

# Urban Design 4 Pandemics: Preventing pollution impacts on public health and pandemic prevalence in urban populations

By Dr Donnell Davis, Immediate Past President - Queensland Division United Nations Association of Australia (UNAA)

This article considers the preliminary determinants causing the spread of zoonotic disease among humans, and the spread of human disease in cities. Zoonotic diseases that pass from animals to humans include Coronavirus, the current pandemic that changed our lifestyles and livelihoods since February 2020. Pandemics spread where intensive living conditions prevail, but more importantly where poor hygiene and polluted air, water and waste impact human habitat. Urban settings are home to most of the world's people, but what can we learn about the design of our cities to prevent, mitigate and improve resilience to future pandemics? This article also examines Urban Design for Pandemics (UD4P) and provides a meta-analysis of monthly articles published in 2020.

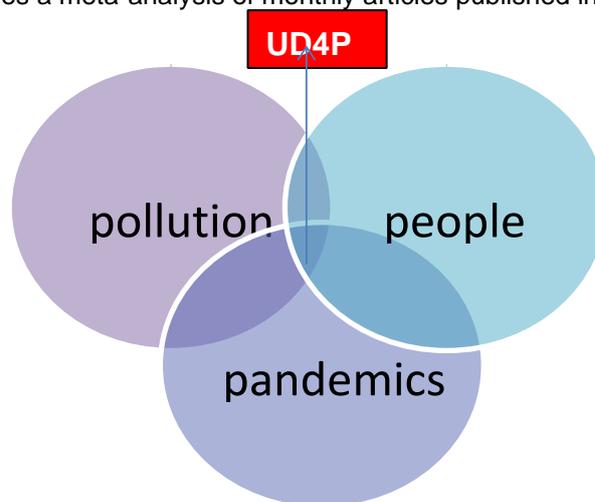


Figure 1. The nexus of people pollution and pandemics focussing on action for better urban design.

## Background

The rapid human population growth on Earth has displaced other species and their capacity to thrive in their natural habitats. The 'natural systems on which human life depends' are being undermined by Anthropocene behaviours where the healthy balance between people and nature is being lost. (WECD: 1987) Safe fresh water, clean atmosphere, productive land, pristine oceans, and clean beaches are disappearing and the safe spaces for biodiverse eco-centric health are being encroached upon by unsustainable human development (Earth Laws, 2020). The footprints from human population explosions in towns and cities are extrapolated by monoculture food production (specific non-endemic crops) and intensive animal husbandry (meat production by narrow species livestock). This means that animals, once wild, are becoming part of our human habitat to survive. Some become more domesticated, like cats, dogs, pigs, chickens, horses, cattle, camels and goats, which result in cross-contamination of parasites, bacteria, virus, prion and diseases in humans, only previously seen in animals. 70% of new viruses are zoonotic, some traced to wild animals at wet markets. In this century alone, we have seen SARS, MERS, BSE (Mad Cow Disease), Hendra Virus and Coronavirus. (Pepper: 2020)

In summary, our human populations- with nearly two-thirds living in cities- are at greater risk of pandemic recurrence if good urban governance does not address: (1) prevention, (2) mitigation of severity, (3) management of impacts and (4) strengthening resilience, through evidence-based information, environmental stewardship, social cohesion, community-need physical systems, and diligent ongoing hygiene with regenerative urban design principles.

Now is the right time to consider lessons to redesign and retrofit our cities to enable resilience to pandemics (Fig.1).

### **Measuring Human Impacts of Pollution**

In measuring our impacts to manage better, Carrying Capacity is seen as a valuable tool. It looks at more than the nine Planetary Boundaries (Rockstrom and Steffan, 2009 and 2015) to determining safe operating space for humanity. The key parameters are: freshwater; land-use; biodiversity; nitrogen; phosphorus; ocean acidification; ozone depletion; chemical pollution; and climate change. Globally we have already surpassed several of those safe boundaries.

Global measurements of Natural Assets may be abstract, but town and city level assessment are highly tangible. Water use and reuse, safe sanitation, greenhouse gas emissions, erosion and chemical runoff may be the responsibility of the local authority or state agency, but other matters may be regional, national or global. Pollution spreads through the environment, so we can only really measure its sources and not necessarily all the sinks, despite sophisticated modelling. The health and economic benefits of services provided for free by nature are Ecosystems Services. For example, in South East Queensland a mature tree may be considered as providing \$22,000 per year for pollution management, noise abatement, carbon sequestration, shade, cooling, water retention, erosion mitigation, biodiversity protection, microclimate modification, spiritual health, and cultural value (Maynard: 2014). In Singapore, trees in public parks have plaques on their trunks to educate visitors on the contribution value of each tree to a healthy human environment (EAROPH: 2014).

