

EUROPEAN HEALTHCARE DESIGN 2019, London, UK
18 June 2019

**TOWARDS HEALTHFUL,
AGEING-FRIENDLY &
ENABLING DESIGN:
A MULTI-SENSORIAL STUDY
OF HOUSING
NEIGHBOURHOODS IN
SINGAPORE**



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Project Title: **Multi-Sensory Approach to Ageing-Friendly Design in High-Density Contexts [R-295-000-145-115]**

Funded by: Ministry of Education, Singapore; Academic Research Fund (AcRF) Tier 1

SENSORY EXPERIENCE

**The most common
initial response
to built
environment is**

EMOTIONAL

**MULTI-
SENSORIAL**



SENSORY EXPERIENCE



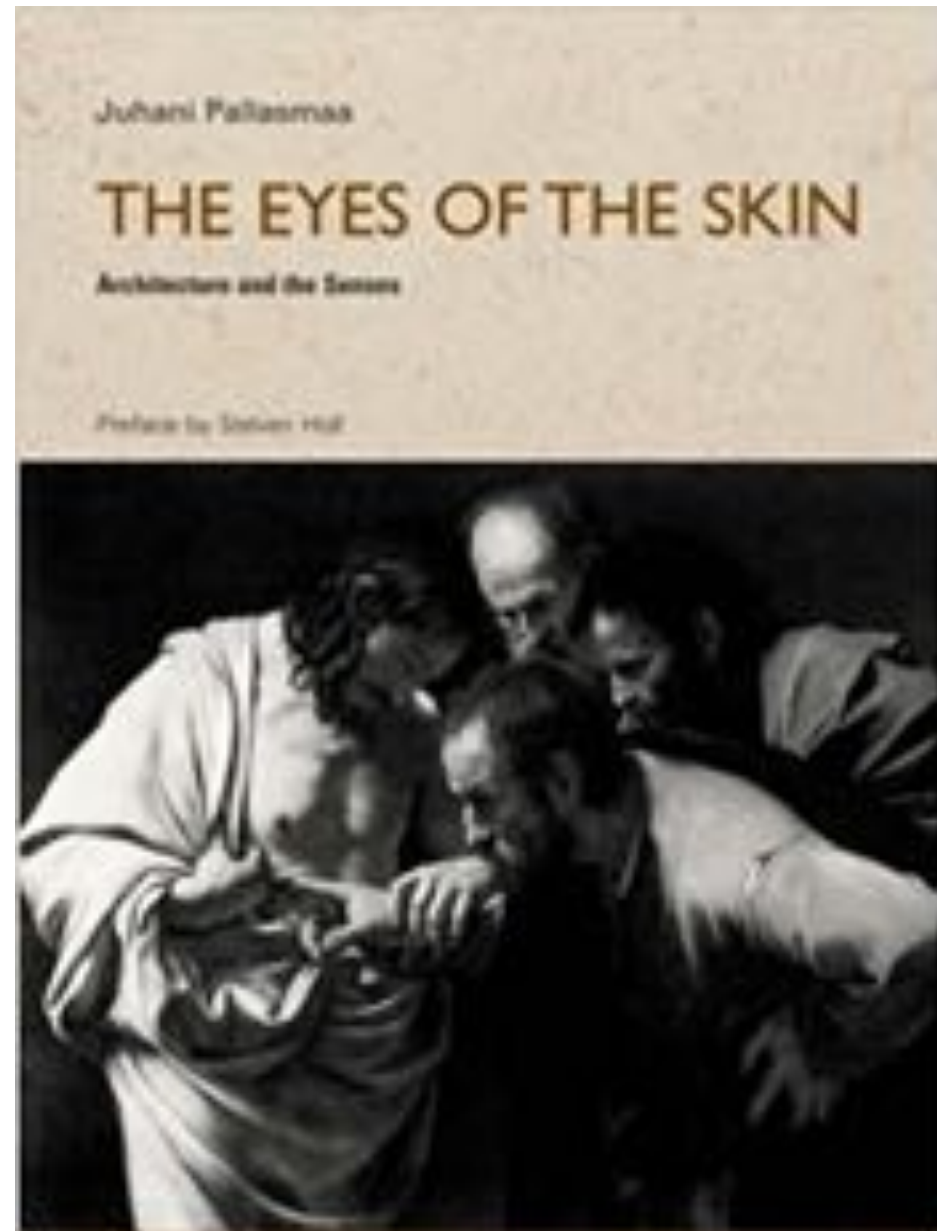
Hong Kong (housing)

STRESS IS THE MAJOR CAUSE OF DISEASES, PANDEMIC DEPRESSION AND DEATH IN THE DEVELOPED WORLD. (WHO, 2002)

SENSORY EXPERIENCE

“The inhumanity of contemporary architecture and cities can be understood as the consequence of the negligence of the body and the senses, and an imbalance in our sensory system.”

(Pallasmaa, 1996)



SENSORY DECLINE



The majority of people experience some degree of **decline in sensory and cognitive capacity** as a common consequence of ageing

(Cacchione, 2014; Dillion et al., 2010)

visual impairment
hearing loss
decline in motor functions
ability to identify odours

SENSORY DECLINE



Associated declines in sensory and cognitive functions with ageing

(Crews & Campbell, 2004; Humes et al., 2013)

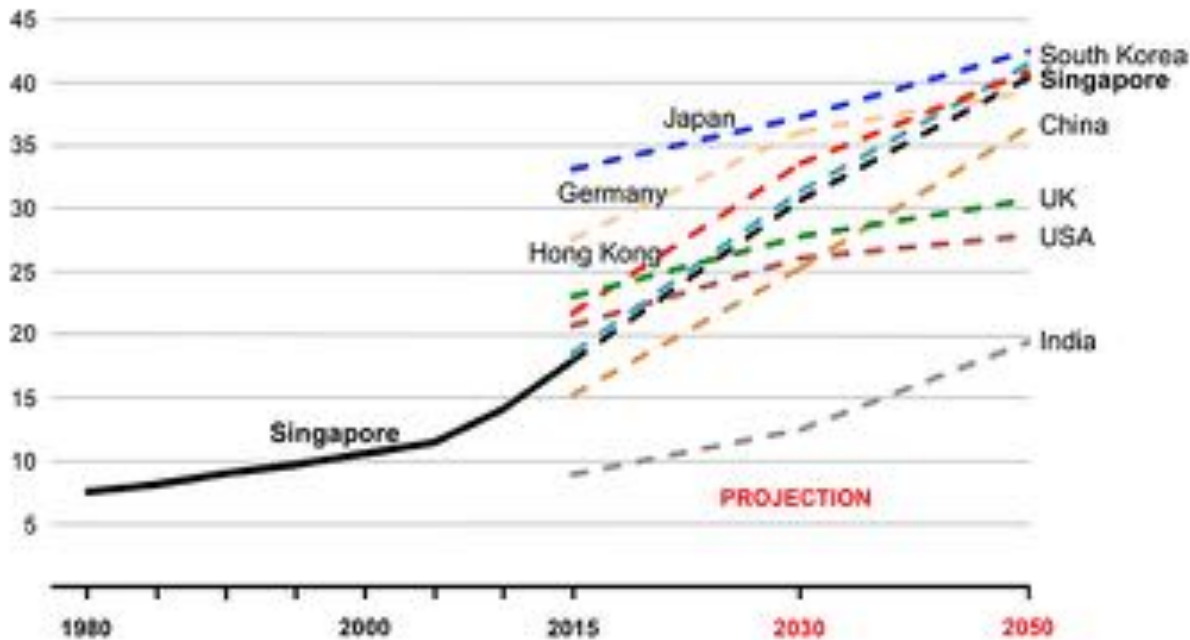
Immense **impacts on quality of life** and almost **all aspects of daily living** of the older adults:

- **mobility, navigation and spatial orientation** (Haanes et al., 2014, 2015)
- **increased falls and accidents** (Lopez et al., 2011)
- **communication difficulties** (Heine & Browning, 2004)
- **lower levels of independence and autonomy, social withdrawal** (Andressen & Puggaard, 2008; Heine et al. 2013)

DEMOGRAPHICS **AGEING POPULATION**

Ageing Populations Worldwide, Projection 2015 – 2050

Proportion of residents aged 60 years and above, in %



By 2050, elderly population in Asia will reach 23%.

In Singapore, population aged 65 and over:

13% in 2017

27% by 2030

47% by 2050

(Department of Singapore Statistics, 2017; Tan, 2017)

Ageing-friendly initiatives

SINGAPORE

Ageing in place & Active ageing

- New housing schemes
- Neighbourhood upgrading programme
- Barrier-free design
- Employment possibilities
- Care and social facilities and programmes
- Life-long learning programmes



Headline: Making S'pore a more elderly-friendly place
Source: *The Straits Times*, Home, Page B6
Date: 10 October 2012

Making S'pore a more elder-friendly place

Experts discuss issues like living environment, income and attitudes

By SALMA KHALIK
HEALTH CORRESPONDENT

RETIREMENT villages: letting the elderly rent out part or all of their HDB flats; and getting them to be aware and to take care of their chronic medical conditions were among suggestions made yesterday by experts in the field.

They were participating in a round-table discussion on "Ageing-in-place: How prepared are we?" held at the National University of Singapore.

Associate Professor Chia Ngee Choon urged the Government to allow the elderly to sublet part or all of their flats. Rents from two-room flats, for instance, can add about \$1,293 a month to their wallets.

