






Presentation Outline

- **Background**
Association between urban nature and social resilience
- **On-going Research**
Strengthening the role of parks in Singapore
- **Areas of New Research**



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Photos: Ken Chang, Chelsea Sia, Craig Sheppard, & Istock



NParks' Mission
To create the **best living environment** through **excellent greenery** and recreation, in partnership with the community.



Urban Living

The good

We now live longer...

The bad

Non-communicable diseases
such as coronary heart disease,
diabetes and cancer dominate
[McMichael, 2001 (p. 2)]

Urban Living

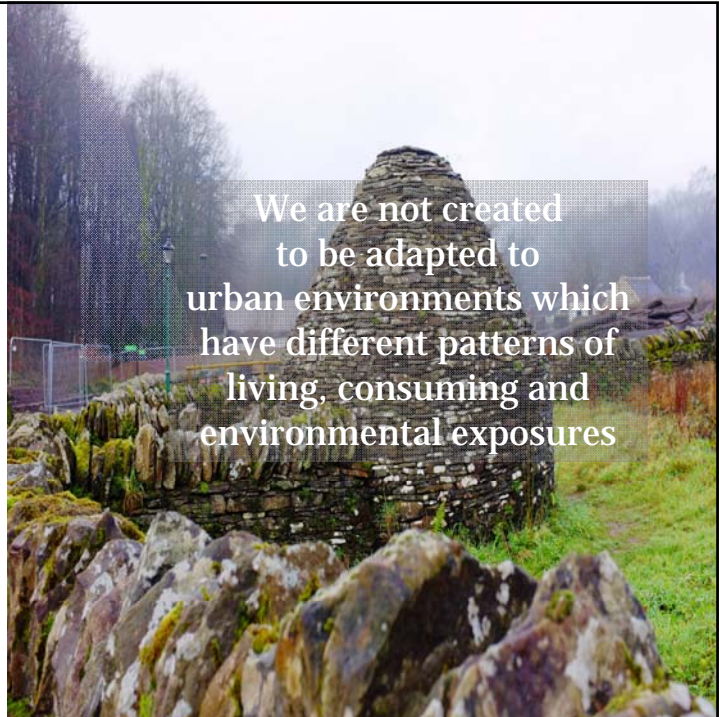
Effects on Mental Health

Mental health is negatively affected by urban living; mood and anxiety disorders are more prevalent in city dwellers.

Peen, J., Schoevers, R. A., Beekman, A. T. & Dekker, J. The current status of urban-rural differences in psychiatric disorders. *Acta Psychiatr. Scand.* 121, 84–93 (2010)



Humans have spent many thousands of years adapting to natural environments, yet have only inhabited urban ones for relatively few generations



We are not created to be adapted to urban environments which have different patterns of living, consuming and environmental exposures

Biophilia hypothesis

E.O. Wilson, 1993

- innately emotional affiliation of human beings to other living organisms

- and this is part of our genetic heritage and evolved human nature

We need Resilience

The concept of resilience emerged in the early 1970s as a challenge to stability thinking (Holling, 1973)

Resilience thinking has since evolved from the ability to bounce back or return to equilibrium following disturbance into a more elaborated theory in which **adaptability** and **transformability** are key ingredients (Folke et al. 2010)

What is social resilience? (erdkunde, 2013)

1. Coping capacities –ability to cope with and overcome adversities
2. Adaptive capacities –ability to learn from past experiences and adjust to future challenges
3. Transformative capacities –ability to craft sets of institutions that foster individual welfare and sustainable societal robustness towards future crises

Role of Parks?

