Green Space in a Resilient City

Centre for Sustainable Cities lecture series | 23 August 2017

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Outline

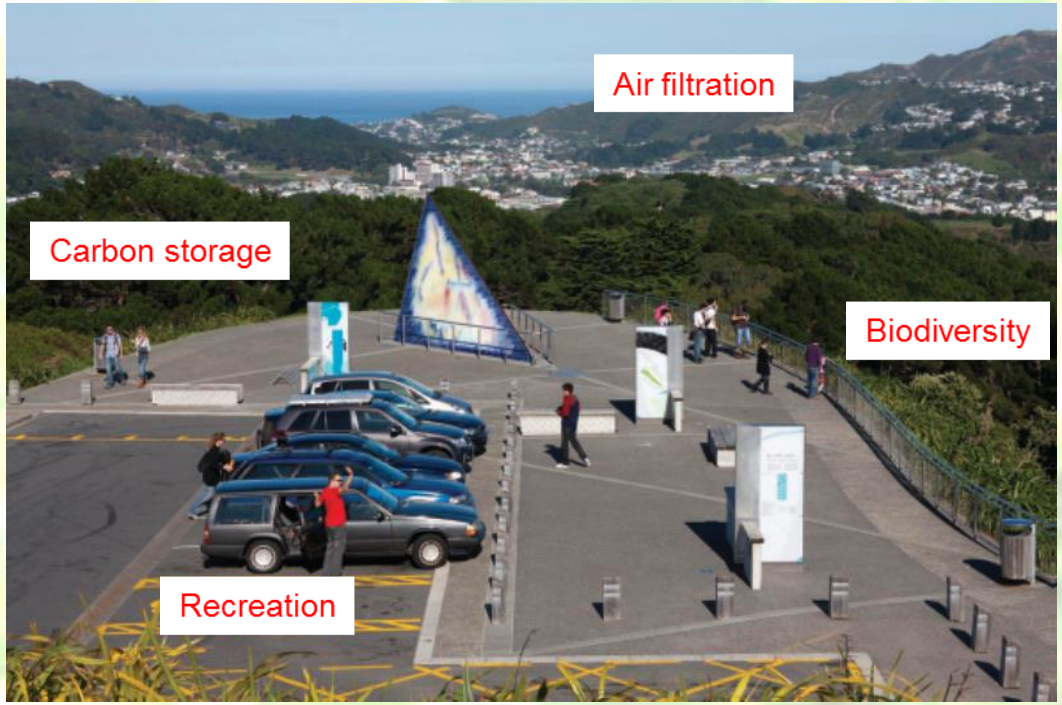
- Why are green spaces good for you?
- What do we know about New Zealand urban green spaces?
- How much green space do we need in Wellington/NZ?
- What do we want from our green spaces in Wellington City?

Ecosystem services approach

- "What does the environment do for me?"
- Ecosystem services:
  - "the benefits that humans receive from nature"
  - "Nature's goods and services'
  - require healthy functioning ecosystems

For example:

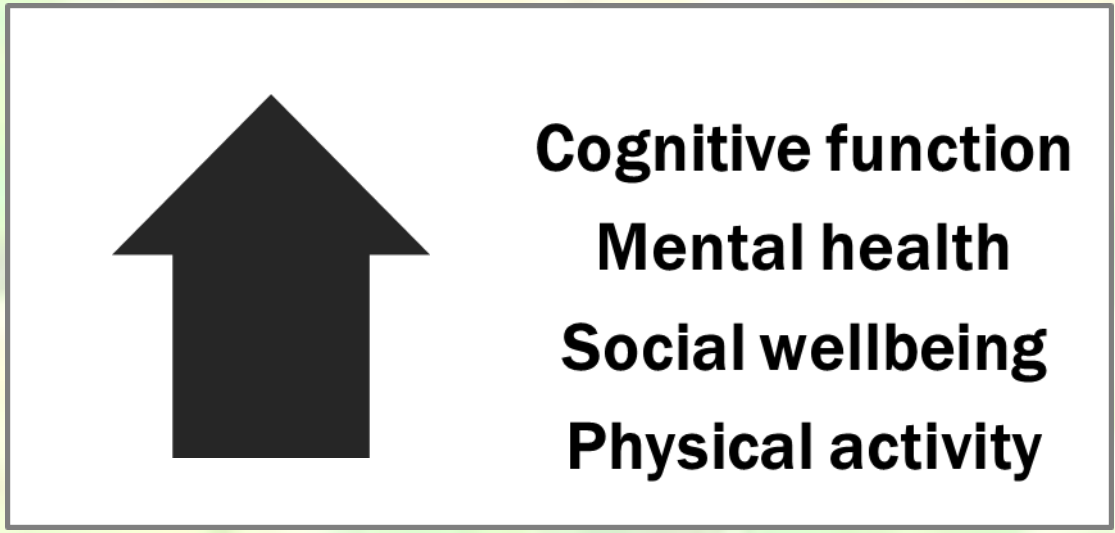
- Production of food and fibre
- Cycling nutrients
- Purifying water
- Decomposing wastes
- Providing pollination and pest control
- Regulating local and global climates
- Recreation & human health



Meurk CD, Blaschke PM, Simcock RC 2013. Ecosystem services in New Zealand cities. *In* Dymond JR ed. Ecosystem services in New Zealand – conditions and trends. Manaaki Whenua Press, Lincoln, New Zealand.

How do natural places / green spaces facilitate health and wellbeing?