However, Associate Professor Paulin Straughan preferred giving the elderly the option of moving into retirement villages, a concept which is popular

in Australia.

Dr Angeliqne Chan felt it was important for people to be aware of and be able to control their chronic medical conditions, so they remain in fairly good health in their sunset years.

But she said a significant number of people with high blood pressure - which raises the risk of heart attacks and strokes - are not even aware of

their condition.

In opening the session, Dr Amy Khor, Minister of State for Health and Manpower, set the tone by saying "we should not see ageing as a problem".

She identified the "4Ps" Singapore will need to cater to its rapidly ageing population: philosophy, physical environment, policies and people.

On philosophy, she said: "What underpins our conversations must be a set of values and beliefs about the kind of society which our seniors, and in fact we ourselves in the future, will live in."

“

VALUES AND BELIEFS

What underpins our conversations must be a set of values and beliefs about the kind of society which our seniors, and in fact we ourselves in the future, will live in.

- Dr Amy Khor, Minister of State for Health and Manpower

In terms of physical environment, she said the Government is gradually turning the country senior-friendly, with lift upgrading in older HDB flats and the setting up of more than 100 eldercare facilities.

Policies, she said, have to be reviewed regularly, as those made in the context of a young population might not apply by 2030, when one in five will be aged 65 years or older.

She cited the example of a recently implemented \$120 grant for families with seniors who need looking after to hire a foreign maid.

The last "P", people, is the most important, she said. It relates to how Singaporeans treat the elderly, and whether they teach the young to respect and care for them.

Dr Khor said: "We will need to think through how we, as a society, can imbue everyone with a sense of obligation towards our elderly members so that they can live out their years with dignity."

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📘 www.facebook.com/ST.Salma

”

Ageing-friendly initiatives

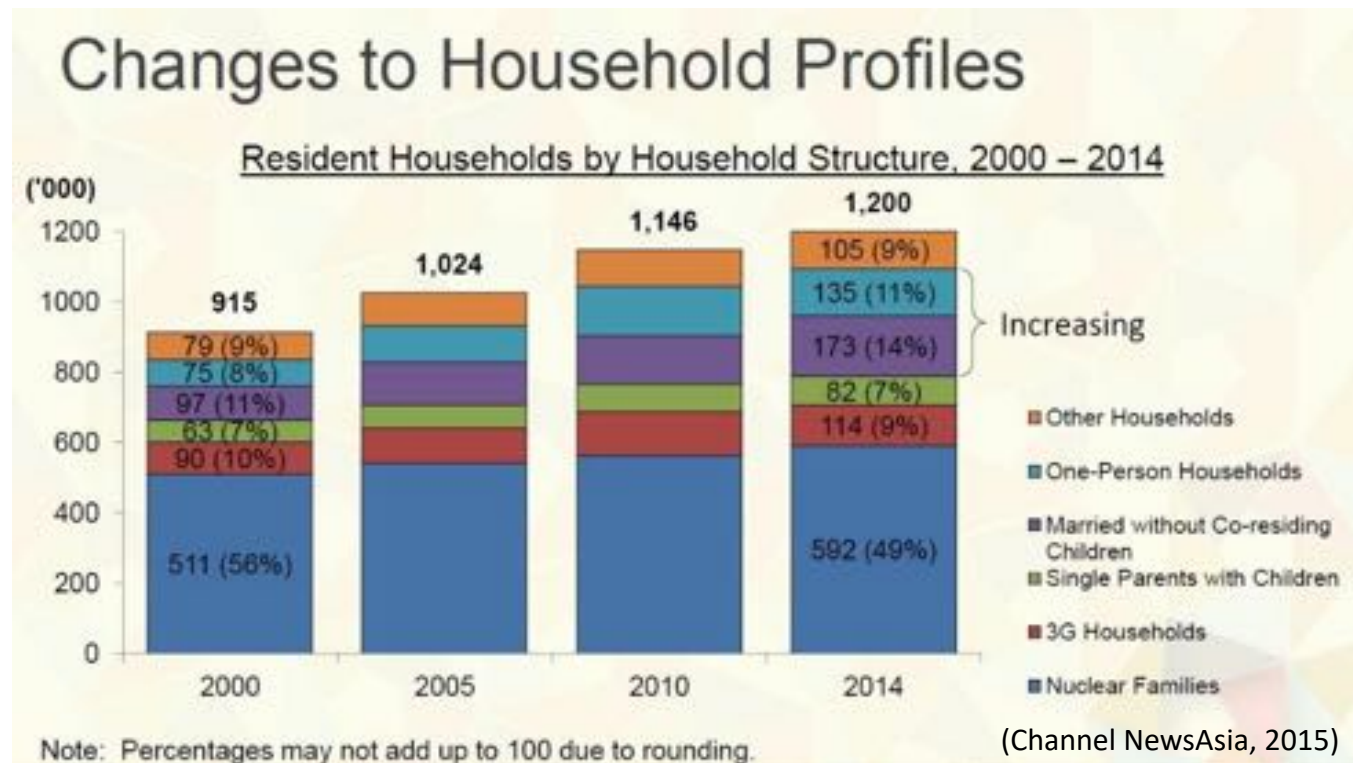
SINGAPORE

Ageing in place

Family has traditionally been the main source of support for the elderly in Asia.

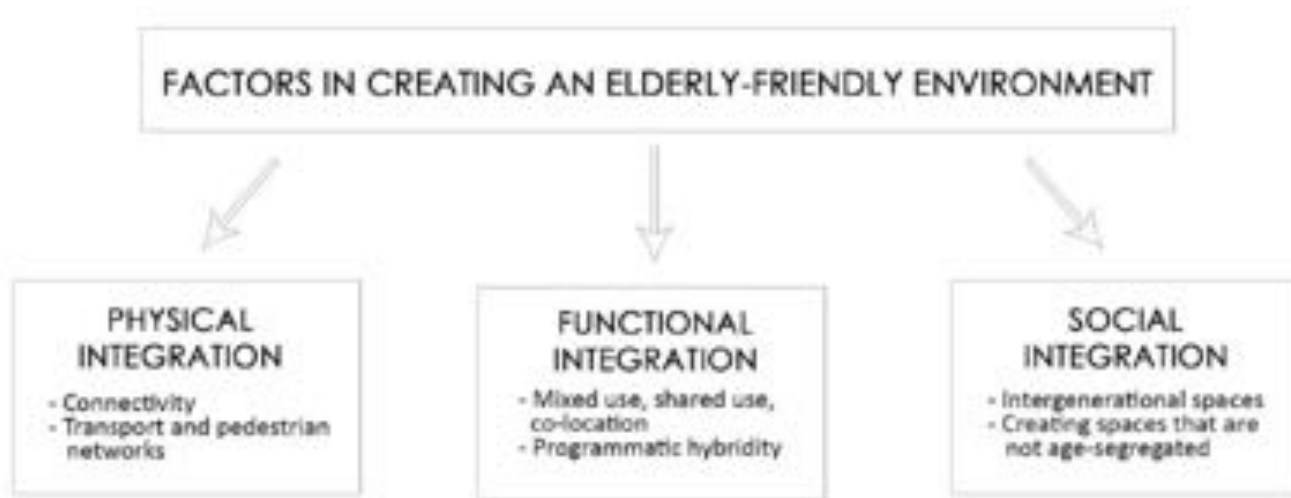
Living alone

However, there has been a rising trend of **more elderly people living alone** expected to reach 92,000 by 2030 (CAI 2006)



PREMISE

Need for more integrated and supportive design



- **physical**
- **mental**
- **emotional**
- **social needs**



“Sensory Revolution”