Towards Resilience Outcomes



P
Provisioning services
 (e.g. food and fresh water)

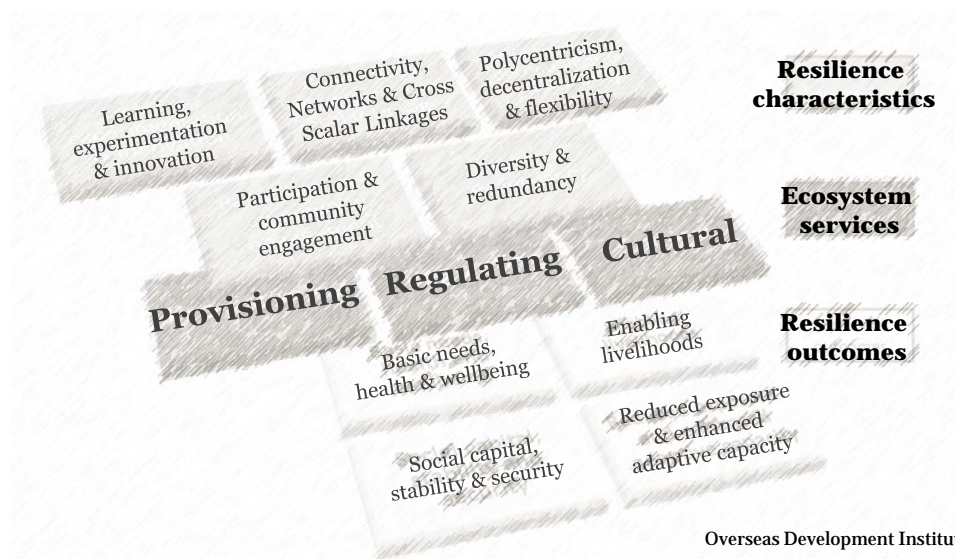
R
Regulating services
 (e.g. regulation of climate, water)

C
Cultural services
 The non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences

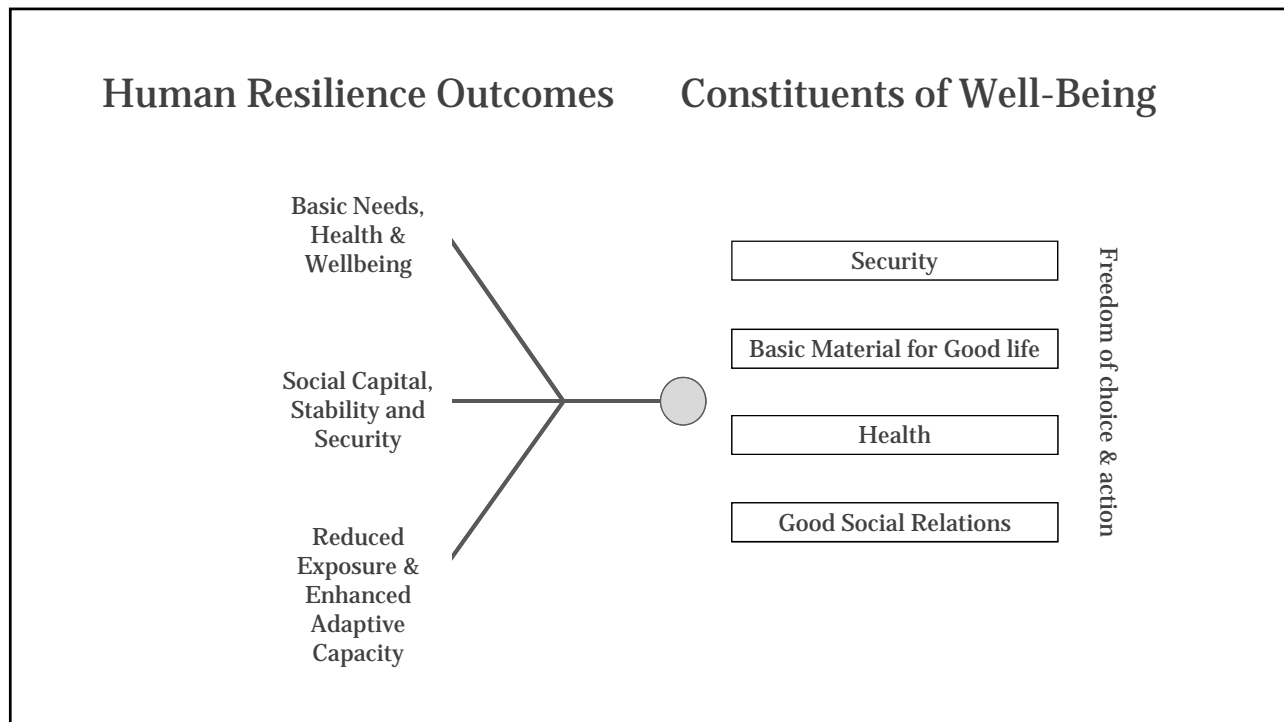
Ecosystem Services

The Millennium Ecosystem Assessment
 (Sarukhán and Whyte 2005)

Conceptual Framework linking Human Resilience & Ecosystems



Overseas Development Institute, 2015



Optimizing the Role of Parks

Towards Resilience Outcomes

Facilitates interactions that help to strengthen social resilience

- **Park Planning Provision**
- **Motivations**
- **Design**
- **Activities**

Role of Parks

Understanding Park Planning Provision

'When parks are nearby people use them. But if the greens are more than three minutes (on foot) away, the distance overwhelms the need.'

Alexander, Ishikawa, and Silverstein, 1977

'People with access to nearby natural settings have been found to be healthier overall than other individuals.'

Kaplan and Kaplan, 1989 (p. 173)

'Those who moved to greener areas had improved mental wellbeing'

Ian Alcock et al. , 2014



http://www.mnd.gov.sg/landuseplan/city_in_a_garden.htm

Park Provision in Singapore

- 0.8ha of parks per 1,000 residents
- Distributed across housing areas
- At least 85% of our residents live within 400m of a park by 2030

Role of Parks

Understanding Motivations

People appreciate having daily contact with nature to enjoy:

- the beauty of nature
 - place for activities
 - gardening
- (Talbot & Kaplan, 1984)

Neighborhood parks are places to:

- enjoy the aesthetics
- unwind, engage in introspection
- exercise
- interact socially

(Park Prescription SG FGD, 2015)