- Three main ways:
  - **direct restorative mental and physical effects,** e.g.
    - recovery from stress
    - improved moods
    - mental recharging
    - reduced blood sugar levels
    - Better immune system functioning
  - by providing opportunities to undertake **physical activity**;
  - by facilitating the development of **social capital**;



Hartig, Terry, et al. "Nature and health." *Annual review of public health* 35 (2014): 207-228

Shanahan et al 2016 Sci report: Health Benefits from Nature Depend on Dose

Brisbane City

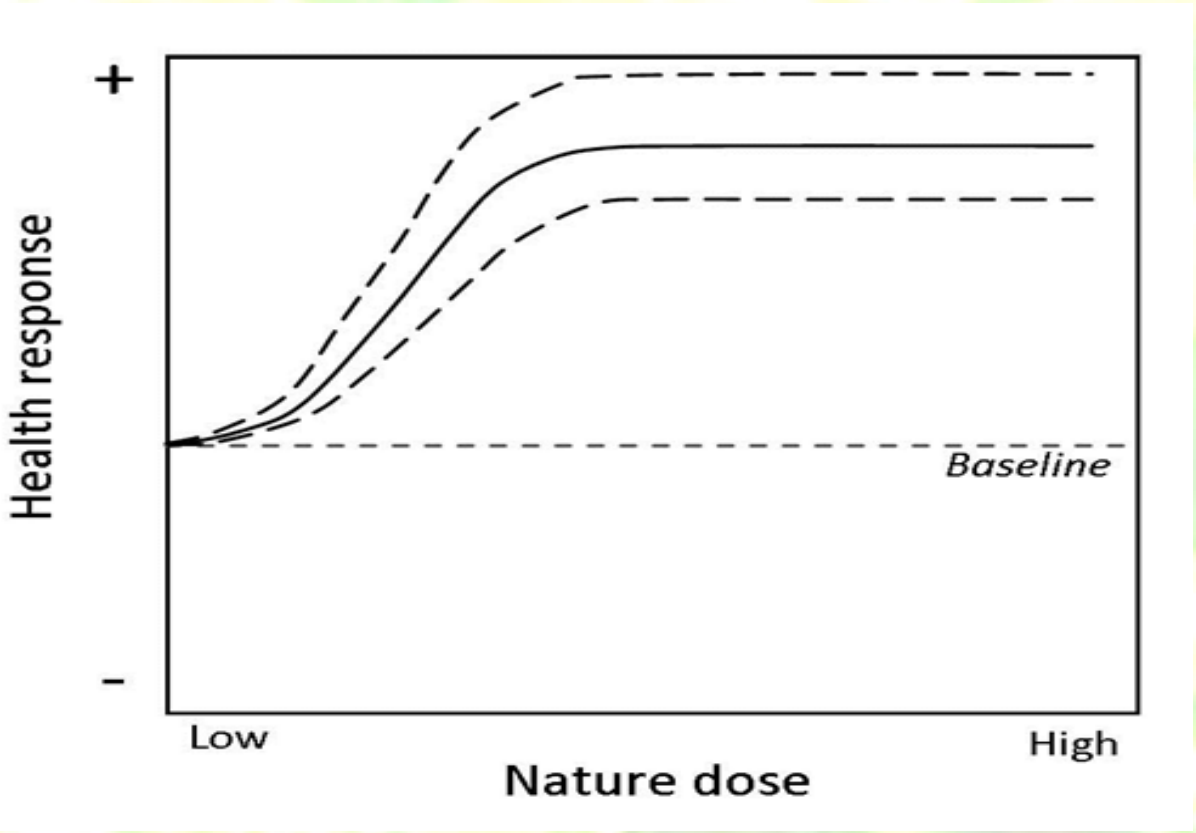
Population survey:

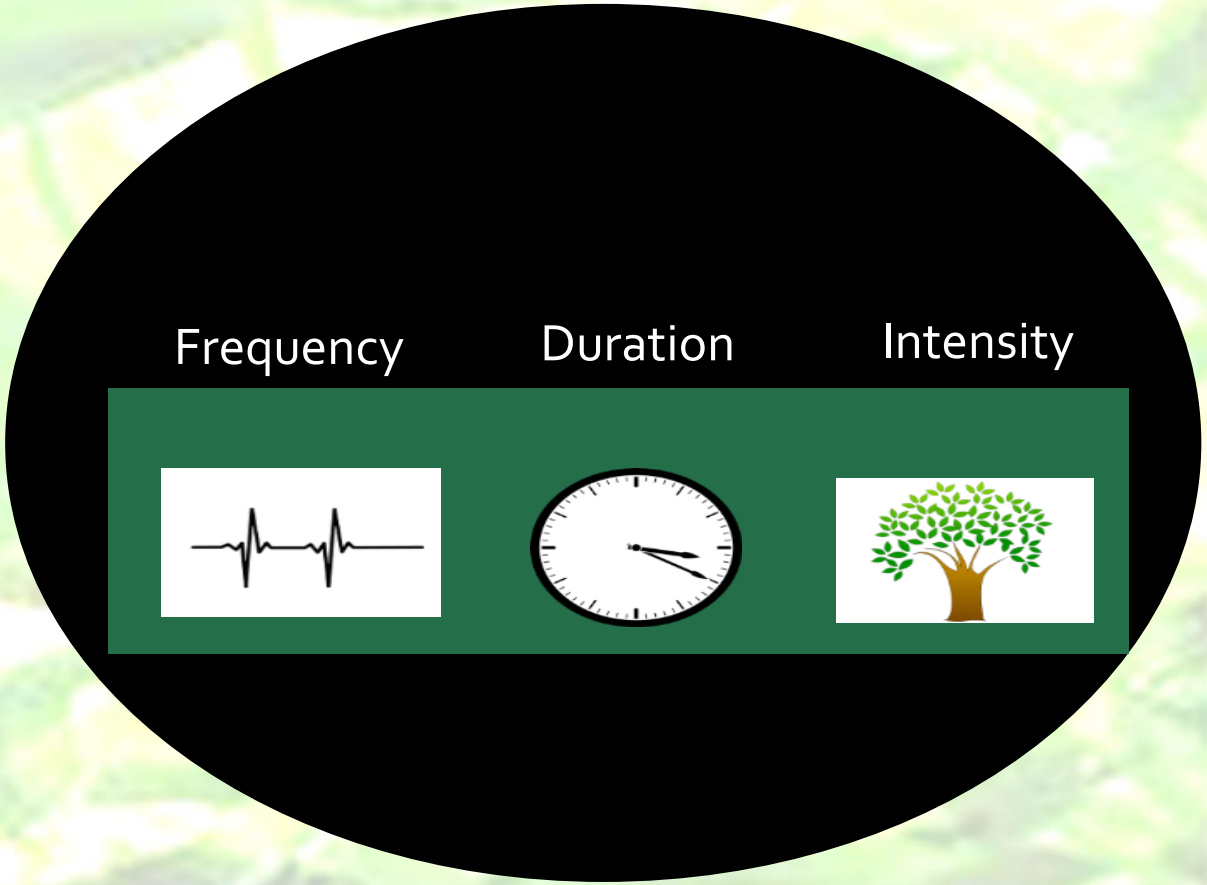
- >1500 people, stratified
- Health outcomes
- Social / demographic
- Nature ‘dose’