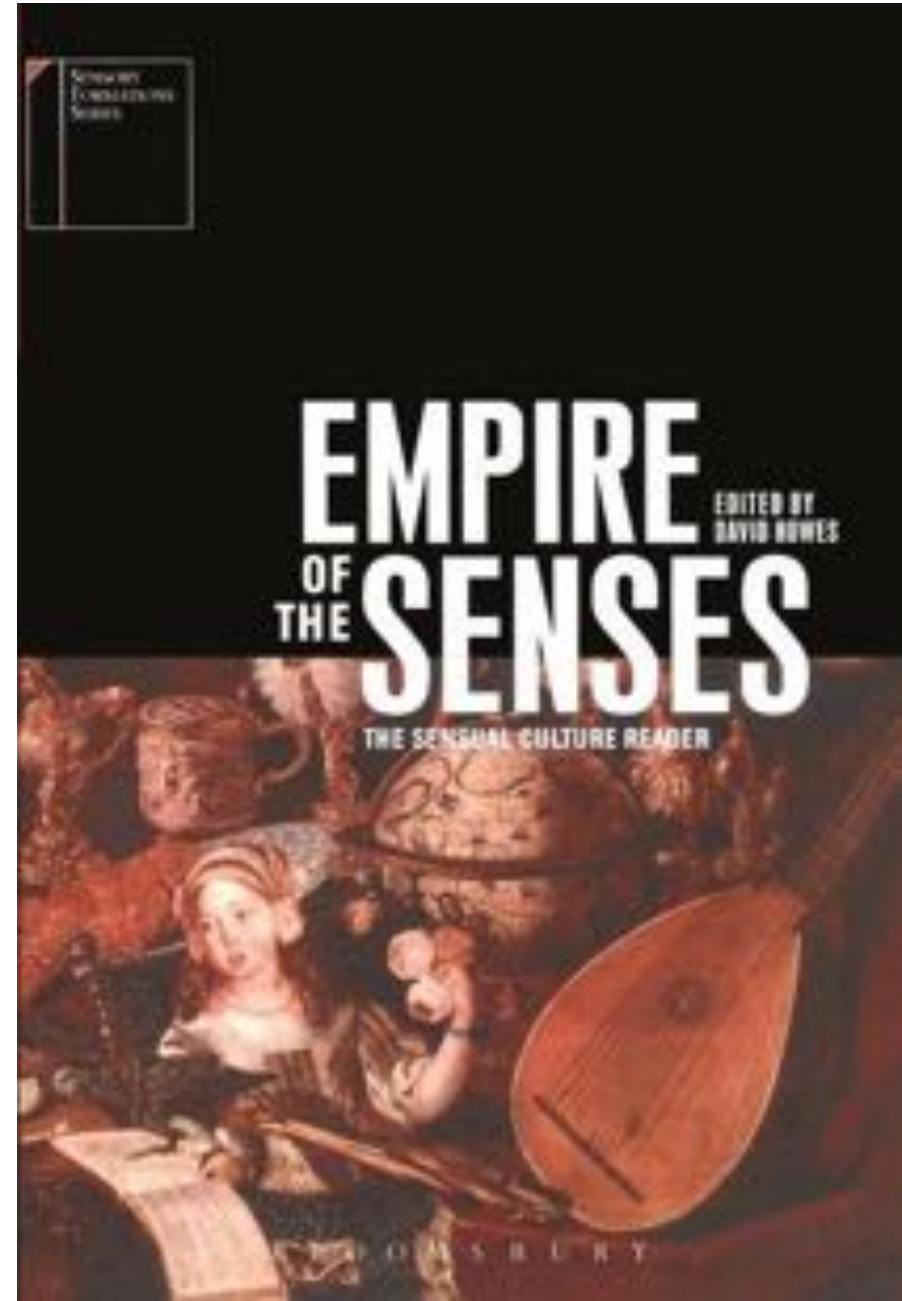
Since early 2000s

Renewed interest in sensory studies:

- Social sciences
- Human geography
- Sensory Ethnography
- Anthropology
- Environmental Psychology
- Neuroscience

+ technological advancement

Translation of such new knowledge into design is a challenge.



OBJECTIVES

To discuss the **role of multi-sensory approach to planning and design of ageing-friendly neighbourhoods** and outline a **study** conducted in **two housing neighbourhoods in Singapore**, which aimed to:

- **document and assess the multi-sensory qualities** of the of local high-density neighbourhoods
- **develop an integrated multi-sensory analysis framework** to investigate the multi-sensory capacities of local neighbourhoods to enable more meaningful and joyful “ageing in place” and “active ageing” and foster higher sense of physical, mental and social well-being for all ages

SCOPE



More than 80% of Singaporeans live in HDB neighbourhoods, 2017

SCOPE

SITE 1: BUKIT PANJANG (1980s)



SITE 2: CASA CLEMENTI (2013)

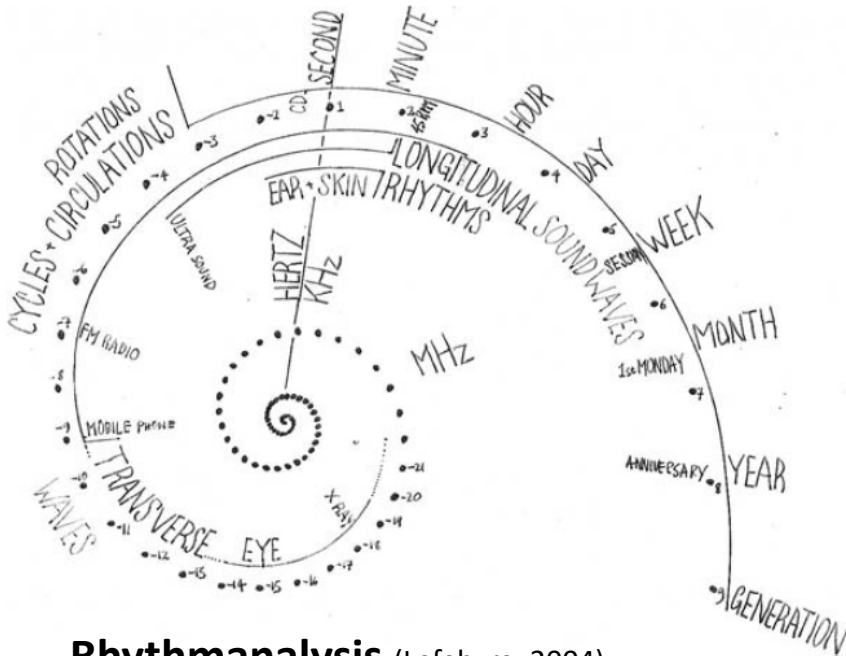
APPROACH & METHODS

PILOT STUDY

EXPLORATORY EXERCISES TO CAPTURE & MEASURE SUBJECTIVE SENSORY EXPERIENCE

with 30 architecture and urban design students

Guy Debord, "Dérive" (1994)
 Walter Benjamin, "Flâneur" (1999)
 Henri Lefebvre, "Rhythmanalysis" (2004)



Rhythmanalysis (Lefebvre, 2004)

- Workshops:
 - Multi-sensory photo-journeys
 - Sensory notation and evaluation
 - Movement notation
- Snapshot activity analysis
- Rhythmanalysis
- Role-playing
- Perception surveys
- Walk-along interviews

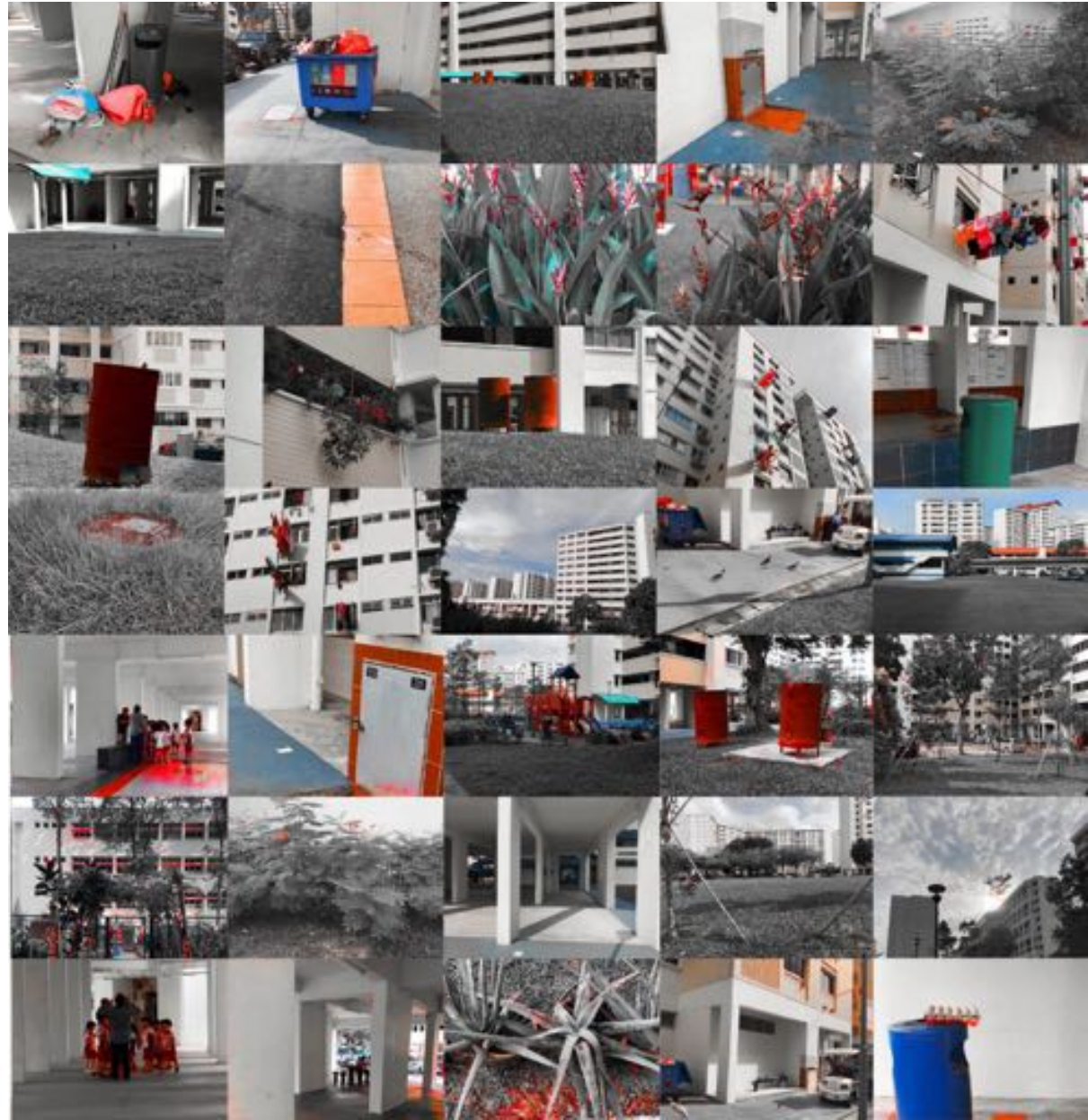
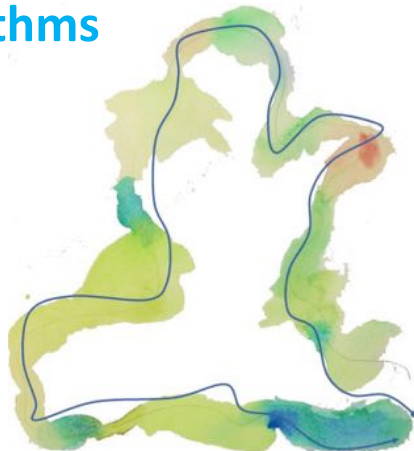
PILOT STUDY **SITE 2: CASA CLEMENTI**

