



# EUROPEAN HEALTHCARE DESIGN 2017

Singapore's Khoo Teck Puat Hospital: Biophilic Design in Action

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**BIOPHILIA** is our innate connection to nature, a phenomena rooted in neuroscience and psychology that describes an inherent human need to affiliate with life and life-like processes [Wilson, E. O. 1984].



**BIOPHILIC DESIGN (BD)** integrates natural elements into the built environment thereby creating, in the users of the environment, positive feelings and experiences such as calmness and satisfaction [Kellert S.R., Heerwagen J., Mador M. 2008].



BIOPHILIC DESIGN, AT THE  
DRAWING BOARD, IS DISCUSSED  
AS ONE OF THREE STRATEGIES  
[TERRAPIN BRIGHT GREEN LLC  
2014]:

**1.NATURE IN THE SPACE**

**2.NATURAL ANALOGUES**

**3.NATURE OF THE SPACE**

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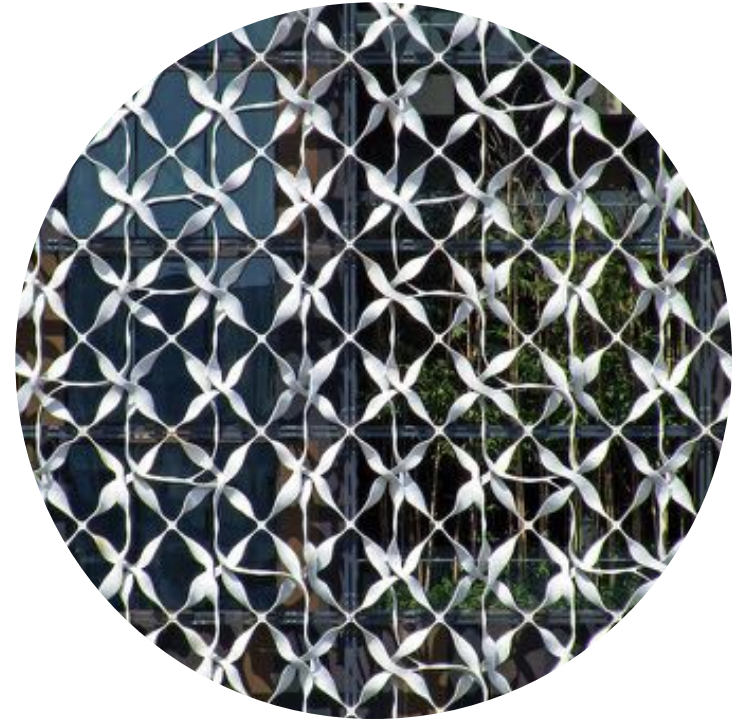
**CREATES SENSORIAL LINKS  
BETWEEN USERS AND  
ELEMENTS OR ATTRIBUTES THAT  
ARE NATURAL OR NATURE-LIKE**

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**CONCERNS ITSELF WITH REPRESENTATIONS OF NATURAL FORMS OR PATTERNS**

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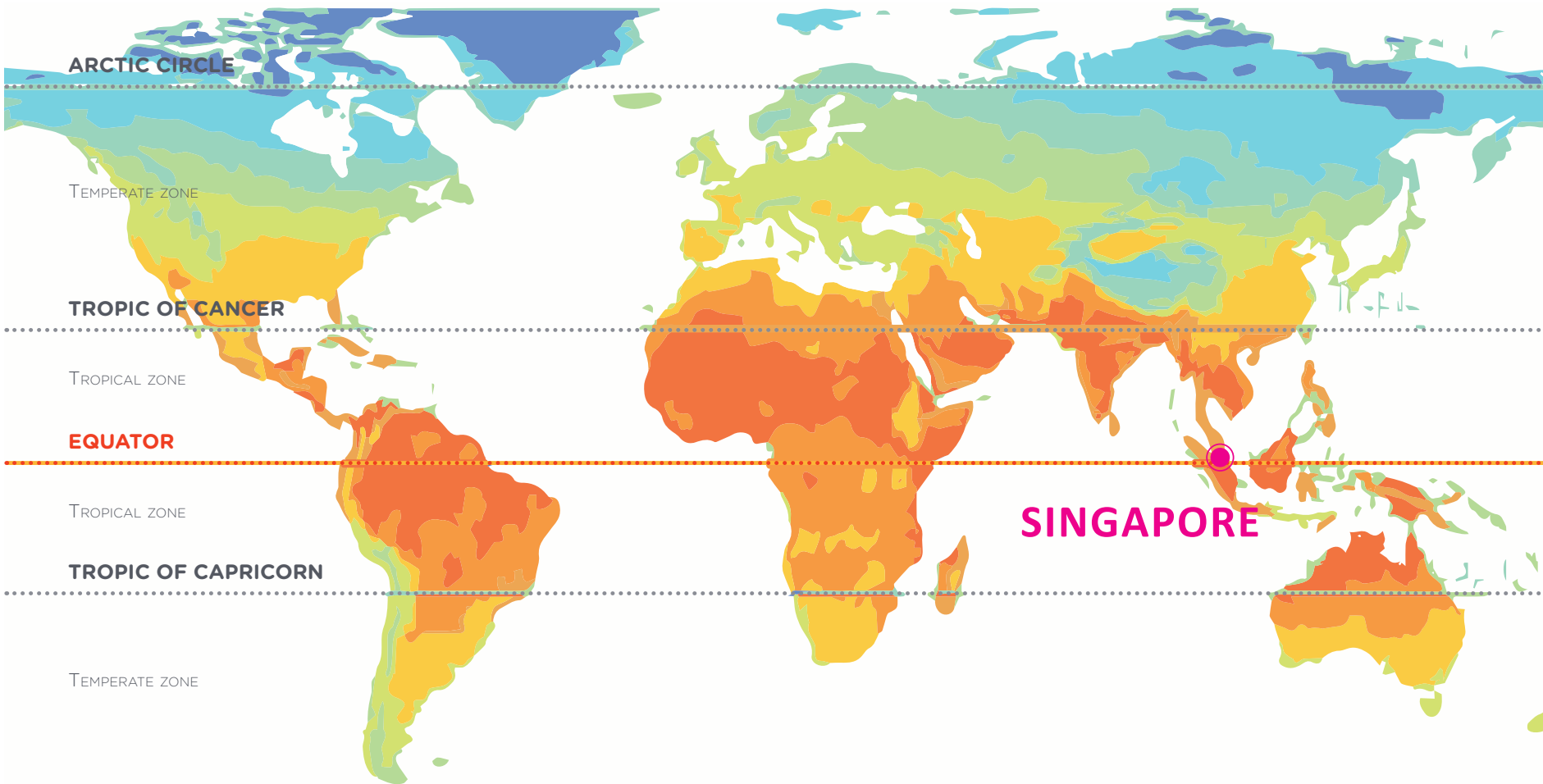