Health response to a dose of nature

Solution

'NATURE DOSE'

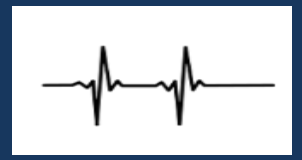




Shanahan et al. 2015 *BioScience*

Nature dose & health

Health response	Nature dose: Frequency	Nature dose: Duration	Nature dose: Intensity
High blood pressure			
Depression			
Social cohesion			
Physical activity			

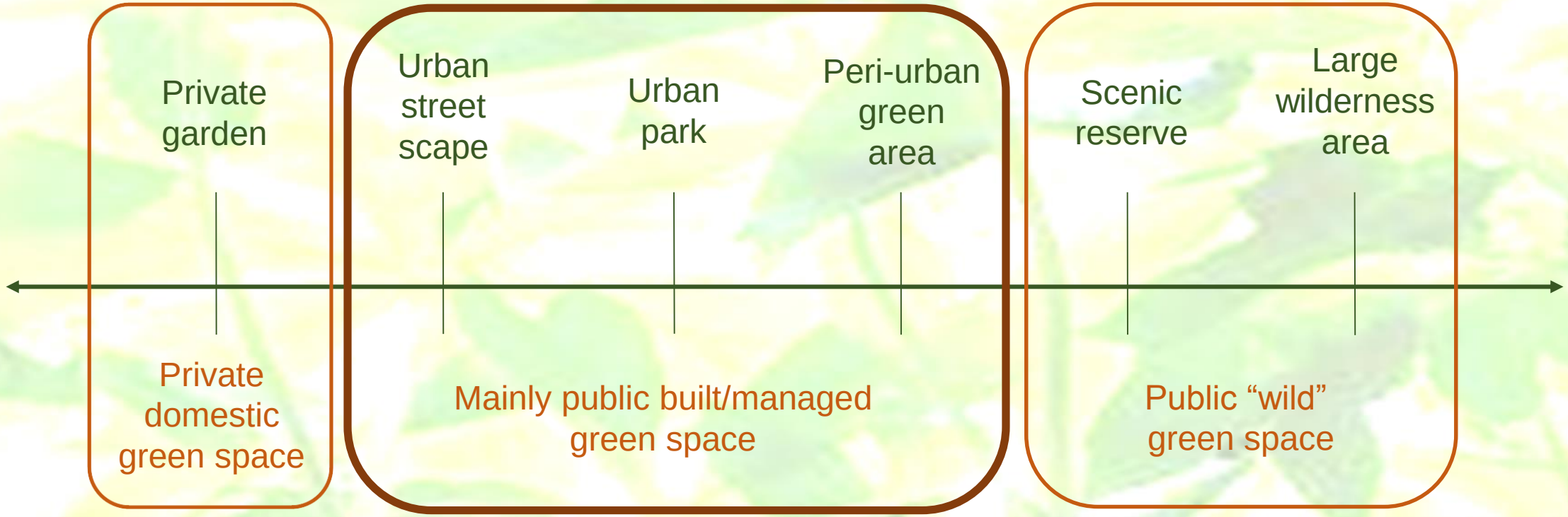


Nature dose & health

Health response	Nature dose: Frequency	Nature dose: Duration	Nature dose: Intensity
High blood pressure		✓	
Depression		✓	
Social cohesion	✓		
Physical activity	✓	✓	✓

What do we know about New Zealand urban green spaces?

Continuum of natural areas





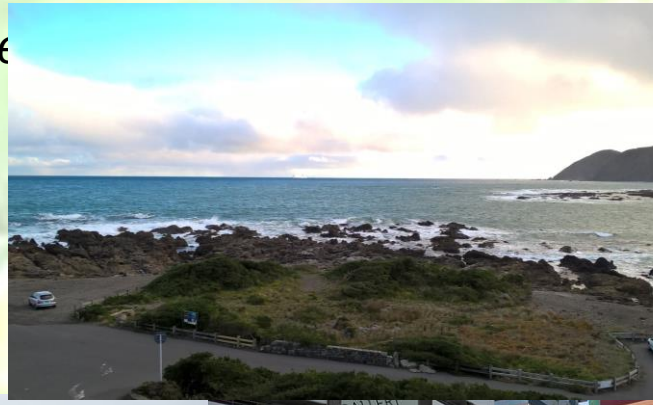



Types of urban green and open spaces

- **Public green space** (“Usable”, “accessible”)
  - Significant degree of vegetation cover
  - Usually permeable surfaces

- **Private green space**
  - Permeable and impermeable surfaces
    - *Private gardens and yards*

- **Public open space**
  - Lower vegetation cover
    - *Road reserves / verges*
- **Private open space**
- **Informal green/open space**
  - “Undeveloped” or unvegetated land
  - *Vacant lots, extensive pave areas, railway/motorway banks*
- **“Third Spaces”**
  - Elements of all
- **(Blue spaces)**



Overview of NZ urban green spaces

- More than 86% New Zealanders live in cities and towns
- NZ cities are well-endowed with urban green space
- In the 20 largest NZ cities:
  - % urban parkland averages 7.3% of area (range 3.5 – 11.4%)
  - % native vegetation cover averages 2% of area (range 1 – 8.5%)
  - Mean number of native vegetation patches is 42

Clarkson, B. D., Wehi, P. M., & Brabyn, L. K. (2006). Bringing back nature into cities: Urban land environments, indigenous cover and urban restoration. Report 52, Centre for Biodiversity and Ecology Research, University of Waikato.