Traces of everyday-ness (Courtesy of Sun Yutong)

PHOTO-JOURNEYS – SENSING THE SITE

- capture the **first impression** about the neighbourhood
- Initiate the discussion on **subjectivity** of experience
- Explore the capacities of photo-taking as means for capturing **sensorial narratives and rhythms**

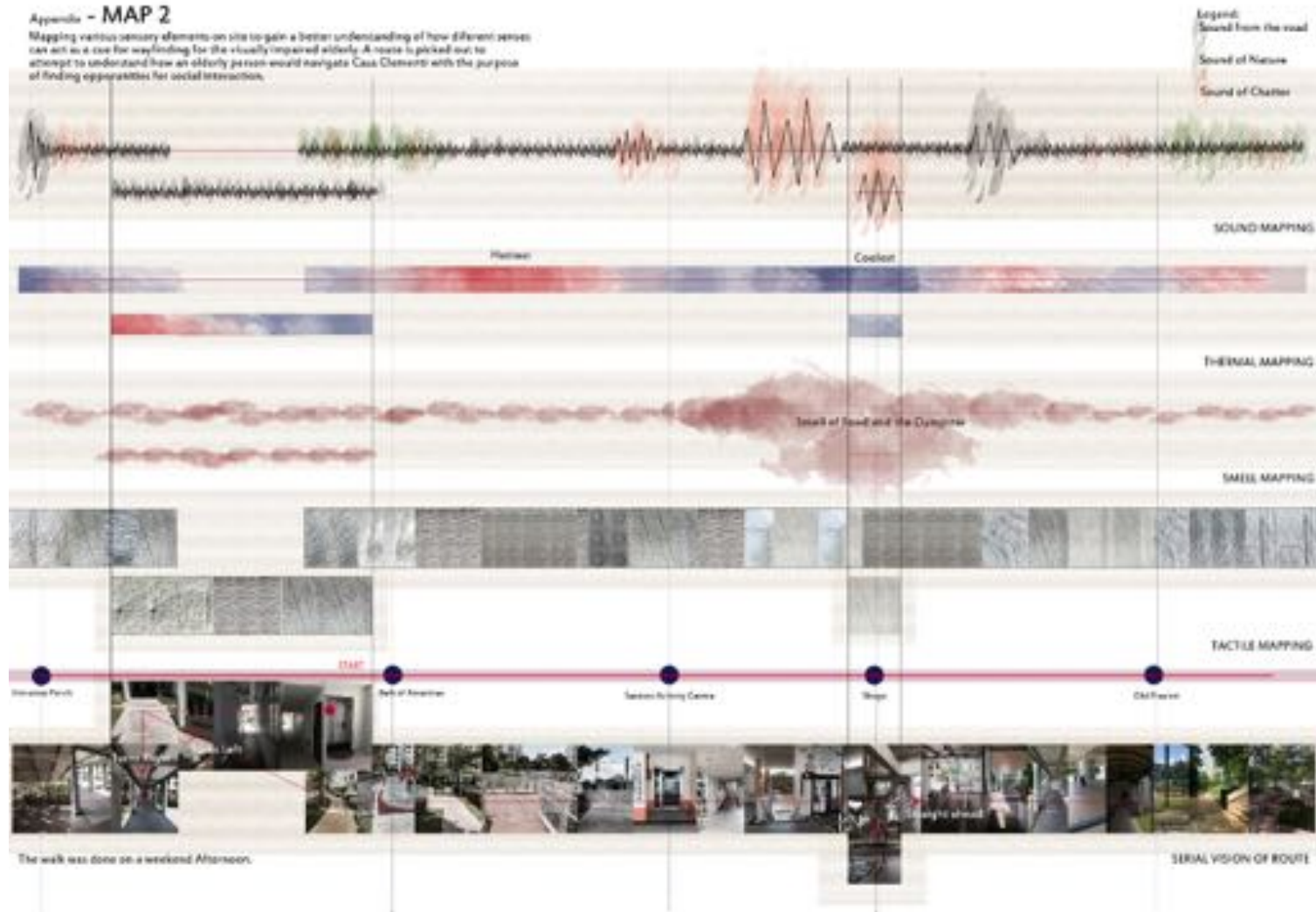
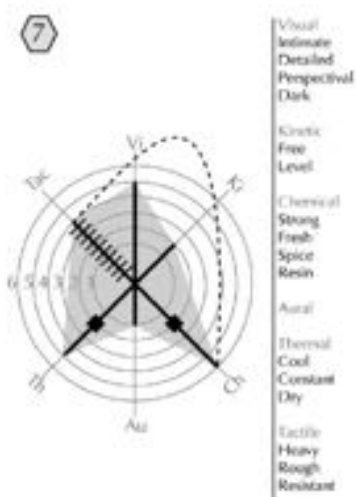
Smellscapes
(Courtesy of
Ge Fan Li,
Naitik Parekh,
Nurzhanat
Kenenov,
Phuah Lin and
Ulrich Chia)



PILOT STUDY **SITE 2: CASA CLEMENTI**

SENSORY NOTATIONS AND RHYTHMS

(Courtesy of See Ying Jia)



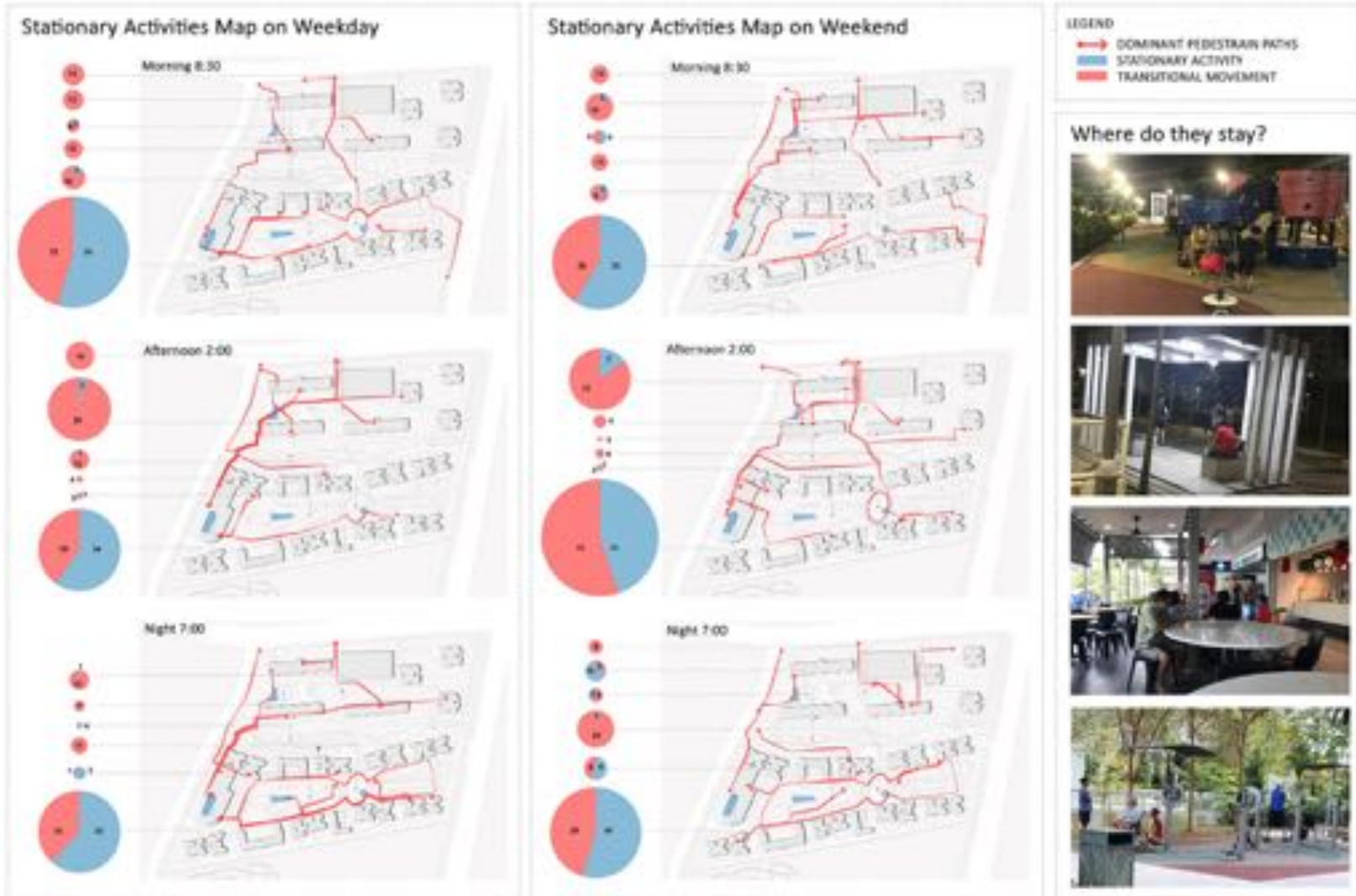
PILOT STUDY **SITE 2: CASA CLEMENTI**

TRACING PEDESTRIAN ACTIVITY RHYTHMS

Where do people move and stay?