**JUXTAPOSITION OF ELEMENTS,  
ALLUDING TO SIMILAR  
EXPERIENCES FOUND IN  
NATURE**



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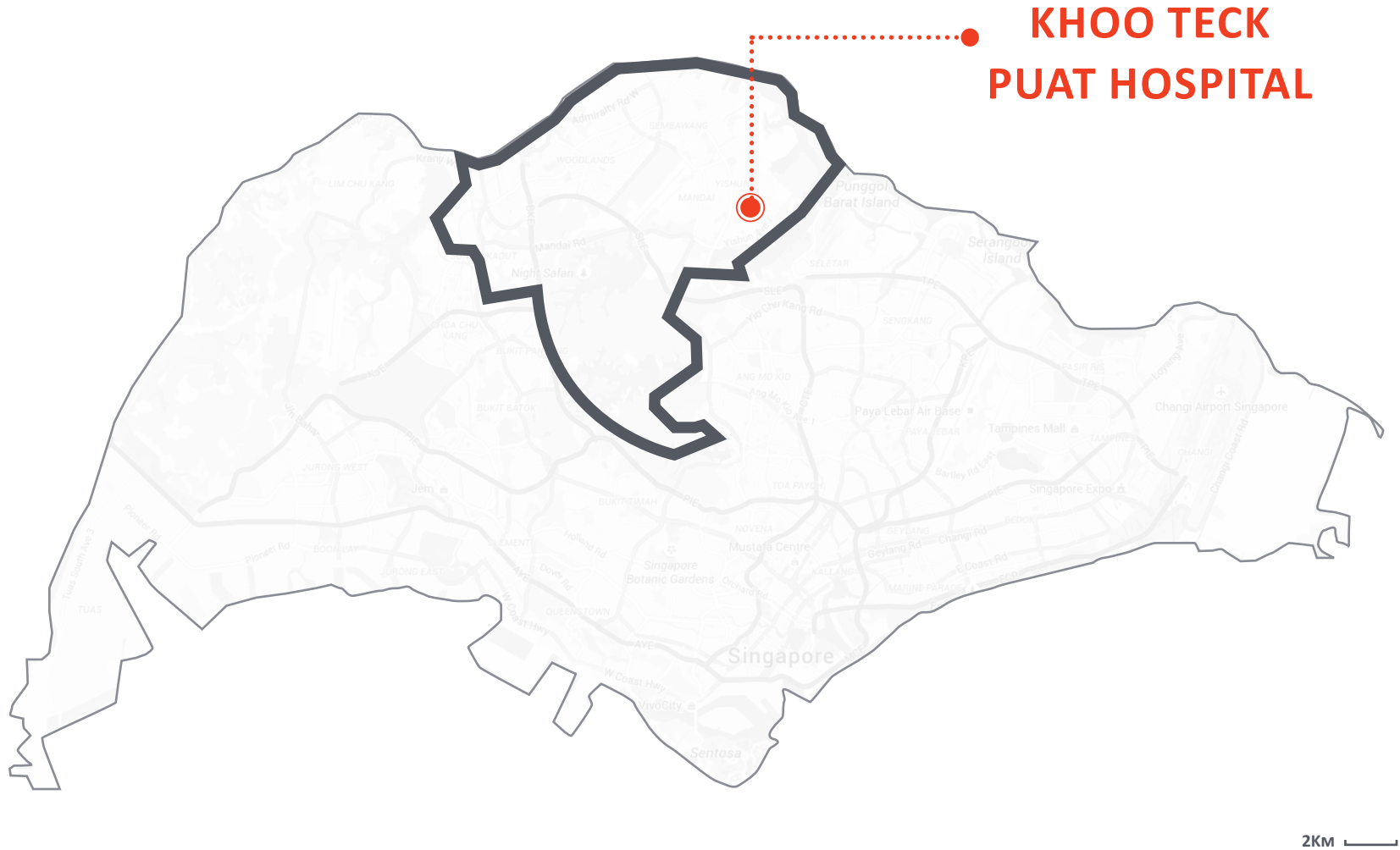






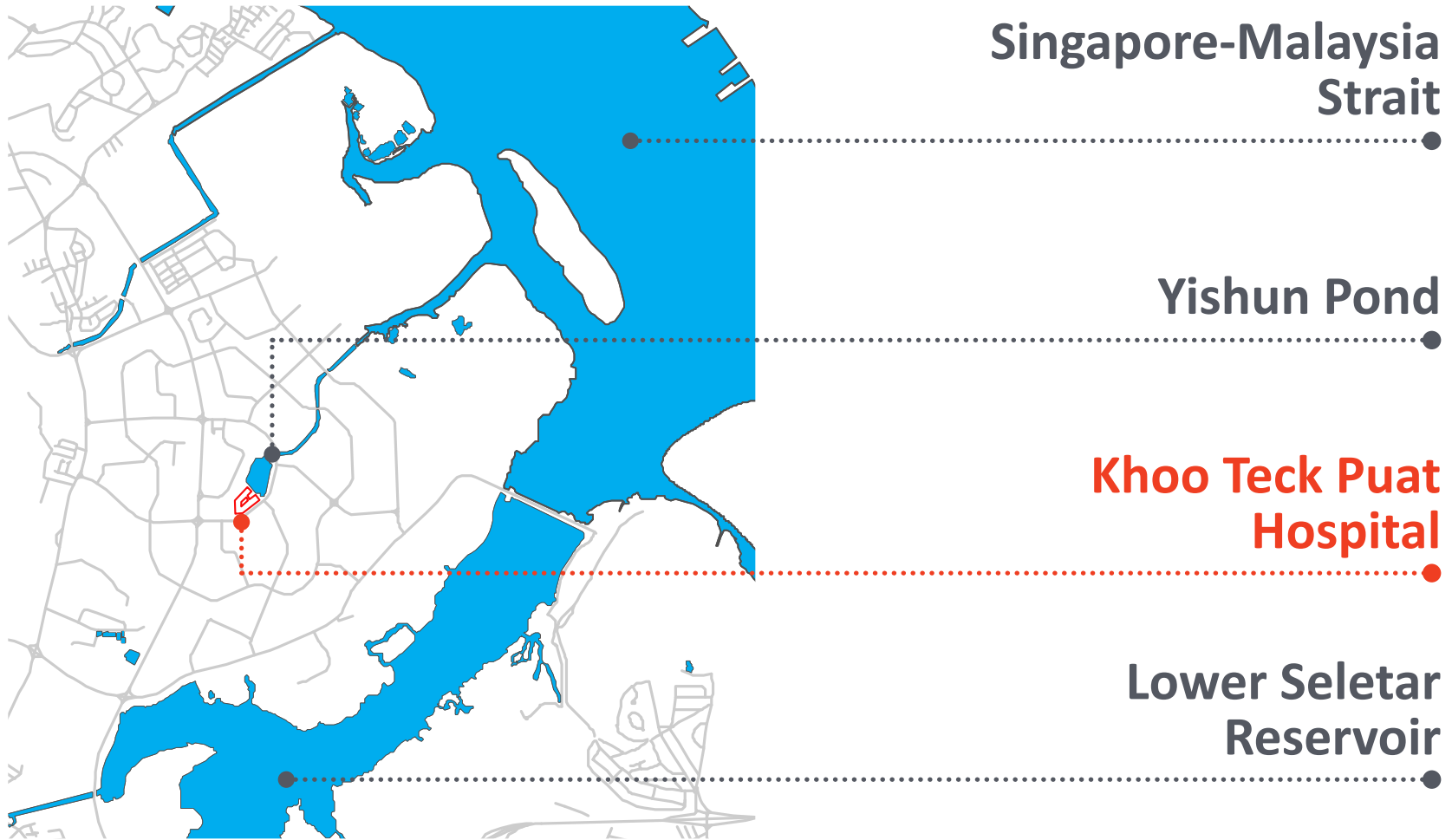
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**SIGHT**