At the local level, urban food footprints have expanded with greater travel and exotic tastes, increasing per capita carbon footprints. Water foot-printing (originating in Netherlands in 2000) and water-exporting also make the task of measuring impacts more complicated (Davis: 2016). Before Covid, city resource foot-printing was difficult, but in 2020 things changed significantly. International trade and movement were scrutinised, as life went back-to-basics in most places. Measurements were taken as city pollution diminished, greenhouse emissions reduced, and domestic living was measured. In one month, China (Beijing) reduced its greenhouse gas emissions by 24% (He et al: 2020). Sewage systems were analysed, detecting coronavirus in populations that allowed for suburbs, towns and cities to take precautionary action even if an outbreak had not yet been discovered through human symptoms and medical covid-testing (Logan City Council, 2020; Hurdley et al., 2020). Care closer to home is most valuable.

### **Public Health interventions: international lessons**

Each country chose its course of early intervention. Leadership styles were as diverse as precautionary such as New Zealand, Singapore, Taiwan, and Iceland, or as denying as USA, Turkey, Egypt, the Philippines and Russia. This had significant impacts on the lives and livelihoods of people from the identification and spread of the disease, the severity, the medical response, and the humanitarian crises, to the global concern for rich developed countries, especially those losing 10% of their urban populations within a few months. Some the precautionary strategies of less developed countries like Botswana have been hailed as honourable and cost effective. The immediate response to epidemics must be to identify the culprit accurately and to isolate the source. Tracing the source and likely circle of contagion means that human behaviour must change to contain the spread. A total lockdown allows these to be determined quickly.

Figure 2. The Great Unlocking: On reopening Asia leads and Europe, with strategies differing between countries

	School		Retail		Industry	Services			Events, Large Gathering	Travel (International)	Contact Tracing*	Social Distancing/Masks	Targeted Isolation	Testing Expansion
	Primary	Higher	Small	Large		Small	Large	Cafes						
Austria	Yellow	Yellow	Green	Yellow	Yellow	Green	Red	Red	Red	Red	Green	Green		Green
Czech Republic	Red	Red	Green	Green	Yellow	Green	Red	Yellow	Red	Yellow	Green	Green		Green
Denmark	Green	Red	Green	Green	Yellow	Green	Red	Red	Red	Red	Green	Green		Green
France	Yellow	Red	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Red	Red	Green	Green	Green	Green
Germany	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Red	Yellow	Red	Red	Green	Green	Green	Green
Italy	Red	Red	Yellow	Red	Green	Red	Red	Red	Red	Red	Green	Green		Green
Norway	Green	Yellow	Green	Green	Green	Green	Yellow	Yellow	Red	Red	Green	Green	Green	Green
Poland	Red	Red	Green	Green	Yellow	Yellow	Red	Red	Red	Red	Green	Green		Green
Spain	Red	Red	Yellow	Red	Yellow	Yellow	Red	Yellow	Red	Red	Green	Green		Green
Sweden	Green	Red	Green	Green	Green	Green	Green	Green	Red	Yellow	Green	Green	Green	Green
China	Yellow	Yellow	Green	Green	Green	Green	Green	Green	Yellow	Red	Green	Green	Green	Green
New Zealand	Yellow	Red	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Red	Red	Green	Green	Green	Green
South Korea	Red	Red	Green	Green	Green	Green	Green	Green	Red	Green	Green	Green	Green	Green

Note: Estimated status of opening as of May 12 (except for New Zealand whose status is as of May 14), based on announcements by authorities. Cafes refers to dine-in restaurants and cafes. Travel (international) refers to non-essential international travel. \*At this stage, contact tracing apps in Europe are mainly on a voluntary basis with decentralized data-protection/sharing approach.

Scale of Opening: green = open with restrictions/guidelines, yellow = partially open, red = closed.

The International Monetary Fund graph (Fig. 2.) illustrates the diversity of national strategies for unlocking after isolation. Benchmarking behaviour helped understanding of the prevalence of Covid. However, the pressure cooker of complete isolation conflicts with the need for human social interaction.

The saving grace for social isolation in 2020 is that technology has allowed for interaction, albeit virtual. But only the privileged has that option. 21% of rural children Queensland do not have reliable access to internet to participate in regular online education, so in a rich society some of our children will be less prepared for the future. Technology allows immediate communications, QR code tracing, fast medical systems including emergency response and tele-surgery, online education, online business and trade, quarantine management, and online social support systems for the isolated and elderly. So, the situation in this pandemic can be favourably compared with the Spanish Flu of 1918. Historically, the great plagues and the Spanish flu killed people due to ignorance. One 2hour parade after World War 1 caused 600,000 Spanish flu deaths in one capital city (SBS news: 2020). This is generally not the case today with news and regular communications, priority medical aid, and support systems.