Who uses Urban Green Spaces? Wellington Botanic Garden

- 1m visits annually (2012)
  - 38% Wellington, 20% other NZ, 42% overseas
- 70% visit with other people
  - 28% with partner/spouse, 20% with family **(14% with children <15),** 18% with friends
- Main activities walk/exercise, view plants, relax
- **Visitors have very high satisfaction with their visit**
- **Sometimes children's first experience of nature**

Wgtn Botanic Garden Visitor Services Quality Review 2012
(Univ South Australia)

New Zealand Garden study, Dunedin

- Domestic gardens make up approximately 36% of all Dunedin urban land
- 46% of the residential area
- Largest single land use
- Benefits
  - stress reduction
  - social connections
  - environmental stewardship and awareness
  - biodiversity increase

Freeman C et al 2012. J Environmental Psychology 32:135–143.
Mathieu C et al J 2007. Landscape and Urban Planning 81: 179–192.

Relationship between increasing urbanisation, decreasing greenness and resultant health effects

- **Relationship is strongly income-related**

Mitchell R, Popham F 2007Journal of Epidemiology and Community Health, 61(8), 681-683

Mitchell R, Popham F 2008. Lancet, 72(9650), 1655-1660

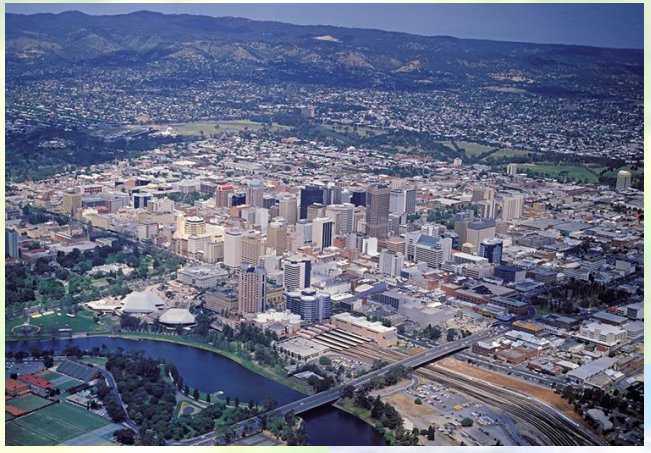
Astell-Burt T et al 2014, BMC Public Health, *14*: 292

- **These conclusions may not hold true in New Zealand** and also in some other parts of the world

Witten et al 2008 Preventive Medicine 47, 299-303

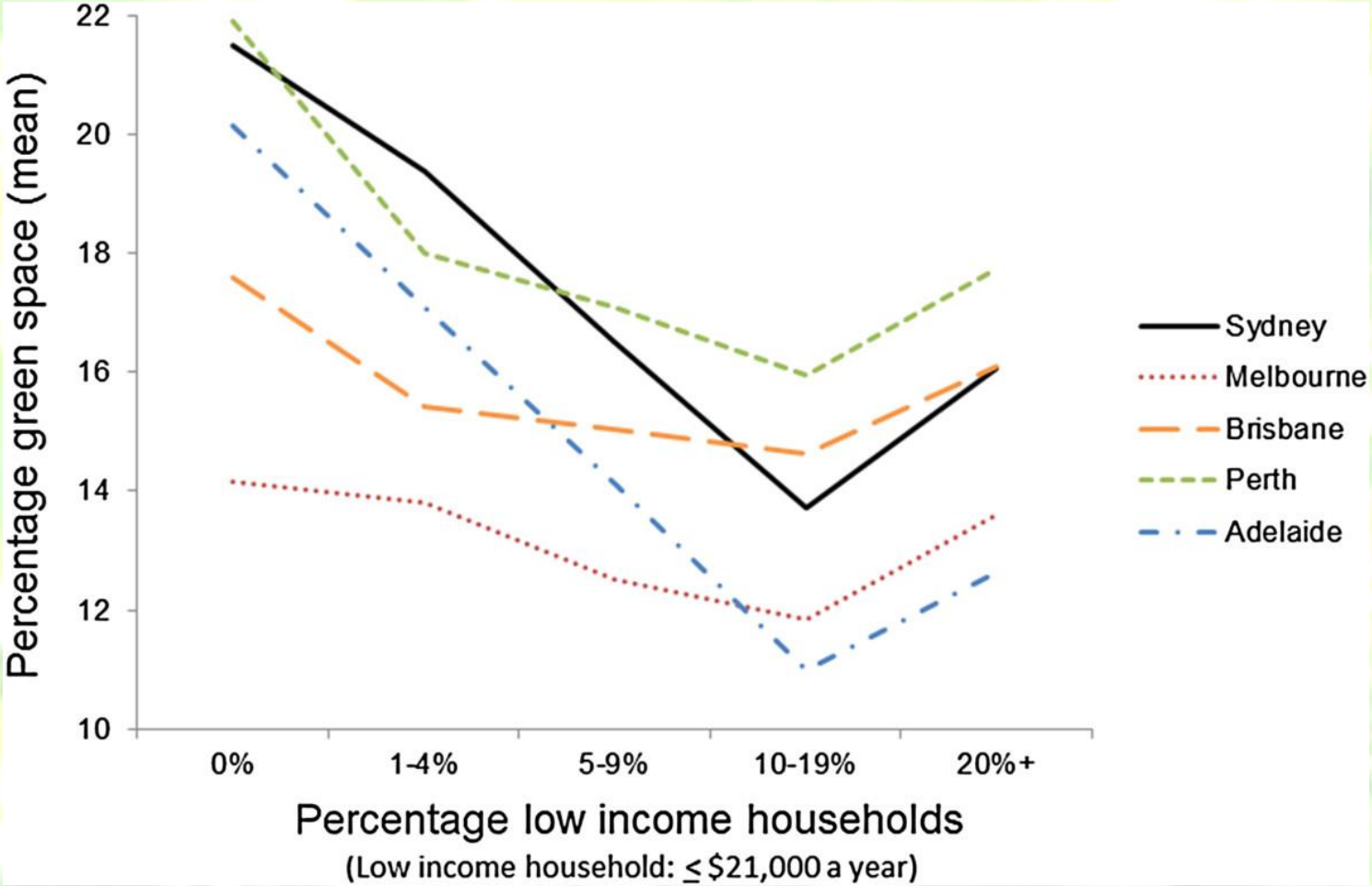
Richardson et al 2010 BMC Public Health 10, 240