**VISUAL ACCESS TO URBAN  
GREENERY AND WATER**

**SMELL**

**SELECTION OF  
SCENTED PLANTS**

**SOUND**

**SOUND OF FALLING  
WATER**

**DIVERSITY**

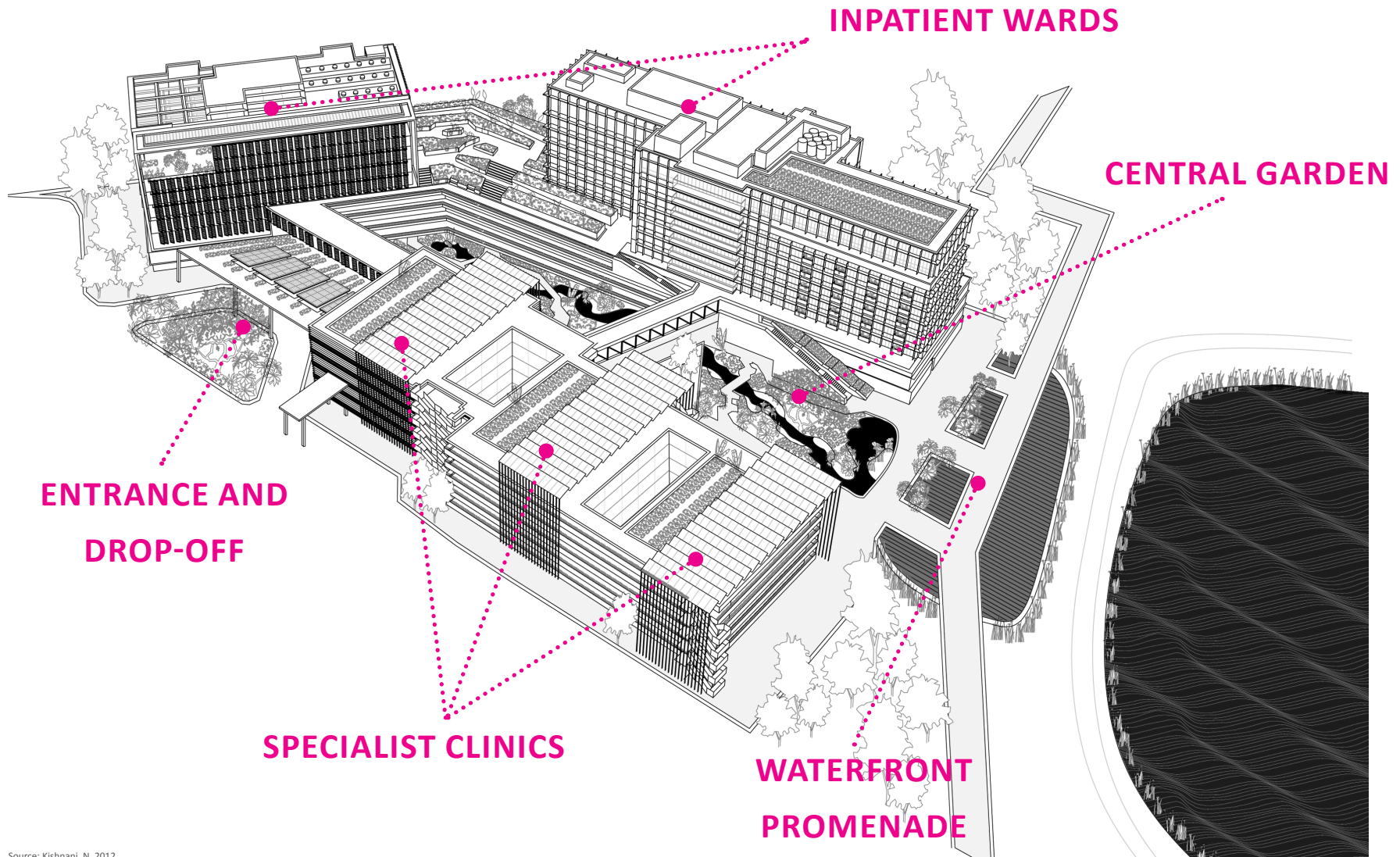
**SELECTION OF PLANTS  
THAT ATTRACT BIRDS AND  
BUTTERFLIES**

**COMMUNITY**

**SOCIAL SPACES NEAR  
OR WITHIN BLUE-  
GREEN ELEMENTS**

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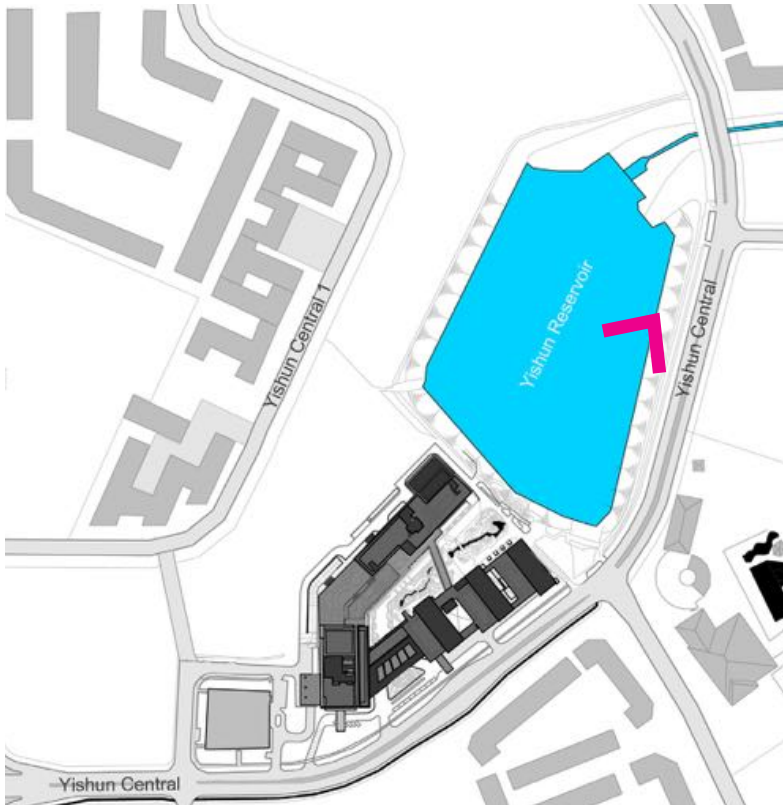
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Source: Kishnani, N, 2012