Snapshot method

(Gehl & Svarre, 2013)



PILOT STUDY

SITE 2: CASA CLEMENTI

SYNTHESIS: Rhythmanalysis



● TRANSIENT ACTIVITY ● STATIONARY ACTIVITY → Predominant movement paths



ACTIVITY RHYTHM (Where do people move and gather?): Morning 7:00-9:00



ENTRANCE (DROP-OFF) FITNESS CORNER CIRCULAR PLAZA NEW PLAYGROUND 1 COMMUNITY GARDEN FOODCOURT SHOPS NEW PLAYGROUND 2 BADMINTON COURT GREEN PLAZA OLD PLAYGROUND

A B C D E F G H I J K



SENSORY RHYTHM (notation charts: Vi-sual; So-und; Ta-ctile; Th-ermal; Ki-nethic; Ol-factory): — Intensity of Sensory Stimulus — Pleasure/Comfort Level

PILOT STUDY

Key topics that arose from the study:

- **safety and wayfinding**
- **thresholds and universal design**
- **integrated public amenities**
- **social interaction and inter-generational design**
- **inclusive vs. exclusive environment (ageism)**
- **emotional landscapes**
- **responsive environment and smart technologies**

This shows the capacity of multi-sensory analysis to capture critical issues pertinent to ageing-friendly design and indicate certain design measures.

PILOT STUDY **SITE 2: CASA CLEMENTI**

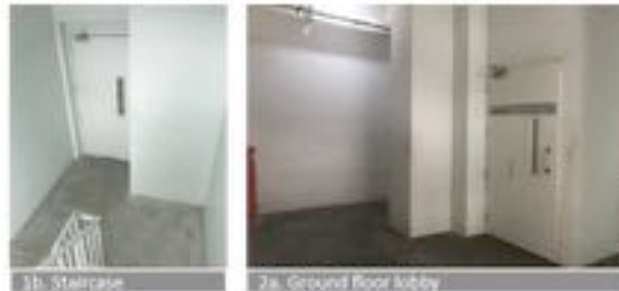
Design Response
Wayfinding
& dementia

- associative clues

Picture 1:
Selected route
represented in
the form of
collage



Picture 2:
Selected route
represented in
the form of
collage after
intervention



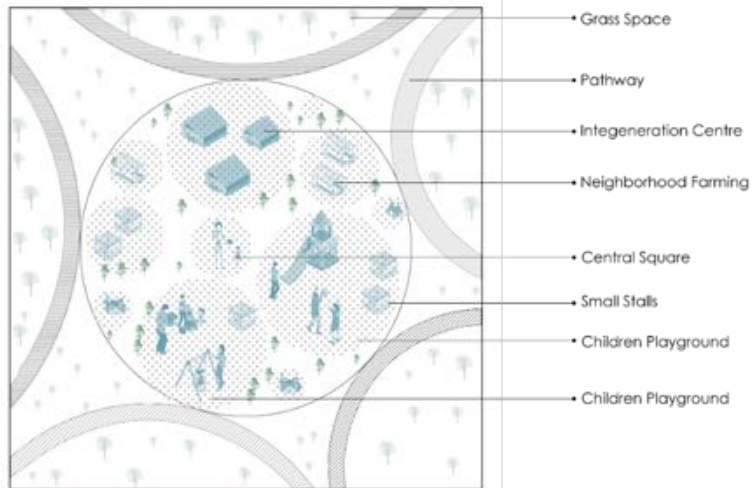
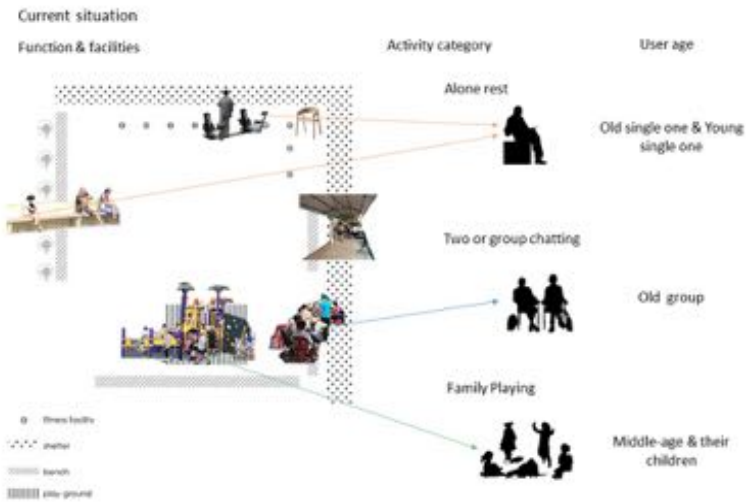
(Courtesy of Nurzarhat Kenanov)

PILOT STUDY SITE 1: BUKIT PANJANG

Design Response

Inter-generational sensory plaza

(Courtesy of Yu Chang)



PILOT STUDY SITE 1: BUKIT PANJANG

Design Response

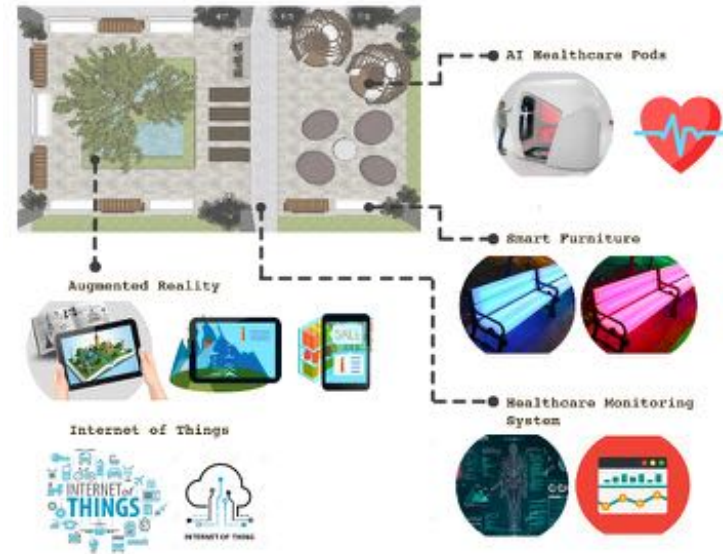
Augmented space & responsive design



Augmented Space

Smart technology
integrated furniture

AI based Healthpods



(Courtesy of Shivank Singhal)

APPROACH & METHODS

FINAL STUDY

- Quantitative sensory data documentation
- On-site observation and mapping of pedestrian activities

- **Socio-perceptual surveys**
- **Eye-tracking journeys and interviews**

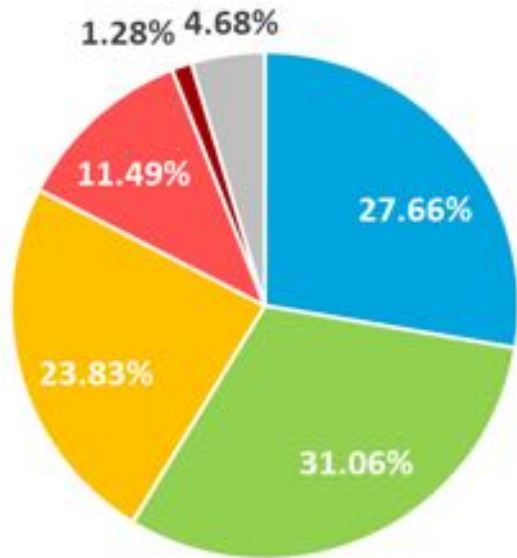
- **SYNTHESIS: INTEGRATED MULTI-SENSORY FRAMEWORK**

FINAL STUDY

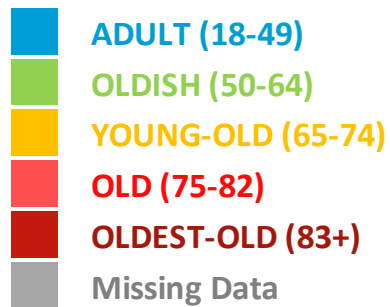
Socio-perceptual survey (key preliminary findings)