In the Pacific, 24 countries have different Covid management strategies depending on governance, density of populations, hygiene risk and border control. Every two years, the military of 42 countries are invited to RIMPAC War Games in the Pacific, trialling their new machinery, techniques, chemicals and strategies. Postponed from May until August 2020, only 22 countries participated eventually, but the impact continued for the environment, people, and animals, exacerbating risks of Covid with thousands of troops from each country in-situ for up to two months. At least 26 US Navy warships reported cases of covid-19 infection, while troops from Thailand and other nations brought to Hawaii may have affected contagion rates. Apart from damage to the fragile marine and terrestrial ecosystems, 250,000 whales were deafened, endangered species died, small towns were taken over with onshore troops residing and celebrating war game victories. The whole fabric of life changes, but the USA military now owns significant land in Hawaii and infrastructure throughout Pacific countries. RIMPAC rituals seem to be a rite of passage for participants. Many of the Pacific countries are impacted adversely.

Vaccines are the long-term intervention. Different vaccines provide different assurances, and as of March 2021, no one vaccine is a panacea to (1) stop contagion (2) prevent spread (3) mitigate severity (4) provide lifetime protection (5) have no side effects. In the meantime, vaccines herald a safer environment so that we can resume some semblance of pre-2020 lifestyle. The lives of some families have changed so much that they choose to escape to rural areas that have no schools or hospitals – social infrastructure. But what is our concept of cities? What does a healthy city designed for resilience to pandemics look like?

## Lessons from the pandemic on how to redesign for resilient cities

Cities are the hubs of human habitation, centres for cultural identity, and places for social infrastructure such as hospitals, public transport, food markets, supermarkets, meeting places, and the engine rooms for national economies. But cities have been **demonised** as the places where the virus spreads.

In retrofitting our cities and designing for future resilience, we must consider the ugly, complex, wicked problems, starting with **pollution, people and pandemics**. We also need to be incorporating futures thinking for ongoing crises like climate change, food security, energy poverty, corrupt governments, and crime at a time in history we should be embracing humanity, sharing assets and sowing healthy seeds of hope. The United Nations Young Professionals 2020 Forum concluded that young people worry about inheriting the public debt from Covid, and investing in the futile urban systems. The WEF 2021 at Davos recommended positive ways forward, but steps need to be taken in every sector and in some ways, we are all responsible to care. The wicked problems start with the need for caring for the most vulnerable people – leave no one behind.

The right to shelter is important, and 'home' is the refuge from epidemics. Cities are responsible for their vulnerable peoples now including:

- international students and migrants who cannot return home, who are not entitled to government financial support, have no home or work opportunities, and rely on compassion from their communities for crisis food and shelter;
- health and aged-care workers in the frontline;
- those whose casual work stopped and permanent employees who negotiated hours as business and luxury industries dissolved during the economic shadow epidemic;
- women as carers and home-schoolers in domestic violence situations as economic stresses worsened; and
- emergency and quarantine workers now the high-risk category.

In Australia, an estimated 2.1 million people were said to be vulnerable before Covid (Rahill:2020), so the pandemic will have considerably increased that number. A city is only as strong as its weakest link. When we reconsider what our cities are for, apart from meeting the need for socialisation, they are economic forces and business hubs, and help give us our identity. Office blocks may still dominate the skyline but now we need to deal with an urban housing crisis. Many cities' economic contributions are larger than those of small countries, and under certain mayors, cities behave like small countries (World Economic Forum, 2021).

## A policy cycle approach to retrofitting urban areas for pandemics

All future policy development begins with leadership to articulate the preferred vision and enlist partnerships to implement desirable change. The fundamental components of planning for future urban growth are:

- **Prevention** includes better human hygiene, less pollution, better natural ecosystems health, and more biodiversity (regenerative principles). (Newman, 2010, Sachs, 2020)
- **Mitigation** includes refining urban working systems (office spaces), use of technology, revising public transport systems and ensuring safe social infrastructure like schools, hospitals, shopping, and socialising activities. (Urban Design Alliance, 2020)
- **Management** includes cleaner living, smaller local footprints, conscious consumption, precautionary hygienic human interactions, and fresh air (rather than quarantine hotels and hospitals with contaminated air-conditioning systems), emergency housing, open space recreation, public parks and outdoor exercise for all ages. (AHURI, 2020) (Daszak, 2020)
- **Resilience** includes balancing the future expectations, legal requirements, regenerative design inside and expanding past the urban footprint, reviewing trade and business with tourism and recreational activities, and adequate care for vulnerable peoples most impacted by Covid. (Queensland Parliamentary Inquiry, 2020)

This is an appetiser for how to articulate urban design for pandemics but a framework comprising toolkits of focussed culturally appropriate interventions can be provided. Now is the right time to consider lessons to redesign and retrofit our cities to enable future resilience.

*Dr Donnell Davis is a Governing Board member with Commonwealth Human Ecology Council, Immediate Past President of United Nations Association of Australia Queensland, and Visiting Fellow at Griffith University Australia. Her Doctorate of Professional Studies investigated the Race between Educational and Catastrophe. She writes monthly reports for professional bodies and international policy groups.*

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