- especially where **much of the population enjoy good access to green/blue areas** even when living in large urban centres or in deprived areas.



Green space availability / access
5 largest cities in Australia

- Green space availability was substantively lower in areas with a higher percentage of low income residents, in all cities
- This association varied between cities (Adelaide most inequitable; Melbourne least inequitable)



Astell-Burt et al. (2014). Do low-income neighbourhoods have the least green space? *BMC Public Health, 14*: 292

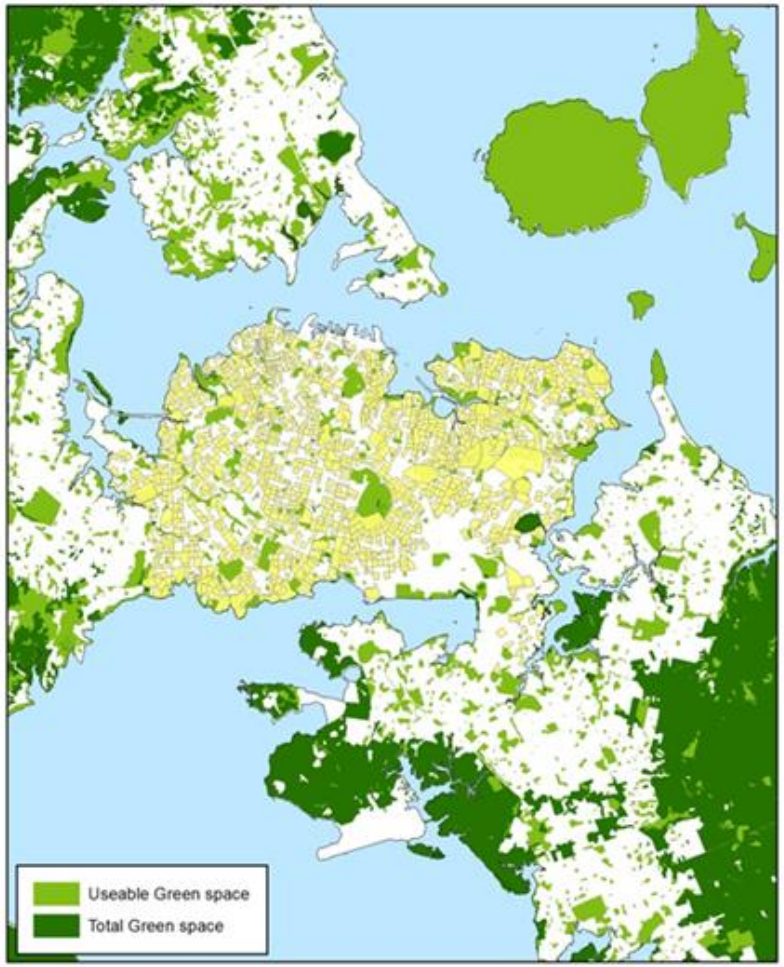
The health effects of UGS-based recreation – how much, what dose and where in New Zealand?

- **Karen Witten:** Investigated neighbourhood access to parks and beaches as a predictor of Body Mass Index and physical activity levels (specific interest in recreation)
- **Little evidence of an association between locational access to open spaces and physical activity**
- Most of our population enjoy good access to green/blue areas even when living in large urban centres or in deprived areas
- Nationally, most access is by car (72% of trips)

Witten K et al 2008. Neighbourhood access to open spaces and the physical activity of residents: a national study. Preventive Medicine Vol 47

Urban green space and mental health in Auckland City

- **Daniel Nutsford et al -** Tested the relationship between access to green space and area-level anxiety/mood disorder treatment counts across Auckland
- **Nearness to greenspace and also high proportions of greenspace in a neighbourhood was negatively correlated with anxiety/mood disorder, i.e. "protective"**
- Benefits of green space for mental health may relate both to active participation in green spaces near to the home, **and** total green space in the neighbourhood environment.



