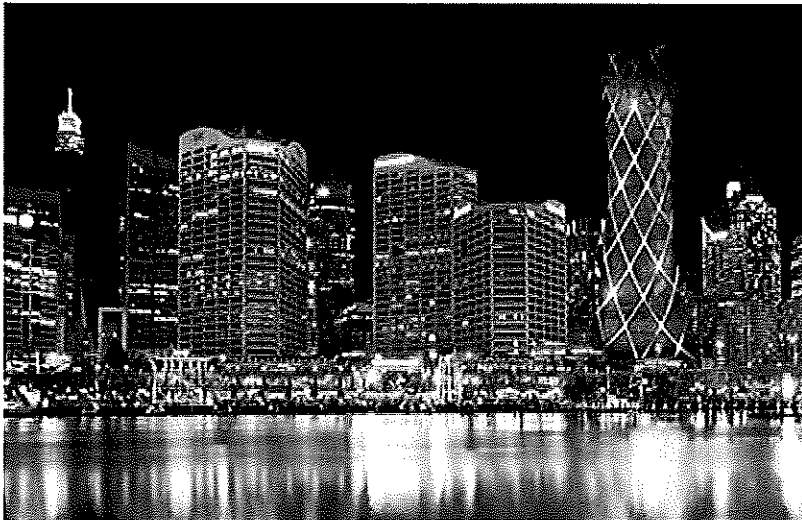
Specific design interventions can have important impacts on physical and mental health outcomes. A move away from petrol- and diesel-engined vehicles to walking, cycling and electric vehicles will allow a move back to openable windows and natural ventilation in commercial buildings, with clear and immediate health benefits. Similarly, the benefits to both physical and mental wellbeing of exposure to the natural environment are well documented^{11,12}. This suggests that the integration of trees and parkland into the urban fabric not only benefits the physical environment by reducing air pollution and reducing the load on stormwater systems by slowing water runoff, it also has direct health benefits.

A major focus of urban planning and health needs to be on enhancing resilience. Recent natural disasters provide plenty of evidence of the fragility of our city systems and motivation for us to find ways for cities to continue to operate effectively in the face of abnormal conditions as well as normal ones. Development of distributed rather than centralised and linear infrastructure systems – transport, energy, water, waste, food, health – is an important part of the solution to this challenge.

A key way this focus is reflected in health planning is the need to strengthen and support – and, in some cases, create – local communities. Local communities represent the lifeblood of healthy cities and their decline in the second half of the 20th century in industrial-age cities represents one of the great tragedies of our era. Reinvigoration of local communities (as it happens, an example of Meadows' item 4: the power to add, change, evolve or self-organise system structure) can provide the foundation on which a wellness-focussed health service is delivered in the ecological age of the 21st century. A city consisting



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Figures 3 & 4: Agriculture in the city. The future could see high-rise buildings used as 'vertical farms', as in this vision for Sydney's skyline

of a network of vibrant local communities filled with empowered citizens will be inherently more resilient than a city with a single central focus surrounded by a sea of community-less commuter suburbs.

Transforming our cities to meet the challenges of the coming decades is vital. So is transforming the way we live in our cities to meet the challenges of delivering on our health agenda. These may be treated as separate and unrelated issues, but to do so invites development of suboptimal outcomes. Better to treat them as the related challenges they are and to work towards best possible outcomes.

About the authors

Peter Head CBE is a civil engineer and expert on the sustainable development of cities, and a director of global design and engineering firm Arup. This essay was co-authored by Andrew Wisdom, principal at Arup in Melbourne and Georgina James, an associate at Arup in Sydney.

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