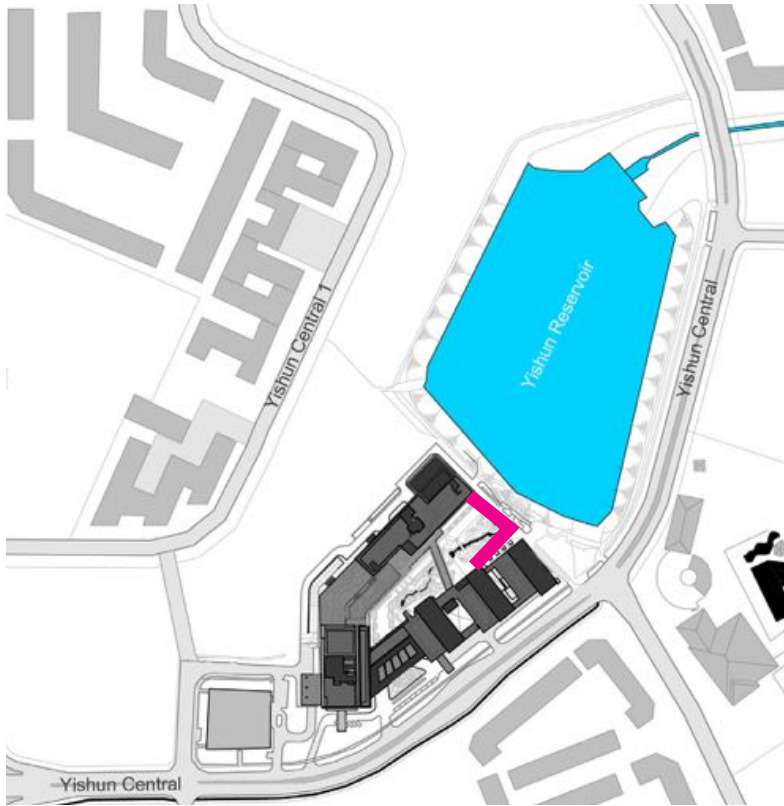
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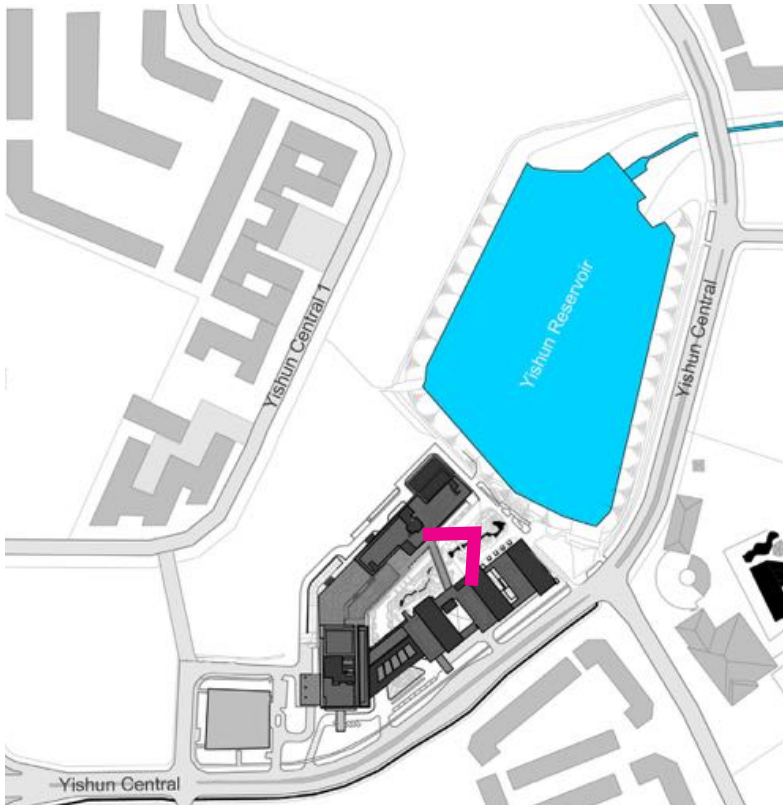
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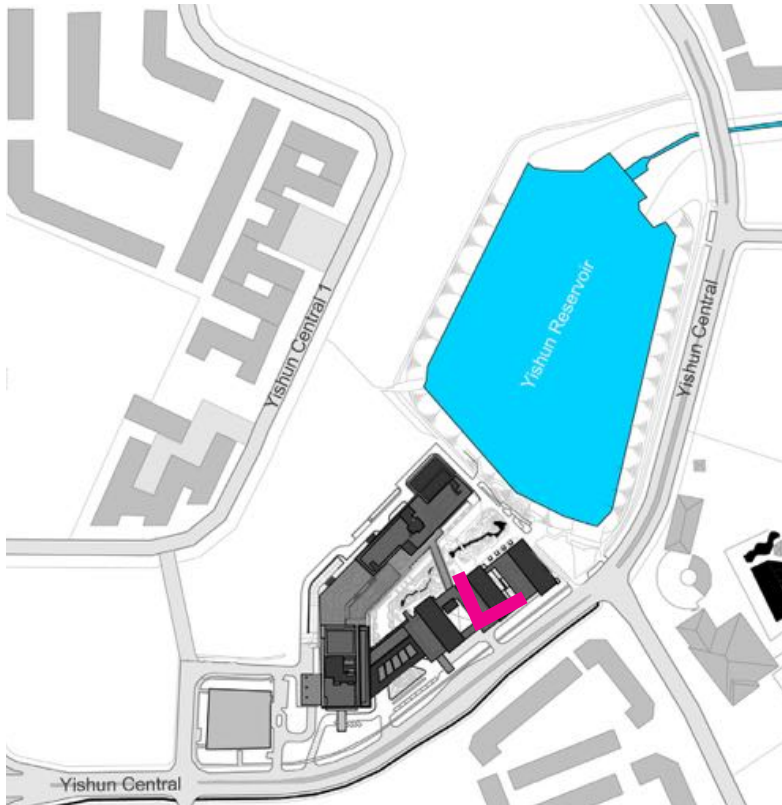
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# KTPH



# NUH



Source: <http://khamchua.hnnuocngoai.com>

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# FINDINGS

## PERCEPTION OF BEAUTY

# Q: HOW BEAUTIFUL IS THIS PLACE?

1=not beautiful 5=very beautiful	Mean_Response KTPH	Mean_Response NUH	Result ( $p \leq 0.05$ )
	<b>4.31</b> (N=195)	<b>3.70</b> (N=70)	.0001 Highly Significant

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### ATTRIBUTES

**AMENITIES** (safety, activities etc.)

**VIEW** (scenery, wide view etc.)

**PROXIMITY TO NATURE** (intercation and closeness to nature etc.)

**PRIVACY** (less people, not crowded etc.)

**AMBIENCE** (spacious, peaceful, clean etc.)

**ENVIRONMENTAL ATTRIBUTES** (quiet, airy, fresh etc.)

**PERCEPTION OF NATURALNESS** (forest-like, etc.)

**FORMAL COMPOSITION OF THE LANDSCAPE**

(juxtaposition of water and greenery)

### ELEMENTS

**BLUE AND GREEN ELEMENTS** (size of Yishun pond, presence of water, flowing water, accessible water features, man-nature relation etc.)

**PERCEIVED DEMOGRAPHICS** (young people, retirees, etc.)

**SOCIAL UNITS** (families, friends, etc)

**FLORA and FAUNA** (wild vegetation, untouched nature, birds and butterflies, etc.)

## ATTRIBUTES

### 1. AFFORDANCES:

amenities (safety, activities etc.), view (scenery, wide view etc.), proximity to nature (intercation and closeness to nature etc.) and privacy (less people, not crowded etc.)

### 2. QUALITY:

ambience (spacious, peaceful, clean etc.) and environmental attributes (quiet, airy, fresh etc.)

### 3. AESTHETICS:

perception of naturalness (forest-like, etc.) and formal composition of the landscape (juxtaposition of water and greenery)

## ELEMENTS

### 4. WATER + GREENERY:

blue and green elements (size of Yishun pond, presence of water, flowing water, accessible water features, man-nature relation etc.)

### 5. PEOPLE:

perceived demographics (young people, retirees, etc.) and social units (families, friends, etc)

### 6. FLORA + FAUNA:

(wild vegetation, untouched nature, birds and butterflies, etc.)