BUKIT PANJANG: 235

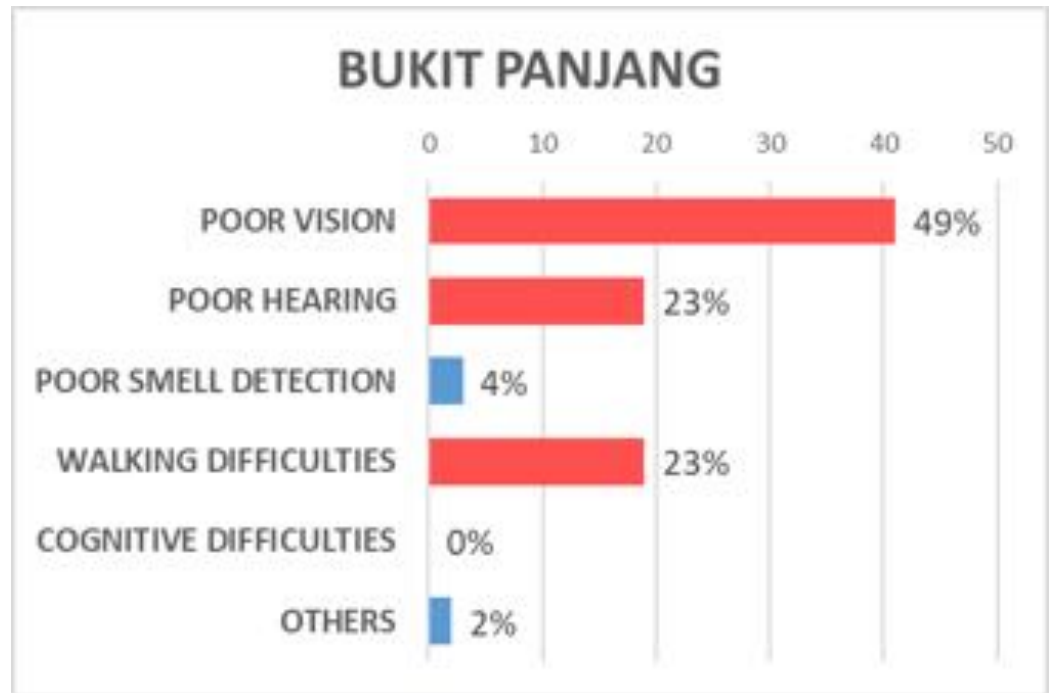
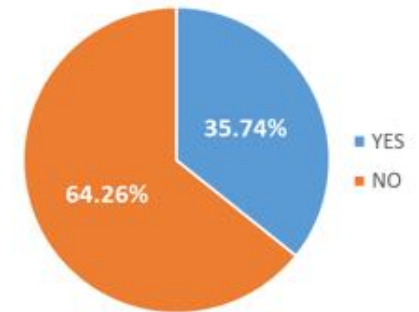
Profile



AGE CLASSIFICATION:



Reported Sensory Impairment



(Bozovic-Stamenovic, 2013)

FINAL STUDY **Socio-perceptual survey (key preliminary findings)**

79.16
%

**THIS NEIGHBOURHOOD IS OVERALL
AESTHETICALLY APPEALING**

85.02
%

NATURE MAKES WALKING THROUGH THIS
NEIGHBOURHOOD MORE ENJOYABLE

57.89
%

I ALWAYS PREFER WALKING ON **SHELTERED
PATHWAYS** (COVERED WALKWAYS AND VOID-DECKS)

FINAL STUDY Socio-perceptual survey (key preliminary findings)

73.00
%

THERE ARE PLENTY OF **OPPORTUNITIES FOR DIFFERENT GENERATIONS** (E.G. CHILDREN AND ELDERLY) TO MEET

FINAL STUDY Socio-perceptual survey (key preliminary findings)

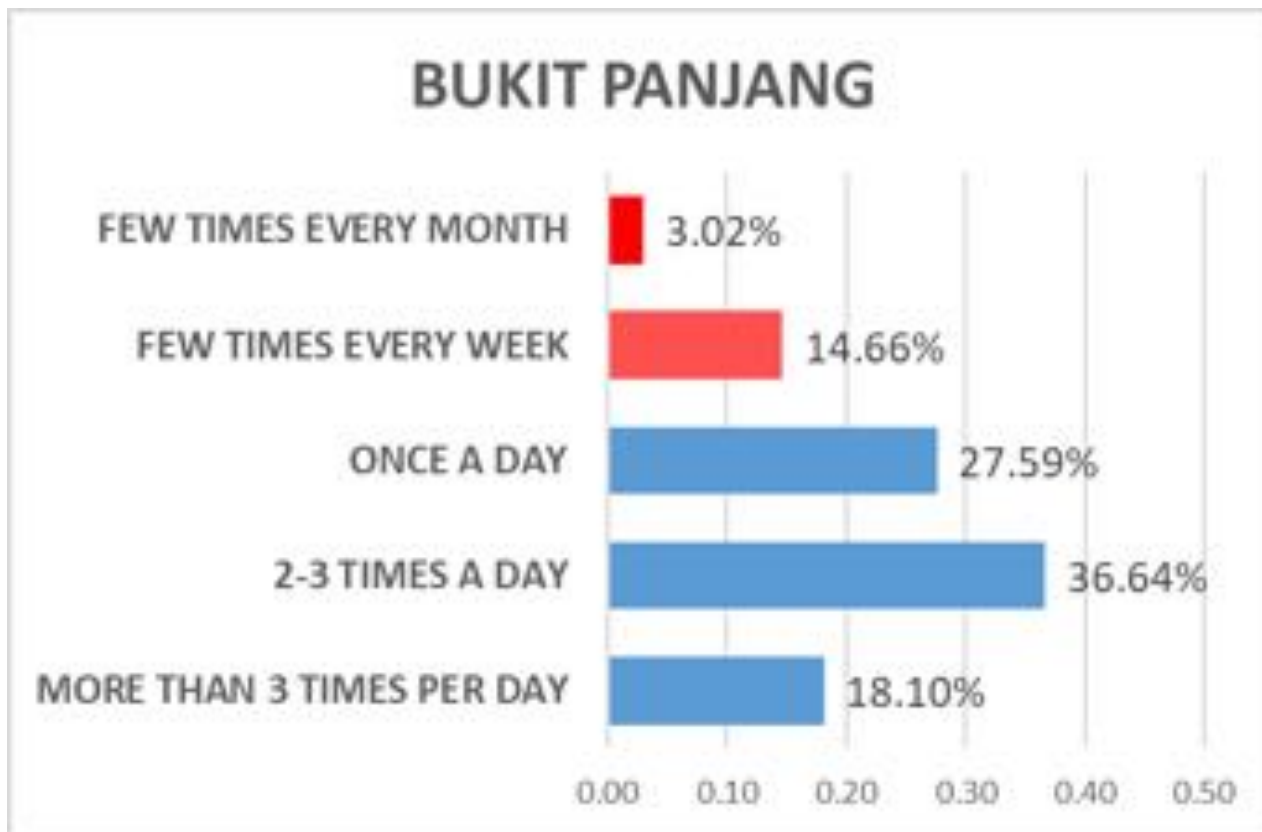


77.00
%

THIS NEIGHBOURHOOD IS OVERALL WELL-DESIGNED FOR THE ELDERLY USERS

FINAL STUDY Socio-perceptual survey (key preliminary findings)**BUKIT PANJANG: 235**

HOW OFTEN DO YOU GO OUT OF YOUR HOME INTO YOUR NEIGHBOURHOOD?

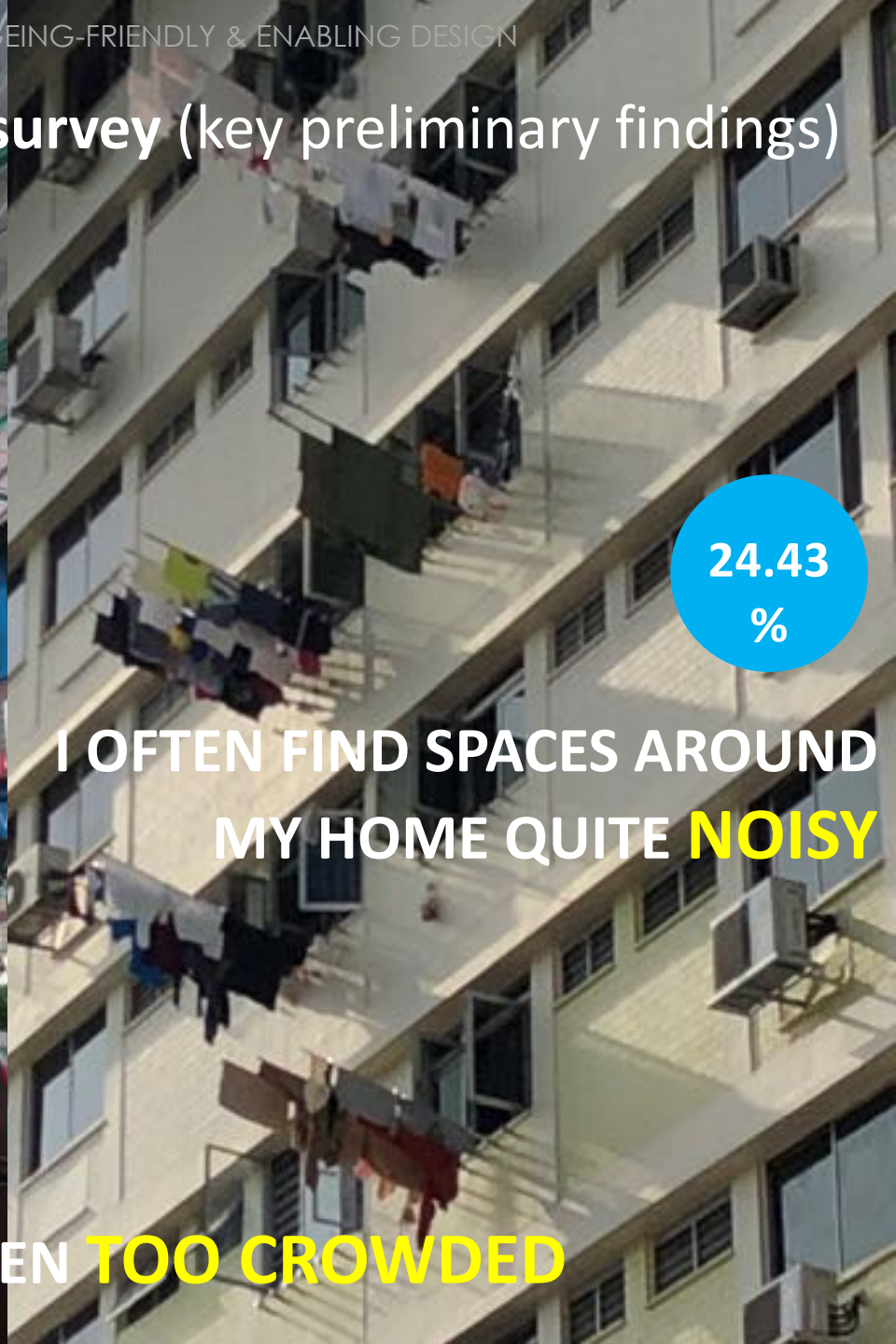


FINAL STUDY **Socio-perceptual survey** (key preliminary findings)