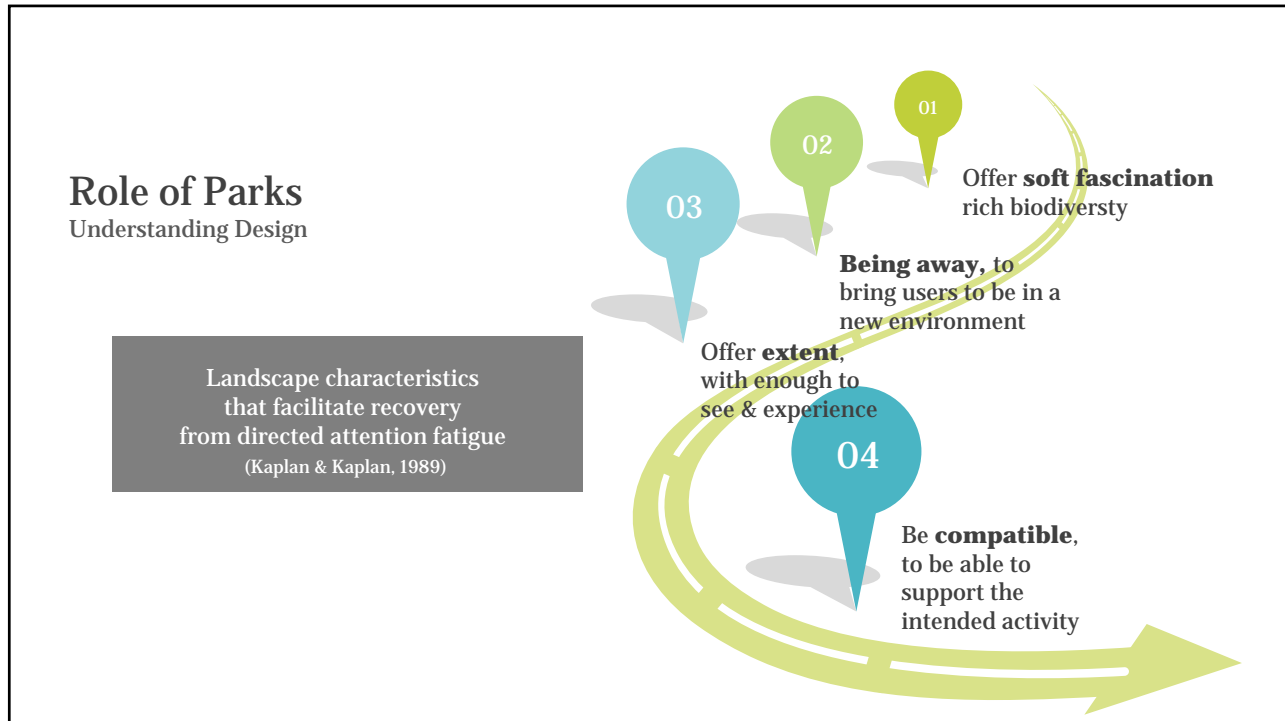
**Attention
Restoration Theory
(ART)**

Engaging directed attention requires us to filter relevant stimulus from irrelevant ones. Urban environments present many factors that heavily tax our directed attention and deplete our cognitive resource.

Being in nature evokes indirect attention, and replenishes our mental and attentional capacity.

**DIRECTED
ATTENTION**
(requires effort)

**INDIRECT
ATTENTION**
(does not require effort)



Role of Parks

NParks' Research

Park Usage & Satisfaction Survey

- Household survey (n >1,000)
- Face-to-face interviews
- Biennial

Research

Parks Usage & Satisfaction Surveys

Usage & Satisfaction Trend

Usage: Have you visited a park in the last 12 months?

Satisfaction: Accessibility, Cleanliness & Safety

Research

Parks Usage & Satisfaction Surveys

Maximum travel time

About 5 minutes for neighbourhood parks.

→ Locating a park within 5 minutes' walking distance is a motivator for park use. This corresponds with the future park provision target of having a park within 400m.

Research

Parks Usage & Satisfaction Surveys

Activities in parks

- Walking (43%)
- Spending time with family (36%)
- Relaxing (35%)
- Exercising (30%)



Research

Intervention Studies

The well-being and immune functions in elderly are negatively associated with social isolation.

Horticultural therapy (HT) is an intervention that uses plants and gardens as media to improve physical and psychological well-being.

HT uplifts the mind, body and spirit (Bassen and Baltazar, 1997; Davis, 1994) through gardening activities and innate closeness to nature (Davis, 1994).

HT was found to improve the **physical and mental health** of patients staying in a cardiac rehabilitation ward (Wichrowski et al., 2005)

Research

Intervention Studies

HT engages participants in social interaction and rhythm of life

(Yao and Chen, 2016).

Therapeutic effects of HT include induction of **positive emotion** (Reif, 2005), enhancing the levels of **physical activities and social engagement, preventing cognitive decline** (Blake and Mitchell, 2016) and **depression** (Connell et al., 2007).

Research

Intervention Studies

Effects of HT on **the Mental Health of Asian Elderly**

A randomized control trial (RCT) designed to evaluate HT's efficacy in promoting Asian elderly's mental health and cognitive functioning.



Methodology

A Randomised Control Trial (Clinical Trial Registration No. NCT02495194)

Treatment and Control Groups:

- A total of 69 elderly participants were recruited.
- They were randomly assigned to receive horticultural therapy in the **active treatment group**, or to be in the waitlist, which served as a **control group**.

Methodology

The Intervention

Structured Sessions (one hour each; 1 Facilitator: 7 Participants) designed to:

- cultivate an interest in gardening
- promote relaxation
- promote interaction with nature and people

❖ Gardening

vegetable & herb planting and harvesting, pruning, compost making

❖ Projects

indoor dish garden, craft making with pressed flowers, cooking

❖ Guided Nature Walks

Singapore Botanic Gardens, Sungei Buloh Wetland Reserve and Gardens by the Bay

Methodology

The Intervention

Goals of the Horticulture Therapy program:

COGNITIVE

- Recall names of plants.
- Understanding size and space.
- Increase concentration by staying on a task for certain amount of time.