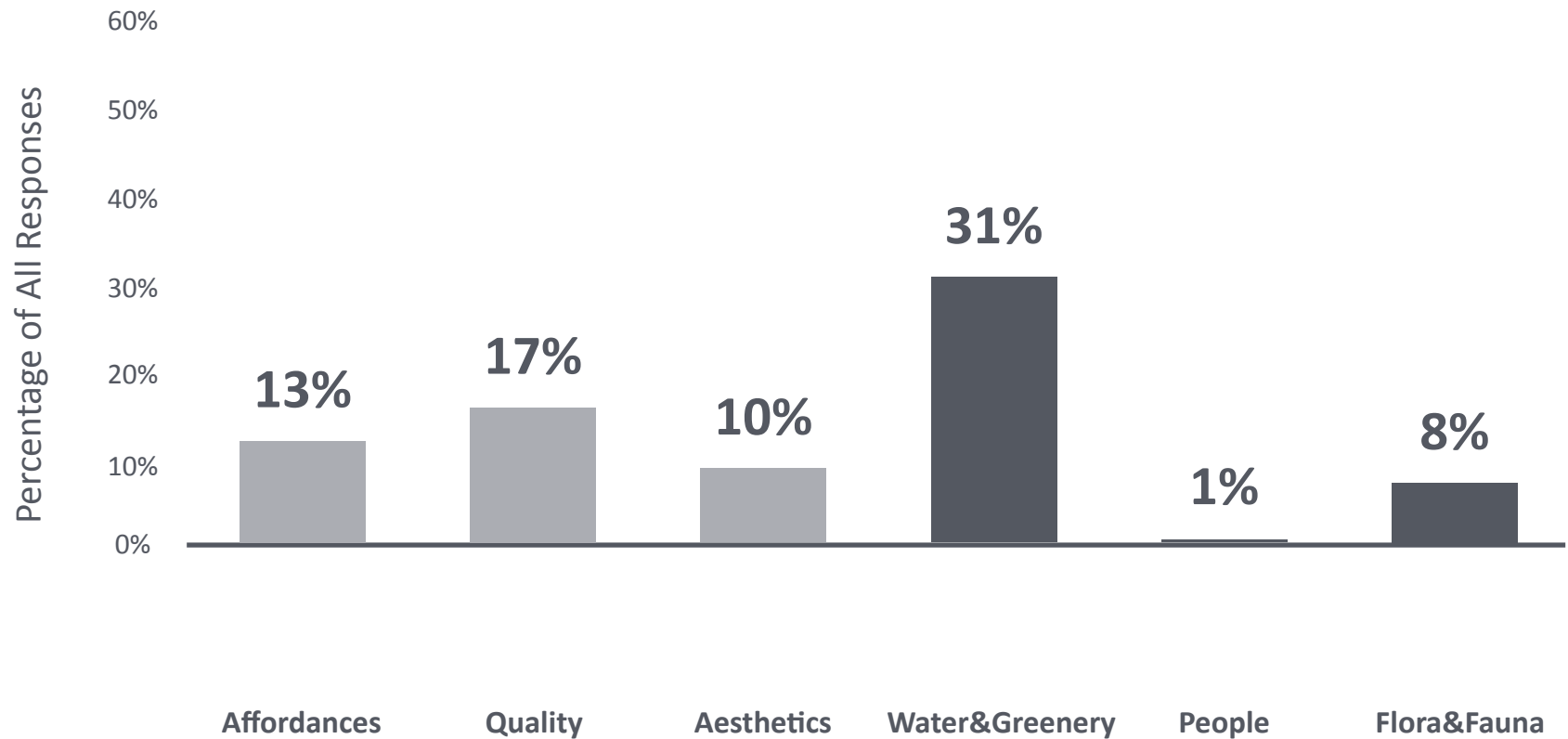
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# KTPH

### ATTRIBUTES

### ELEMENTS



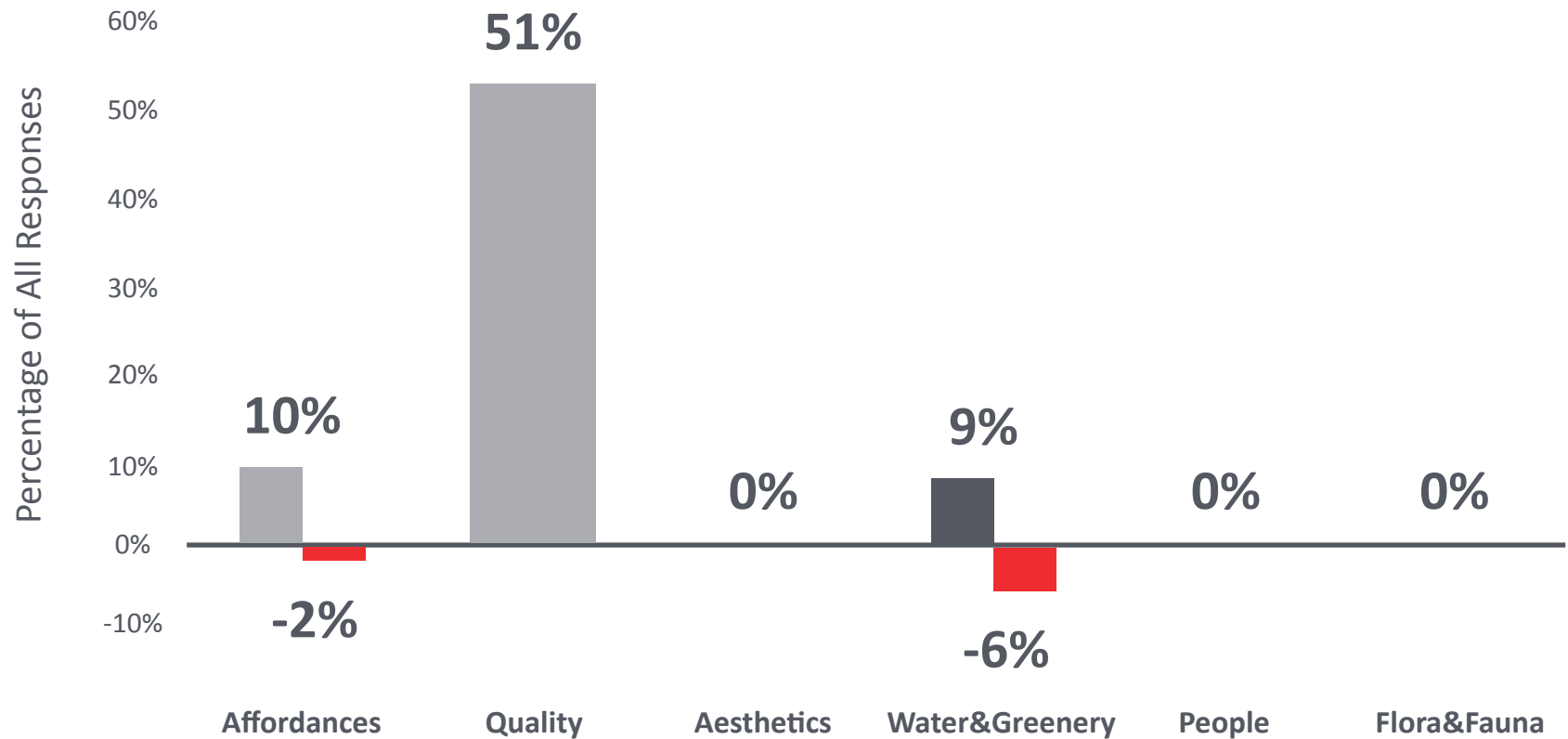
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# NUH

### ATTRIBUTES

### ELEMENTS



## SENSE OF WELL-BEING

# Q: "I FEEL CALM AND RELAXED HERE"

1=strongly disagree 5=strongly agree	Mean_Response KTPH	Mean_Response NUH	Result ( $p \leq 0.05$ )
	<b>4.17</b> (N=190)	<b>3.75</b> (N=70)	.001 Highly Significant