Nutsford D et al 2013. An ecological study investigating the association between access to urban green space and mental health. *Public Health Vol 127*

Green space access in Wellington
Freeman MPH thesis 2017

- 83, 11-13 yr old Wellington region students monitored over 4 days in 2014/5 summer
- Green space setting and activity recorded. Public playing fields and private gardens were the two types of GS most frequently visited
- Students from high decile schools (low deprivation) visited green space on average **at least five times more** than those from middle deciles and twice as much as those from low decile schools.
- On average **girls visited green space twice more frequently than boys** and spent three times more time per visit to green space than males.
- Students were almost always with another person, more than half the time with an adult

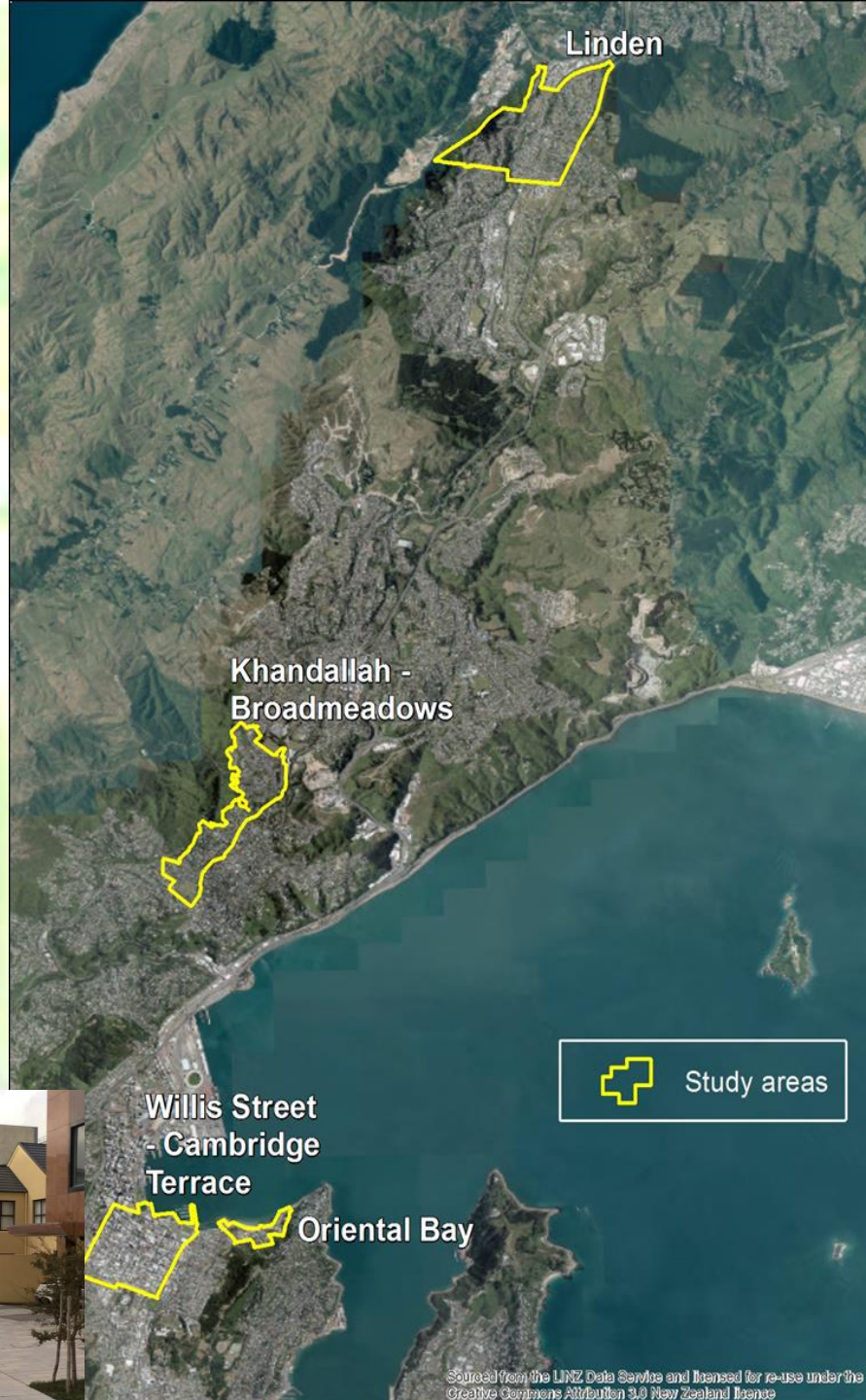
Kids'Cam

Nadia Freeman: Children's recreational use of green spaces: Impact of household deprivation and green space characteristics. Masters Public Health thesis (submitted), University Otago Wellington
https://diet.auckland.ac.nz/content/kidscam

Distribution of green space in four Wellington City neighbourhoods

- Centre for Sustainable Cities exploratory study (Fiona Chan, 2016-17 summer studentship)
- 4 contrasting Census Area Units in Wellington City.

Census Area Unit	2013 Census Total Population	Total Land Area (ha)
Khandallah Park – Broadmeadows (low dens /low dep)	2796	100
Linden (low dens /high dep)	3999	151
Oriental Bay (high dens /low dep)	1056	16
Willis Street – Cambridge Terrace (high dens /high dep)	7329	103



Distribution of green space in 4 Wellington City neighbourhoods

Census Area Unit	Total area parks & road reserve (ha)	Total GS in parks & road reserve (ha)	GS as % of public parks / road reserve	Total public GS as % of CAU area	Total public GS (m^2/head)
Khandallah Park – Broadmeadows (low dens /low dep)	24.2	12.4	**51%**	**12.4%**	**44.5**
Linden (low dens /high dep)	53.6	32.0	**60%**	**21.2%**	**80.1**
Oriental Bay (high dens /low dep)	4.6	1.1	**25%**	**7.2%**	**10.9**
Willis Street – Cambridge Terrace (high dens /high dep)	31.8	3.6	**11%**	**4.9%**	**4.9**