Methodology

The Intervention

Goals of the Horticulture Therapy program:

SOCIAL

- Communicate with facilitators and peers.
- Promote teamwork (sharing tools and assisting with clean-up).

Methodology

The Intervention

Goals of the Horticulture Therapy program:

PHYSICAL

- Provide moderate exercise and exposure to fresh air in a park
- Increase range of motion by watering plants.
- Improve motor skills (through manipulate small objects such as seeds and use of gardening tools).
- Touch flowers and other textured plant materials.

Measurements

Baseline and After Intervention

PSYCHOMETRIC ASSESSMENTS

Psychopathology: Zung Self-reported Depression and Anxiety Scales

Psychological Wellbeing: Ryff's Scales of Psychological Wellbeing

Social Connectedness: Friendship Scale

BIOLOGICAL ASSESSMENTS

Plasma IL-6 (higher levels associated with inflammatory disorders and depression)

Plasma CXCL-12 (higher levels associated with vascular repair in the brain)

Findings

Psychological Well-Being: Positive Relations with Others

HT Treatment Group

The mean score of positive relations with others, a subscale of the Ryff's Scales of Psychological Well-being, was significantly improved ($p = .001$) six months after the intervention.

Control Group

The mean score reduction was not significant.

Positive Relations with Others

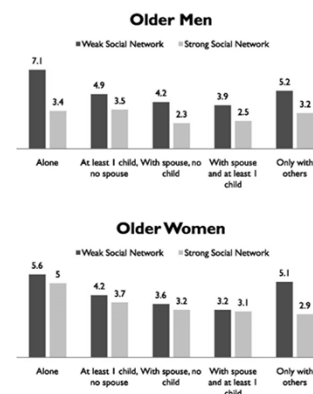
Matters for elderly

A strong social network of family, friends and neighbors plays a vital role in ensuring good mental health among older people.

Older men and older women in Singapore tended to have a lower incidence of depression when they had strong social networks.

Chan, Malhotra, Malhotra & Østbye, 2010

4-3. Mean Depressive Symptom Scores for Older Men and Older Women, by Living Arrangements and Social Networks



Notes: For Graph 4-3, $n=4,542$
Source: MCYS SHLS 2009

Findings

Biological Markers

	Plasma IL-6 levels	Plasma CXCL-12 levels
	Contributes to silent cerebral infarction (Nagai et al., 2011) which could result in dementia (Blum-Degen et al., 1995; Licastro et al., 2000) and depression.	CXCL12 plays a key role in vascular repair mechanism by mobilizing brain marrow-derived stem cells to the site of lesions (Laske et al., 2008).
	Past research showed that high plasma IL-6 levels are associated with inflammatory disorders, impairment in encoding and recall in healthy and depressed elderly (Elderkin-Thompson et al., 2012).	Treatment with anti-dementia medication such as donepezil is paralleled with an increase of plasma CXCL12 concentrations in patients with Alzheimer's disease (Leyhe et al., 2009)
HT Group	Significant decrease	Increase
Control Group	No significant change	Significant decrease
Discussion	The biological benefits of HT include reducing inflammation and depression in elderly.	The biological benefits of HT include protecting neuronal functions in elderly.



Translational Research

- Support NParks' initiative to develop a network of Therapeutic Gardens.
- Nature programs for the community - contribute towards "Adding Years of Healthy Life" to our people.

Research

New Areas

Investigating landscapes that brings optimal benefits

The “savanna hypothesis” proposes that people prefer to be in savanna-like environments as they provided a superior resource base compared to the forest or desert biomes.

Heerwagen and Orians 1993



- Long distant views that afforded surveillance for predator detection and avoidance.
- Scattered clusters of trees provided shelter from the sun and for protection from terrestrial predators.
- Even ground cover for efficient movement across the terrain.