## PERCEIVED CLOSENESS TO NATURE

# Q: “I ENJOY SEEING BIRDS AND BUTTERFLIES HERE”

1=strongly disagree 5=strongly agree	Mean_Response KTPH	Mean_Response NUH	Result ( $p \leq 0.05$ )
	<b>3.83</b> (N=172)	<b>2.81</b> (N=58)	.0001 Highly Significant





# PERCEIVED CLOSENESS TO NATURE

## Q: “I FEEL CLOSE TO NATURE HERE”

1=strongly disagree 5=strongly agree	Mean_Response KTPH	Mean_Response NUH	Result ( $p \leq 0.05$ )
	<b>4.21</b> (N=197)	<b>3.38</b> (N=70)	.0001 Highly Significant

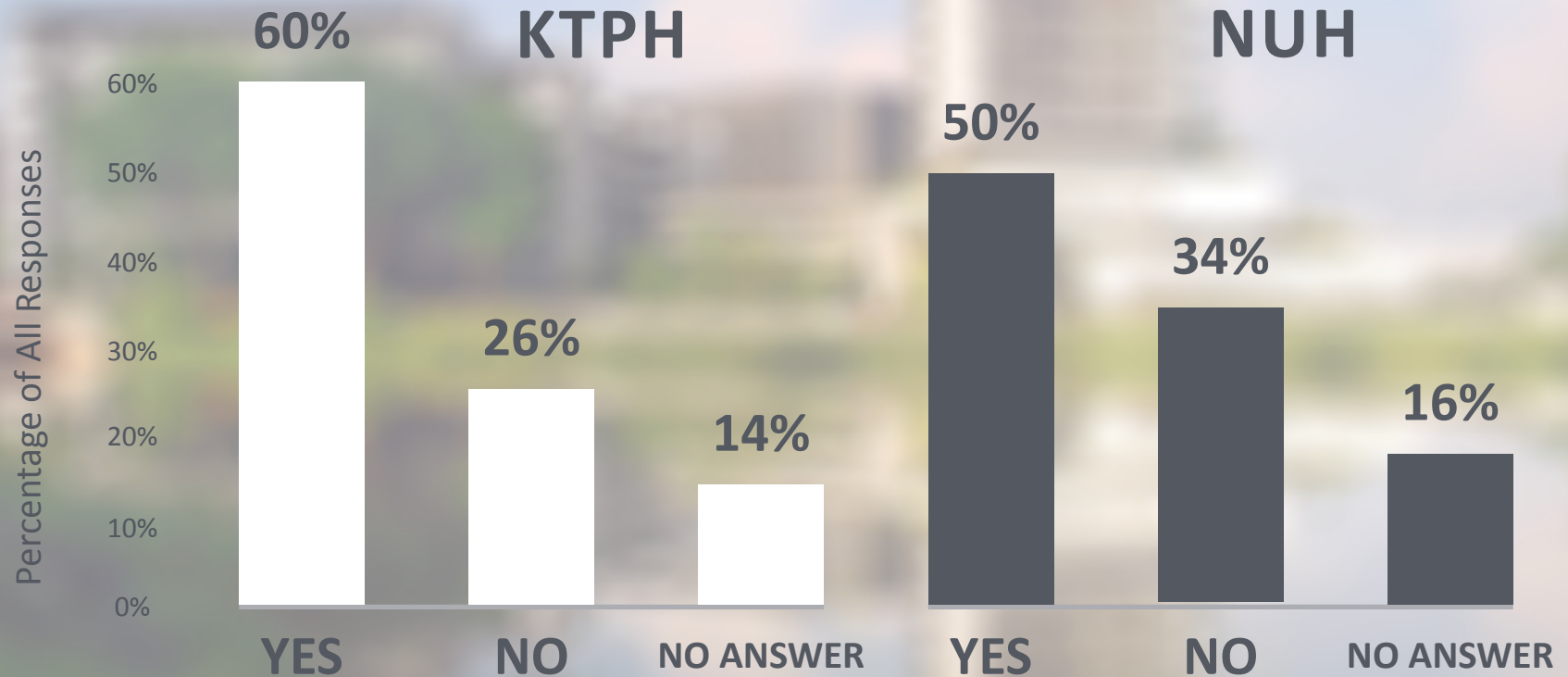




# PREFERENCE OVER OTHER HOSPITALS

## Q: DID YOU CHOOSE THIS HOSPITAL OVER OTHER HOSPITALS?

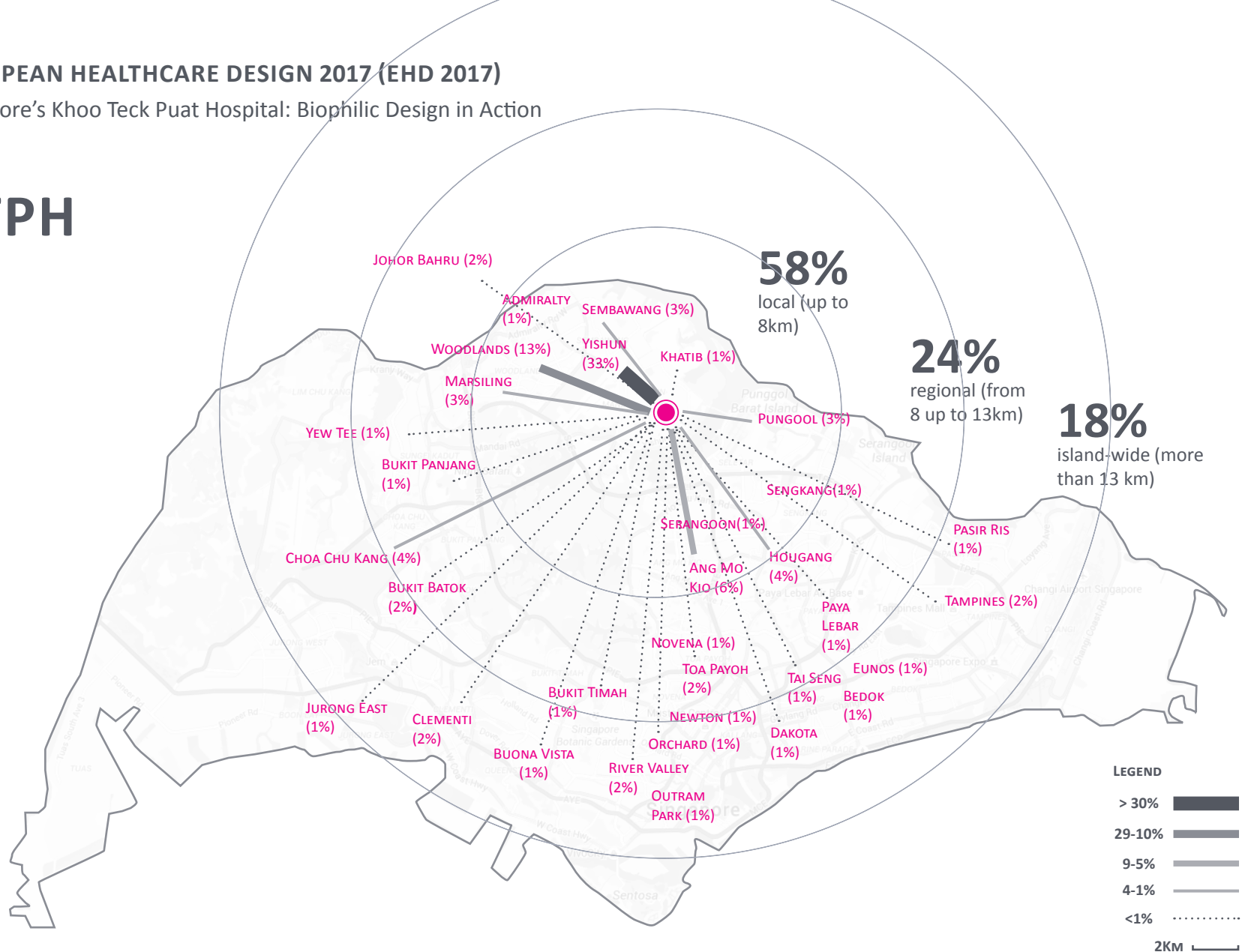
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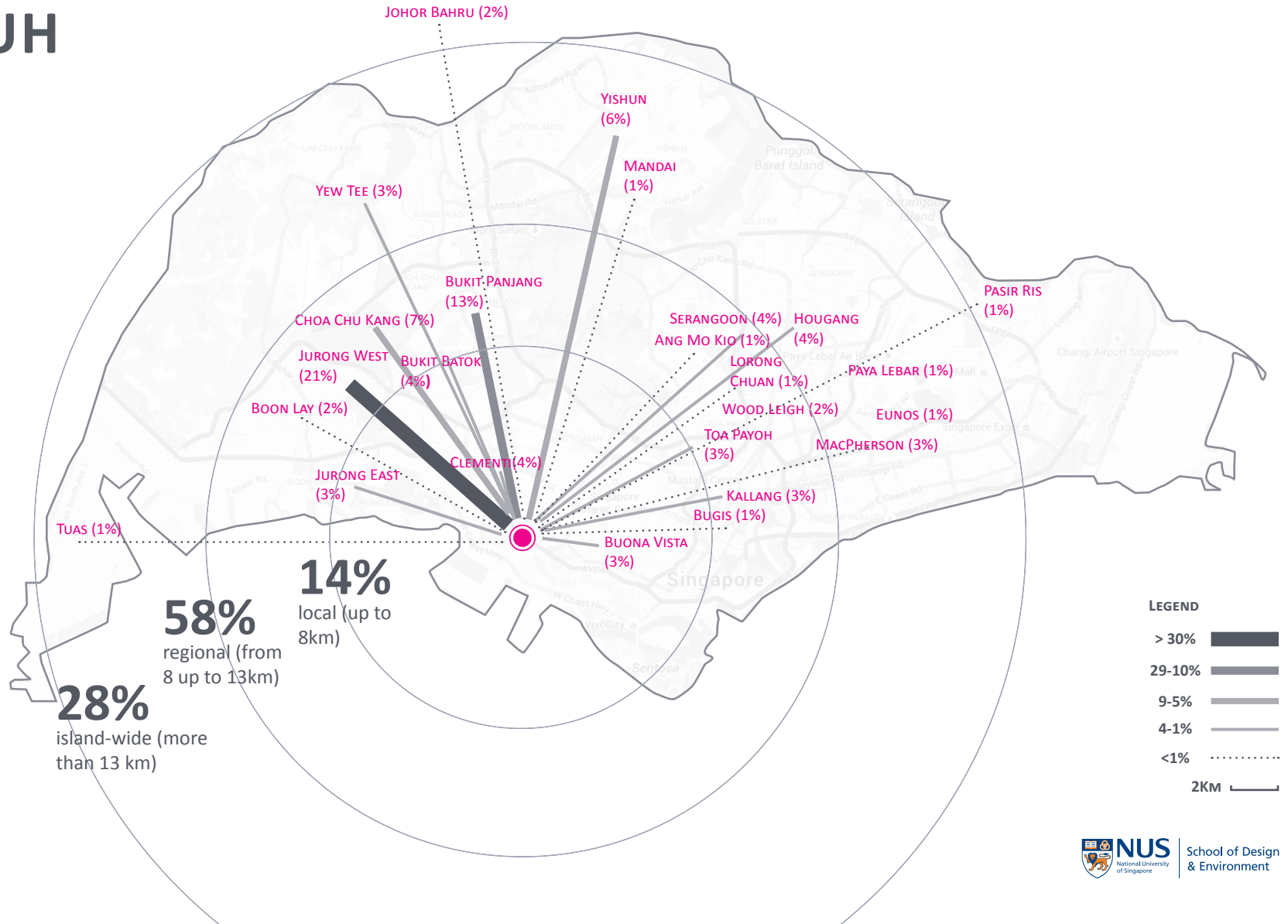
## KTPH



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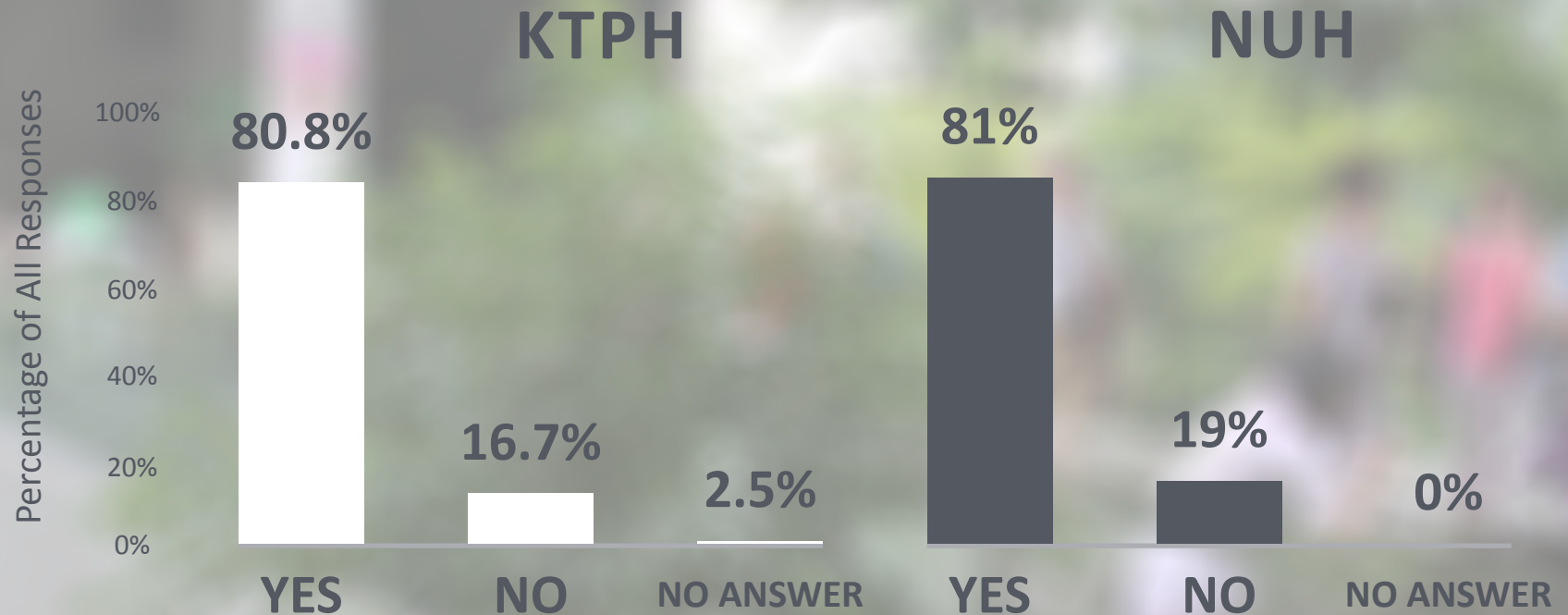
# NUH