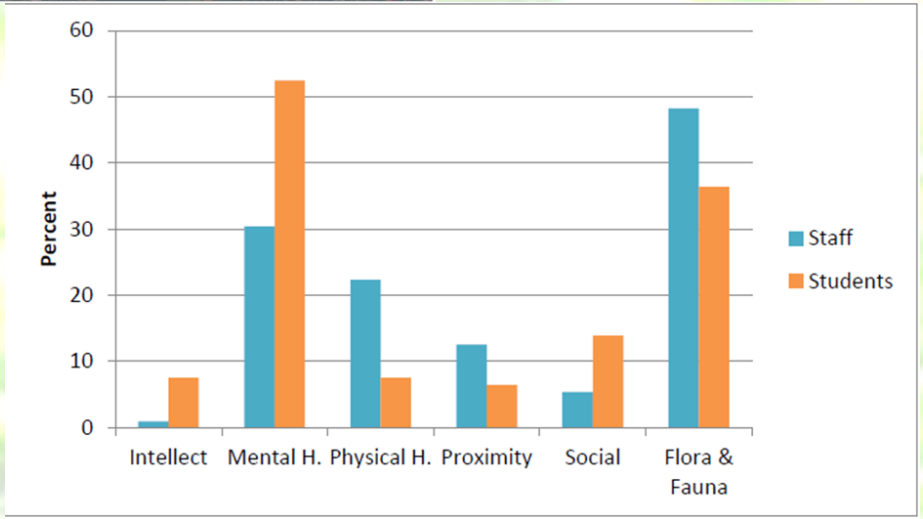
- Strong disparities in green space availability (public and private) between the four CAUs, both in absolute area and in availability per person.
- Disparities are especially marked in the inner city CAUs

Distribution of green space in 4 Wellington City neighbourhoods – adding the private spaces

Census Area Unit	Total area parks & road res. (ha)	Total GS in parks & road reserve (ha)	GS as % of public parks / road reserve	Total public GS as % of CAU area	Total public GS (m^2 /person)	Total area private GS (ha)	Total public & private GS (ha)	Public /private GS ratio	Total GS as % of CAU area	Total GS (m^2/ person)
Khandallah Park – Broadmeadows (low dens /low dep)	24.2	12.4	51%	12.4%	44.5	45.4	57.8	0.273	57.7%	207.0
Linden (low dens /high dep)	53.6	32.0	60%	21.2%	80.1	56.3	88.3	0.569	58.5%	220.9
Oriental Bay (high dens /low dep)	4.6	1.1	25%	7.2%	10.9	4.9	6.1	0.23	38.2%	198.3
Willis Street – Cambridge Terrace (high dens /high dep)	31.8	3.6	11%	4.9%	4.9	2.0	5.6	1.80	7.6%	7.6

Victoria University Green Spaces study

- Between 1990-2015 there was net loss of 69 species from the campus
  - More loss of introduced than native species
  - Loss of large trees
- What do you want more of?
  - sunny spots
  - “birds & bees & trees”
  - Seats
- If student/staff numbers grow, green space demand may outstrip supply

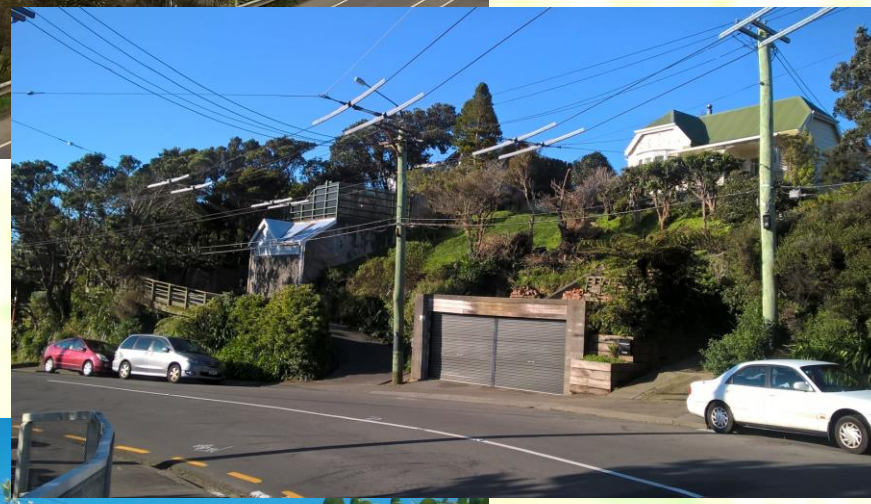


Forsyth, F 2016. Biodiversity Planning for VUW’s Kelburn Campus” VUW, MSc thesis

Urban Vegetation, Wellbeing and Pro-environmental Behaviour

Julie Whitburn MSc 2014

- Investigated whether engagement with urban nature influenced the wellbeing and pro-environmental behaviour of residents of Wellington City
- Quantified vegetation levels in 20 neighbourhoods and postal survey of 423 residents in these areas
- Models assessed relationships with nature and self-assessed personal wellbeing
- Findings suggest “promotion of time in nature and increases in amount of urban planting may be effective public health intervention and also result in increased pro-environmental behaviour”



- Stratified random sample of 20 neighbourhoods across Wellington City - varied in their amount and type of vegetation cover

Level	*n*	Mean percentage of vegetation cover				
		Total Veg	Mature	Grass	Shrubs	Single tree
1	54	32	23	57	19	0.7
2	50	34	25	45	32*	5
3	76	43	31	38	31	0.2
4	69	49	52	28	20	0.4
5	56	53	68	19	13	0
6	70	57	72	18	10	0
7	48	56	83	11	6	0

Summary: what NZ cities offer for green space

- Well endowed with green space
- Relatively good access (but some disparities)
- Generally high quality parks and urban spaces
- Wonderful natural settings (including some close to cities)
- Some good programmes
  - e.g. Green Prescription