37.67
%

THIS NEIGHBOURHOOD IS OFTEN **TOO CROWDED**

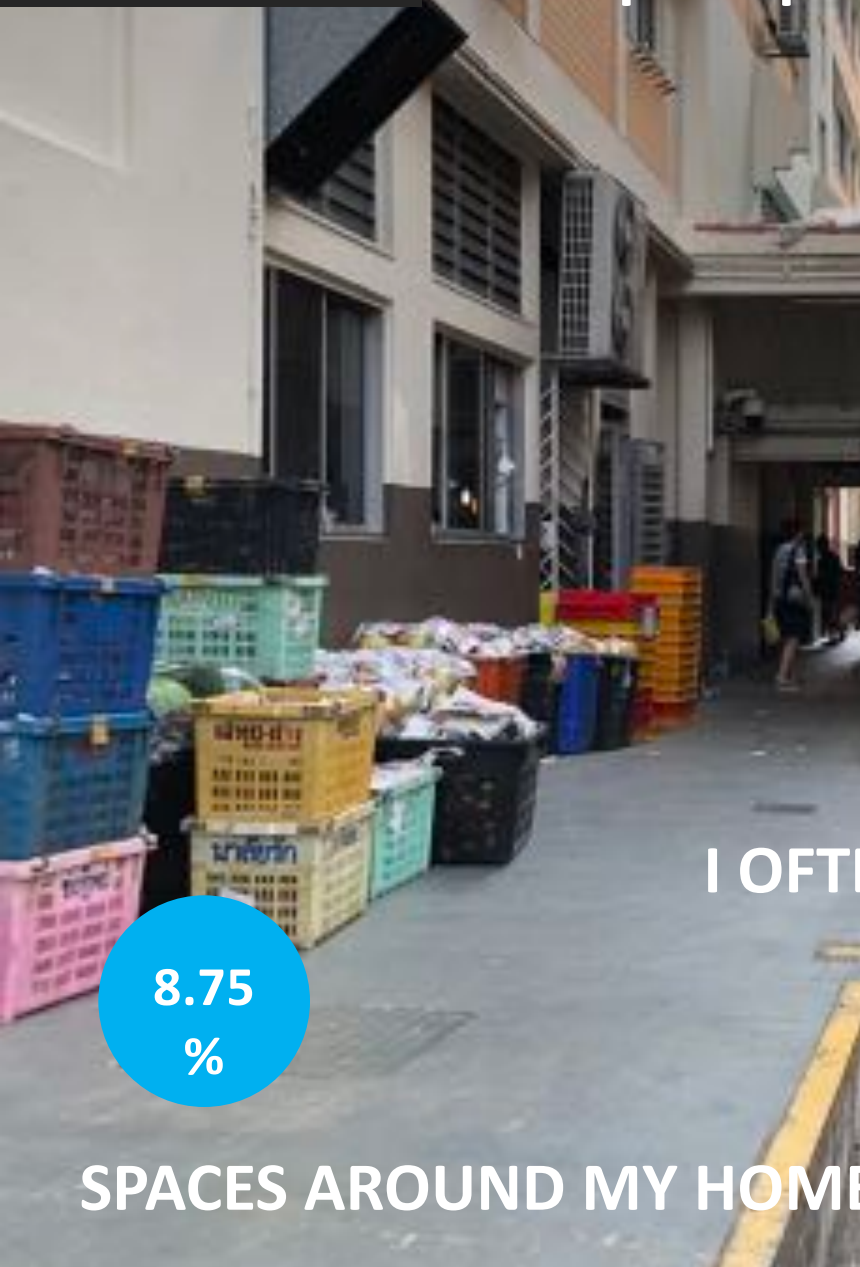


24.43
%

I OFTEN FIND SPACES AROUND
MY HOME QUITE **NOISY**

FINAL STUDY

Socio-perceptual survey (key preliminary findings)



8.75
%

SPACES AROUND MY HOME ARE **DIRTY AND MESSY**



13.42
%

I OFTEN FIND PLACES AROUND MY HOME **SMELLY**


FINAL STUDY

Socio-perceptual survey (key preliminary findings)

49.03
%

I AVOID PASSING BY RUBBISH CHUTES, MESSY AREAS AND DARK PLACES

FINAL STUDY Socio-perceptual survey (key preliminary findings)



30.55
%



THERE ARE **MANY OBSTACLES** TO
WALK AROUND THIS NEIGHBOURHOOD

34.29
%

FLOORS IN THIS NEIGHBOURHOOD ARE **SLIPPERY**
WHEN IT RAINS AND I FEEL **UNSAFE** TO WALK

FINAL STUDY

Socio-perceptual survey (key preliminary findings)

10.68
%

SOMETIMES, I **CAN'T FIND MY WAY**
IN THIS NEIGHBOURHOOD

12.81
%

I **HESITATE TO GO OUT** IF THERE IS NO ONE
ACCOMPANYING OR HELPING ME

FINAL STUDY **SITE 1: BUKIT PANJANG**

Eye-tracking [sample size: 60]

Tobii Glasses 2

Wearable eye tracking
Second generation

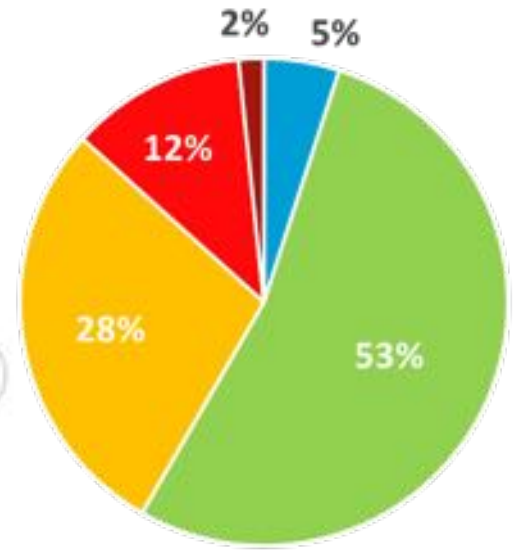


**Spontaneous
daily routine walks
(15-30mins)**



FINAL STUDY **SITE 1: BUKIT PANJANG**

Eye-tracking [sample size: 60]



ADULT (18-49)	3
OLDISH (50-64)	32
YOUNG-OLD (65-74)	17
OLD (75-82)	7
OLDEST-OLD (83+)	1

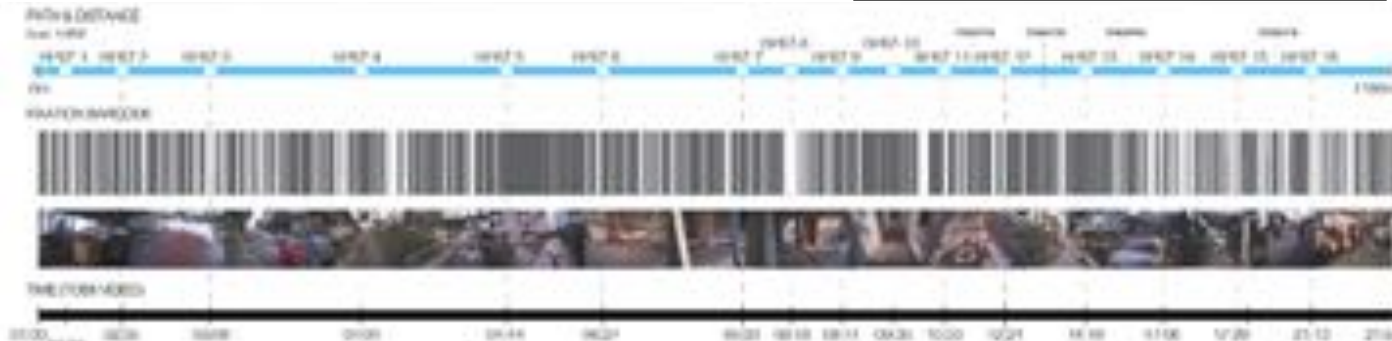
FINAL STUDY

**Eye-tracking documentation
SINGLE JOURNEY**



Participant's profile

Plotted path



PATH

EYE-FIXATION BAR

VIDEO

TIME

Walking speed

SCENARIOS & QUESTIONS

 SP101 When I walk, I normally focus my eyes on the floor instead of looking across the road. Only when I feel very nervous, I will enjoy watching the traffic and people.	 SP102 I am often bothered when walking. I noticed that there was an elderly man sitting on the ground on the way and knocked several bottles over. I tried to walk past him.	 SP103 I am conscious when the bicycle messengers pass along the road. I noticed that the messengers were driving down the road and I had to get up to identify where it is coming from.	 SP104 I notice the wheelchair user is moving quickly on the sidewalk during class. I have taken them to the room and been very helpful.	 SP105 In the morning, the lighting of the 15th floor is not so bright. There is a lot of the furniture and it is a bit uncomfortable for the eye.	 SP106 The area from the car park is very noisy. The people had no privacy.	 SP107 It is important to be able to see the road clearly. It is a good way to monitor the road and to be able to see it.
 SP108 I got tired of being stuck here as the cars in front of me. I took a lot of the time from walking.	 SP109 I found the trees very green as they are always green and I went there a very day.	 SP110 I usually walk with my dog during the day. I sometimes walk with my dog and I tend to walk with him.	 SP111 I have noticed that the wheelchair user is moving quickly on the sidewalk during class. I have taken them to the room and been very helpful.	 SP112 The people on the sidewalk are very noisy. The people had no privacy.	 SP113 The area from the car park is very noisy. The people had no privacy.	 SP114 The people on the sidewalk are very noisy. The people had no privacy.