WILLINGNESS TO PAY

**Q: DO YOU THINK  
HOSPITALS SHOULD  
SPEND MONEY ON  
GREENERY AND WATER?**

# WILLINGNESS TO PAY

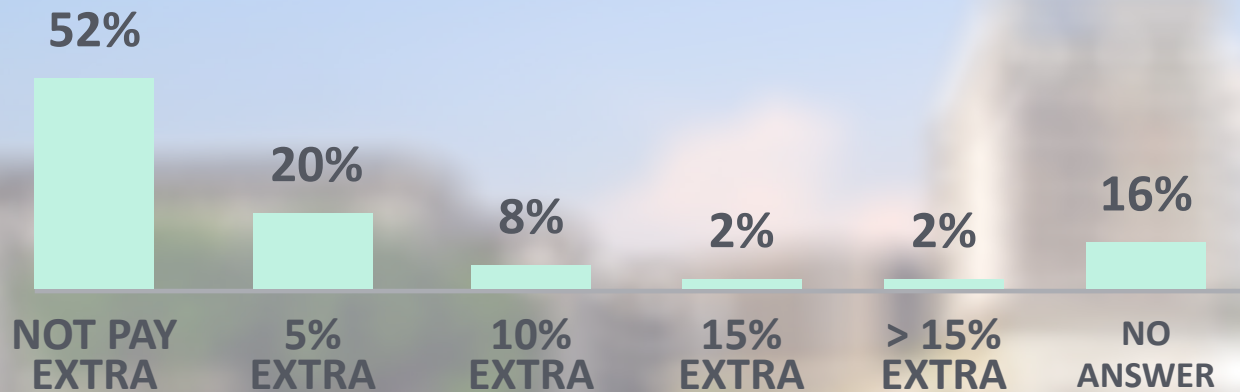


WILLINGNESS TO PAY

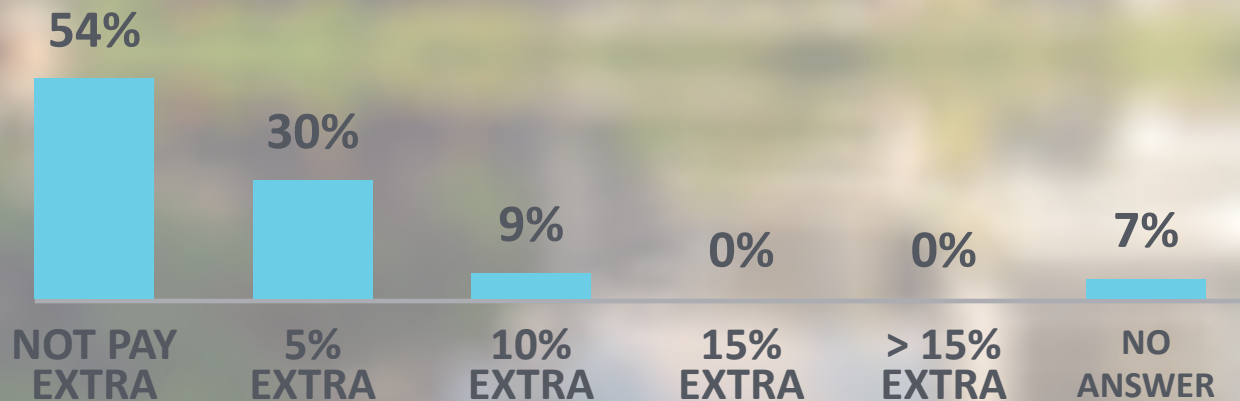
**Q: HOW MUCH EXTRA  
WOULD YOU BE WILLING  
TO PAY PER VISIT?**

# WILLINGNESS TO PAY

KTPH



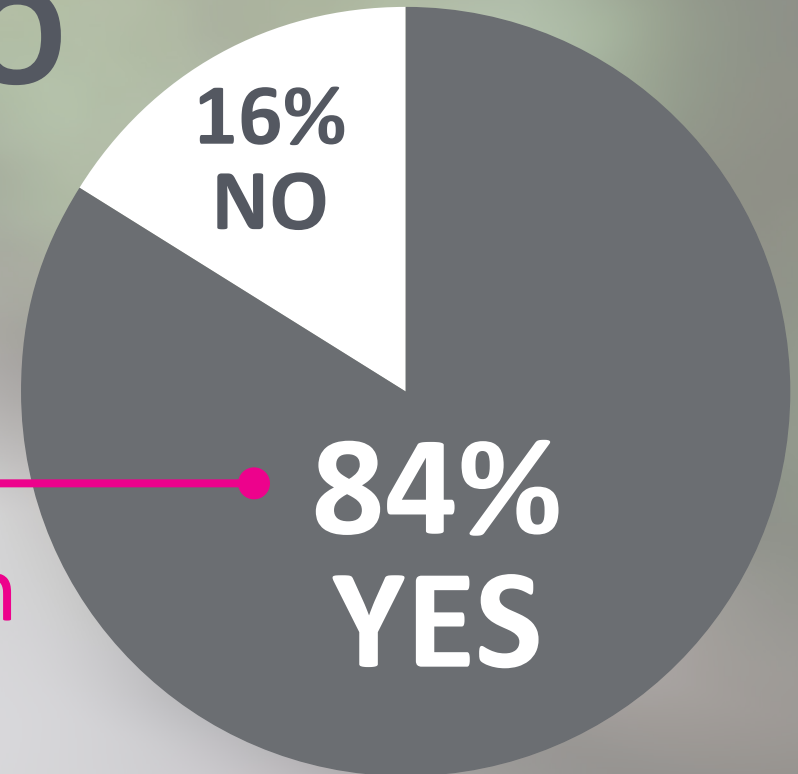
NUH



## REPLICATION AND REPUTATION

# Q: IS THIS HOSPITAL IMPORTANT TO SINGAPORE?

Public amenity  
Singapore's  
reputation as a City in  
a Garden



## NG TENG FONG GENERAL HOSPITAL BY CPG ARCHITECTS



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# CONCLUSION

**ON PERCEIVED BEAUTY, INDICATORS OF SELF-REPORTED  
WELL-BEING, AWARENESS OF AND PROXIMITY TO NATURE –  
KTPH DOES BETTER THAN NUH**

**BEAUTY WAS FOUND TO BE LINKED TO ATTRIBUTES AND  
ELEMENTS IN THE PHYSICAL ENVIRONMENT, SUCH AS THE  
PRESENCE OF WATER, GREENERY AND PEOPLE**

**ON PERCEIVED BEAUTY, INDICATORS OF SELF-REPORTED WELL-BEING, AWARENESS OF AND PROXIMITY TO NATURE –**  
KTPH DOES BETTER THAN NUH

**BEAUTY WAS FOUND TO BE LINKED TO ATTRIBUTES AND ELEMENTS IN THE PHYSICAL ENVIRONMENT, SUCH AS THE PRESENCE OF WATER, GREENERY AND PEOPLE**

**MORE THAN 80% OF RESPONDENTS SURVEYED SAY THAT HOSPITALS OUGHT TO INCLUDE BLUE-GREEN ELEMENTS IN THEIR DESIGN**

**PREFERENCE FOR KTPH OVER OTHER HOSPITALS WAS FOUND TO BE 10% HIGHER THAN IN NUH**

**KTPH'S BD APPROACH IS NOW REPLICATED IN OTHER HEALTHCARE PROJECTS IN SINGAPORE**

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# THANK YOU

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