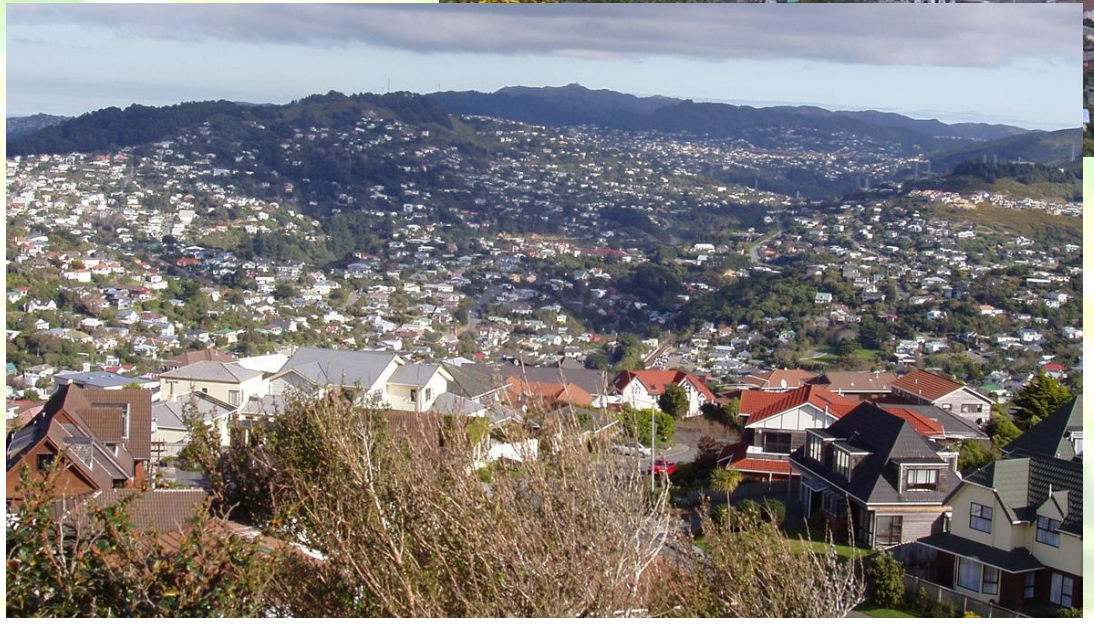
Photos: Sport Wellington TL, www.newzealand.com BL, Mana Cycle Group, BR

Is there an optimal amount of green space in a city?

- Berlin survey: positive effect of green space was greatest at 11% of a 1-km diameter ‘buffer area’ around an individual’s residence
- Could the marginal benefit of GS start to decline at more than this figure?
- Assuming that:
  - overall population density is lower when GS density is higher
  - population density associated with other urban values

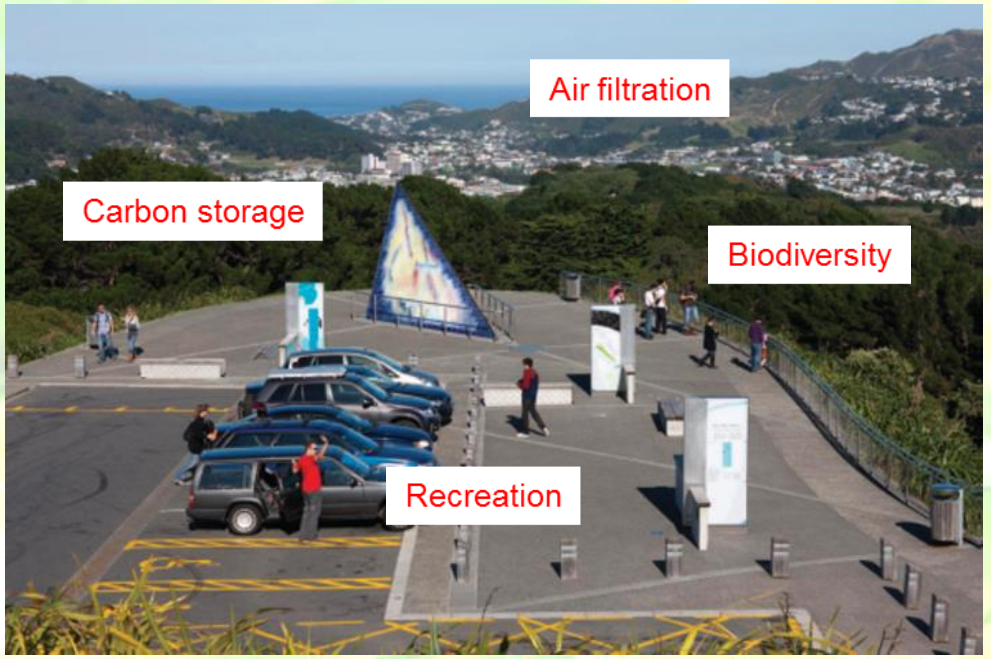
Bertram C & Rehdanz K (2015). The role of urban green space for human well-being. *Ecological Economics, 120*, 139-152.

Could we have too much green space in Wellington City?



Green spaces as providers of multiple ecosystem services

- Transport
- Water management
- Food supply
- Climate regulation
- Resilience
- etc, etc



To provide for and maximise these ecosystem services we need to consider:

- Quality of green/blue space
- Accessibility of green/blue space
- Public/private/third space balance
- Needs of different population groups
  - children, elderly, disabled, ethnic and cultural minorities

- *None of these principles is defined only by absolute quantity*
- *Quantity, quality and accessibility are all critical*

What would we want from our green spaces in Wellington?

- Green spaces that are accessible to all
  - Not equal density but equitable access
  - All modes of transport access optimised
- Green spaces that offer many opportunities for health and wellbeing
- Green spaces that are good for biodiversity and other ecosystem services
- Green spaces that complement blue spaces and other public spaces
- Green spaces that are resilient
- Green spaces that enhance the city's resilience

Many thanks to:

- Ralph Chapman, Philippa Howden-Chapman, Ed Randal, Nic Preval (Centre for Sustainable Cities)
- Nadia Freeman, Fiona Chan, Claire Freeman (University of Otago)
- Frances Forsyth, Julie Whitburn (VUW)
- Danielle Shanahan (Zealandia)
- Bec Ramsay, Myfanwy Emeny, Peter Gilberd, Sean Audain (WCC)