Sensory narratives

FINAL STUDY

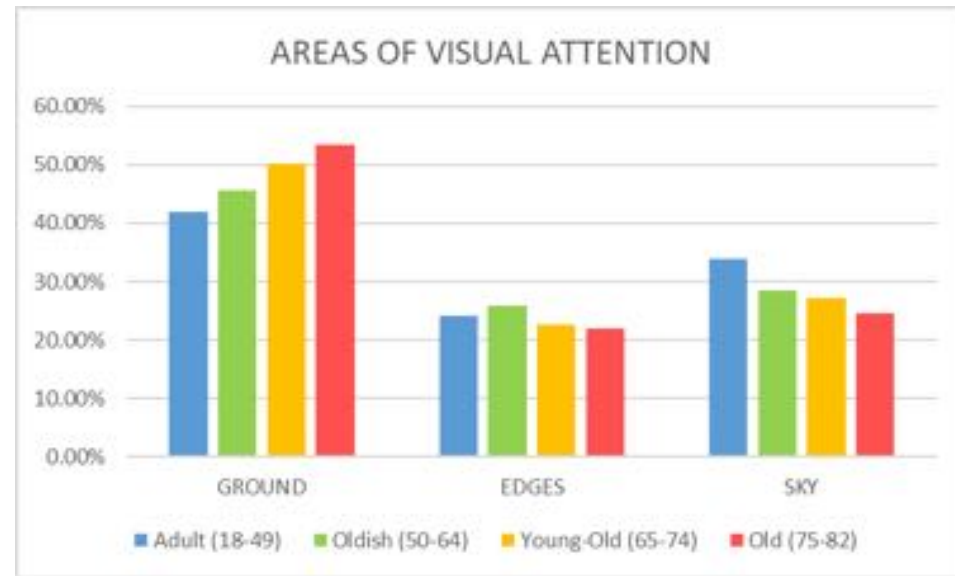
SYNTHESIS: INTEGRATED MULTI-SENSORY FRAMEWORK



FINAL STUDY

Eye-fixations - visual regions

Visual attention of older adults tend be focused on the **ground**, due to the **safety concerns** and possibly the **body posture**.



I have to be extra careful, my daughter-in-law told me to be careful and made me wear an amulet to keep me balanced, not topple. Falling down is a very issue for old. (Ms Lim)

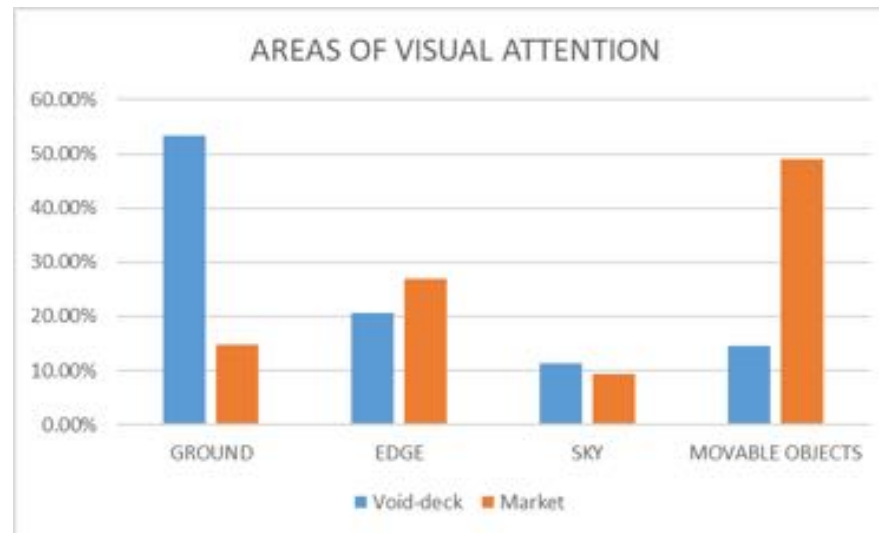
I will not walk here in a rainy day as it is very slippery. (Mr Wong)

FINAL STUDY **SYNTHESIS** **MULTIPLE JOURNEYS OVERLAPPED**



Market and open plaza

Sensory rich
Engaging
Edges
Crowded
Colourful
Social interaction



Void-deck

Sensory poor
Disengaging
Ground
Empty
Monotonous
Social interaction

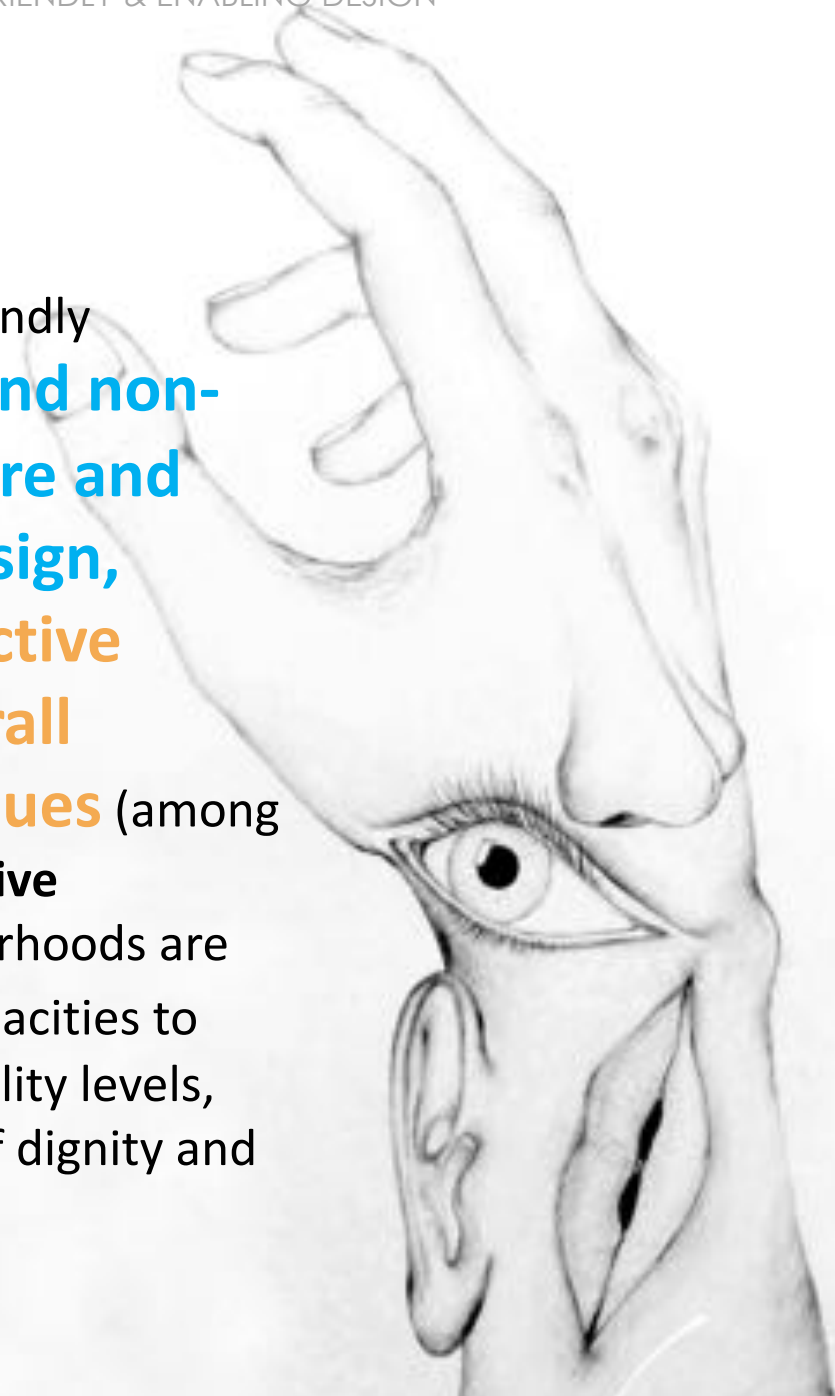
INSTEAD OF CONCLUSION

Looking at plants makes my mood better. Sometimes the flowers change colour. When we noticed that, we will think to ourselves: “Look at that! What a surprise!” If there’s something growing, I will feel happy. (Sam)

I often come here and watch people grow plants. (...) I used to live in “kampong” [village]. My mom would grow vegetables, rear pig, chickens. (Lynn)

INSTEAD OF CONCLUSION

Creating health-supportive and ageing-friendly environments goes **beyond passive and non-integrated provision of healthcare and eldercare facilities, universal design, hygiene and safety**. Instead, **subjective multi-sensorial experience, overall ambience and culture-specific clues** (among others) become **the agenda for age-sensitive neighbourhood design**. Housing neighbourhoods are seen as **supportive “devices”** with capacities to build up residents’ physical and mental ability levels, independence and social support, sense of dignity and self-esteem, at different stages of ageing.



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THANK YOU!

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