Research

New Areas

Investigating landscapes that brings optimal benefits

Natural environments can be specifically designed to bring about optimal restorative benefits for users.

Therapeutic gardens fulfil this purpose.



They are often intended to meet the needs of a specific population, through a multi-disciplinary collaborative design process helmed by a team of professionals.

Research

New Areas

Investigating landscapes that brings optimal benefits

- Incorporating measures of brain activities in our analysis of landscapes.
- New brain interface technologies now allow us to explore the brain response to particular visual stimuli in a non-invasive experimental way.



Prefrontal cortical activation while viewing urban & garden scenes: a pilot fNIRS study

Research

New Areas

Connectedness with nature

Disconnection from nature results in the loss of health and well-being benefits for urban dwellers (Soga and Gaston, 2016).

It is an underlying cause of biodiversity loss (Miller, 2005).



Our collective human behaviour (affected by values and attitude) towards nature makes or breaks the Earth's environment (Schultz, 2011).

Research

New Areas

Connectedness with nature

Study how people identify themselves with the natural environment and the relationships they form with nature,

using scales such as:

- Connectedness to nature
- Love and care for nature
- Emotional affinity towards nature

(Restall and Conrad, 2015)



Research

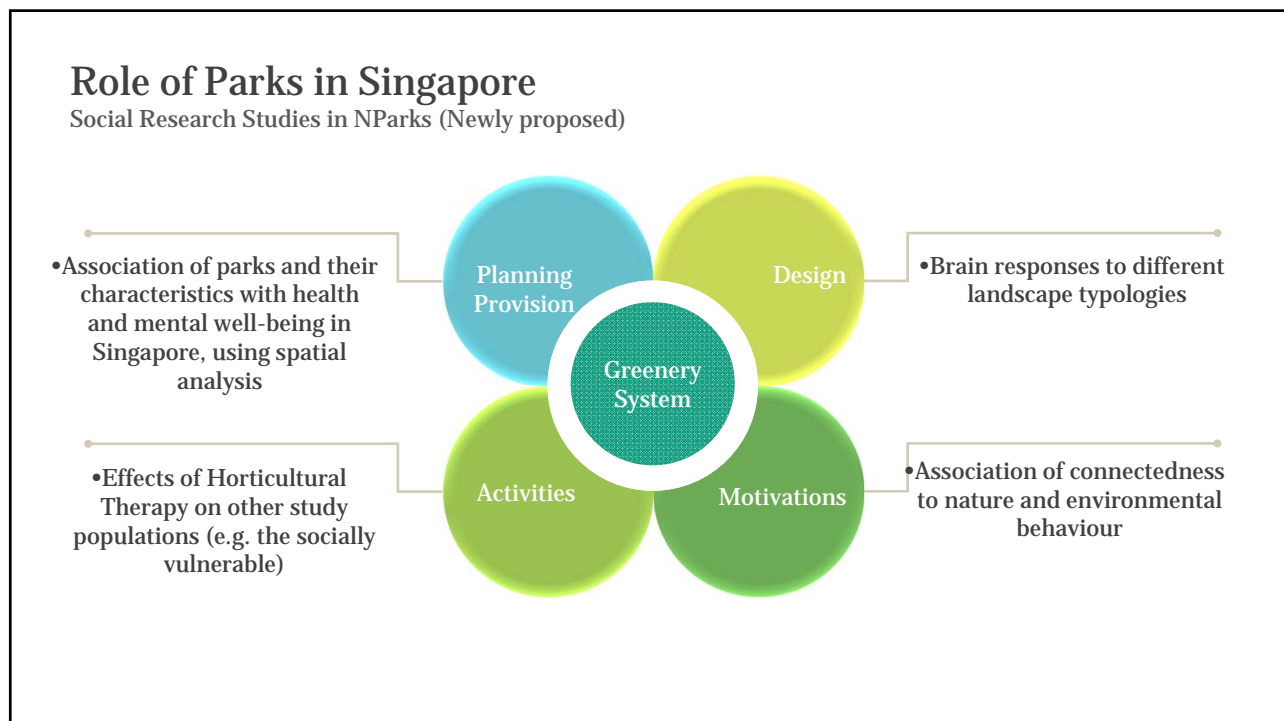
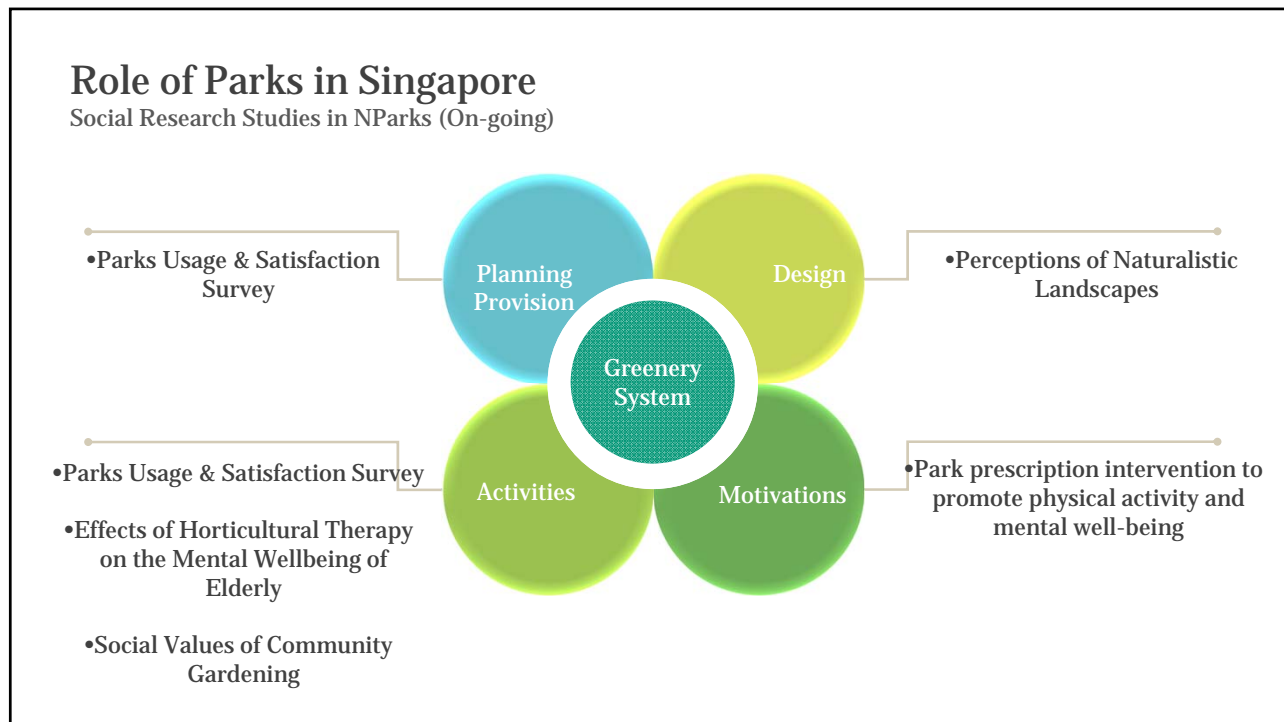
New Areas

Living in proximity to nature

Are people living in greener areas healthier than people living in less green areas?



Association of parks and their characteristics with health and mental well-being in Singapore, using spatial analysis



Research Publications

Conferences

- 2016, May. Horticultural Therapy for Mental Health of the Elderly - Protocol for a Randomized Controlled Trial. Poster session presented at the Annual Scientific Conference of Ageing, Singapore.
- 2016, June. Park Prescription Study: using mixed-methods to develop a physical activity based intervention for a multi-ethnic Asian population. International Society of Behavioral Nutrition and Physical Activity Annual Conference, Cape Town.

Research Technical Notes

- Ecological Landscape Design and Public Perception
- Reconnecting with Nature for Biodiversity Conservation and Sustainable Development

Thank You